Lifelong Learning
Erasmus
University of Ruse

Agrarian and Industrial Faculty

UNIVERSITY OF RUSE

AGRARIAN AND INDUSTRIAL FACULTY

Erasmus ECTS Information Package

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GENERAL INTRODUCTION

THE ECTS SYSTEM

The Information Package provides a description of the University of Ruse, of the Agrarian and Industrial Faculty and the courses offered by the Faculty in order to help prospective ECTS students to prepare their study period at this institution.

What is ECTS?

ECTS, **The European Community Course Credit Transfer System,** was developed by the Commission of the European Communities in order to provide common procedures to guarantee academic recognition of studies abroad. It provides a way of measuring and comparing learning achievements and transferring them from one institution to another. The European Commission promotes the system and the international cooperation between universities as a means of improving the quality of education bringing benefits both to students and higher education itself. In this respect, student exchange is the basic element in university cooperation. Recognition of education and diplomas is the necessary condition for establishing an open European higher education space where students and lecturers can "move" with no restriction.

ECTS provides **transparency** through the following means:

- **ECTS credits** which are a numerical value allocated to course units to describe the student workload required to complete them;
- **The Information Package** which supplies written information to students and staff on institutions, departments/faculties, the organization and structure of studies and course units;
- **The Transcript of Records** which shows students' learning achievements in a way which is comprehensive, commonly understood and easily transferable from one institution to another;
- **The Learning Agreement** covering the programme of study to be taken and the ECTS credits to be awarded for their satisfactory completion, committing both home and host institutions, as well as the student.

The ECTS Credits

ECTS credits are allocated units to describe the **student workload** required to complete them. They reflect the **quantity** of work each course requires **in relation to** the total quantity of work required to complete a full year of academic study at the institution, i.e. lectures, practical work, seminars, self-study –in a library or at home- and exams or other assessment activities. ECTS credits express a **relative value**.

In ECTS, **60 credits** represent the workload of a year of study; normally **30 credits** are given for a semester and **20 credits** for a term. It is important that no special courses are set up for ECTS purposes, but that all ECTS courses are mainstream courses of the participating institutions, as followed by the home students under normal regulations.

Credits are awarded only when the course has been completed and all required examinations or other assessment activities have been successfully passed. Detailed information about disciplines (short description of course contents, teaching methods, types of assessment, etc.) is given in the information package of each degree programme.

ECTS Students

Students participating in ECTS receive full credit for all academic work successfully carried out at any of the ECTS partner institutions. These credits are transferred to the home university and fully replace the annual/semester workload including exams and other forms of assessment. In this way students can study abroad for a certain period of time and when they come back, they are able to continue their education without any loss of semesters and exams. Some students may also decide to graduate from the host university, and permission for that is given by the academic authorities based upon the student's transcript of credit points and his/her performance at the home university.

DATA ABOUT BULGARIA

The Republic of Bulgaria is a country situated in South-East Europe. In the north it borders the Republic of Romania, in the east it ranges to the Black Sea, in the south it neighbours the Republic of Turkey and the Republic of Greece, and in the west it borders (Former Yugoslavian) Republic of Macedonia and Republic of Serbia.

Area: 110,993.6 sq km

Population: 7,262, 675

Capital city: Sofia

Official language: Bulgarian

Alphabet: Cyrillic

Religion: There is freedom of religious confessions. Traditional religion in the Republic of Bulgaria is Eastern Orthodox Christianity

National holiday: March 3, the Day of the Liberation of Bulgaria from Ottoman domination (1878)

Public (non-working) holidays:

3 March – Liberation Day (national holiday)

1 January – New Year

Easter (Resurrection of Christ) – two days (Easter Sunday and Easter Monday)

1 May – Labour Day (the Day of International Working Class Solidarity)

6 May - Day of Bravery and Bulgarian Army, Gergyovden (St. George's Day)

24 May – Day of Bulgarian Education and Culture, and of the Slavonic Alphabet

6 September - Unification Day

22 September - Independence Day

1 November – Day of the National Revival Leaders

24 December – Christmas Eve

25 and 26 December - Christmas

Monetary unit: the Bulgarian Lev

Administrative division: 28 regions, named after their respective regional centres

State system: a parliamentary republic with a one-chamber parliament (National Assembly), consisting of 240 national representatives, elected for a four-year term of service. The head of state of the republic is the President, elected for a five-year term of service. The Council of Ministers is the main body of executive power.

Climate: moderate continental with Black Sea influence in the east and Mediterranean in the south

Waters: rivers (main rivers are the Danube, Maritsa, Mesta, Strouma, Iskar, and Yantra); warm and cold mineral springs (more than 600)

Transport: railway, automobile, air and water

International automobile sign: BG

International telephone code: +359 ……..

International telephone code for Ruse: +359 82 ……..

Official Symbols of Bulgaria

The national flag of the Republic of Bulgaria is in three colours: white, green and red bands, following horizontally from top to bottom.

A legend associates the origin of these three colours with the colour symbols of the Old Bulgarian Army. Its left wing was set apart by white strips on the spears, the right one by red, while arranged in the centre were the elite troops with a green strip, the traditional colour of the ruler. The three-colour flag had first been used by the First Bulgarian Legion of Georgi Rakovski (1861). By force of the Turnovo Constitution (1879), the three-colour flag - white, green and red, was confirmed as Bulgaria's national flag.

The coat-of-arms of the Republic of Bulgaria is a rampant gold crowned lion against a dark-red background in the form of a shield. Above the shield there is a big crown, whose original shape was that of the crowns of medieval Bulgarian rulers, with five crosses and one other cross, separately, over the crown itself. The shield is supported by two golden crowned rampant lions, facing the shield from the left and right heraldic side. They are standing on two crossed oak tree twigs with acorns. Inscribed in golden letters onto a white strip with a three-colour edging, placed under the shield across the ends of the oak twigs, is ***Union is Strength***.

The Bulgarian Landmarks in the UNESCO List of the World Natural and Cultural Heritage

Kazanluk Tomb
A Thracian tomb, dated to the late 4th-early 3rdcentury B.C. The murals in the burial chamber and in the corridor are of exclusive artistic value. The tomb is located in the Tyulbeto Hill near the town of Kazanluk.

Ivanovo Rock Churches
A rock monastery compound of the Holy Archangel Michael, with partially preserved churches. The murals in the Church of the Holy Virgin have been described as some of the most significant achievements of 14th century Bulgarian medieval art. The churches are located about 20 km away from the city of Ruse, east of the village of Ivanovo, in the rocks of the Rusenski Lom Nature Park.

Boyana Church
It has unique murals from 1259, considered among the masterpieces of medieval European painting. It is at a distance of about 8 km from the centre of the city of Sofia (in the Boyana residential district), in the foothills of Mount Vitosha.

Madara Horseman
A rock relief, cut into the Madara rocks on the northern slope of the Provadiisko Plateau at a height of 23 m. This is the most significant monumental piece of art from the early Middle Ages, unique of its kind in European cultural history. It is close to the village of Madara, about 16 km away from the city of Shumen.

Rila Monastery
The most impressive monastery compound in Bulgaria of exceptional architectural and artistic merits. Founded in the 10th century, rebuilt in the 13th-14th century, a literary centre in the 15th century and completed in its present-day striking appearance during the 19thcentury. A spiritual centre of the Bulgarian people, it is located in the northwest part of the Rila Mountain, about 20 km from the town of Rila and about 120 km from Sofia.

Nessebur, the old part of the town
An architectural, historical and archaeological reserve at the Black Sea coast with valuable archaeological relics from different periods, original churches from the 5th to the 17th century and authentic National Revival Period houses.

Sveshtari Tomb
A Thracian tomb from the first half of the 3rd century B.C. The central burial chamber has exceptionally lavish decoration and impressive caryatides in high relief. It is located close to the village of Sveshtari, 7 km northwest of the town of Isperih.

Sreburna Reserve
A biosphere reserve in the valley of the Danube, including the Sreburna Lake and its surroundings. It has been established for the preservation of rare plant and animal species. It is 16 km west of the town of Silistra.

Pirin National Park
It is part of the scenic Pirin Mountain. Located in the high parts of the Northern Mount Pirin, it is characterized by a specific relief and an inimitable plant and animal world. It also incorporates the Bayuvi Dupki - Dzhindzhiritsa Biosphere Reserve and the Yulen Reserve.

INFORMATION
ON
THE CITY
AND
THE UNIVERSITY

THE CITY OF RUSE

Welcome to Ruse

" ... All that I experienced afterwards had already been in Roustchouk"
Elias Canetti

Ruse is the biggest Bulgarian port town on the bank of the river Danube. After the opening of the Rhein - Main - Danube canal which covers 3,500 km and connects thirteen European countries with the Near and Far East via the Black Sea, the river becomes the longest inland waterway on the planet.

This key position has determined the nineteen century long co-existence of town, river, and people, carrying the unique atmosphere of history as a precious heritage, and of future as an open road full of promises. The Romans were the first to build the fort which they called Sexaginta Prista (the port of sixty ships). Then came others, from Europe, leaving their indelible imprint in this intersection of material and spiritual culture, followed by the imbued with the zeal of drive and enterprise Bulgarians, who gradually turned the place into a centre of the Bulgarian national revival. The very name Ruse became a synonym of economic growth and cultural rebirth.

The nineteenth century saw here the opening of the first Bulgarian printing house, the first model farm, the first Bulgarian railroad connecting Ruse with Varna, the first Bulgarian weather service, the first technical school and technical society, the first professional teachers' club, the first insurance agency, the first chamber of commerce and industry, the first inland navigation service on the Danube, the first teletel, the first moving picture show, the first Bulgarian newspaper, the first geography map.

New industries sprang up, banks and trade agencies were founded and European shipping agencies, as well as 17 foreign consulates were established. A large number of Bulgarian, Austrian, Italian, and Swiss men of arts created the wealth of architectural forms and styles characteristic of the period in Europe: Neoclassicism, Neo-baroque, Neo-gothic style, Art Nouveau, and Fin du siecle.

The town hosted a vast variety of multinational ethnic groups, which the Nobel writer Elias Canetti defined as a microcosmos of two dozen nationalities. French, German, Italian, Jewish, Armenian, Turkish, and other schools, boarding houses and churches, reading clubs, theatres and music halls, museums and bookshops, opened their doors to help diversify the cultural life of the city in its steady march towards enlightenment. In this completed picture of social life, today the town is still rediscovering its true face, spanning a bridge across cultures in the new context of integrated Europe.

THE UNIVERSITY OF RUSE

On **12 November 1945** the first out-of-capital higher education institution was founded in Ruse. Its three departments were specialized in Engineering for the purposes of the agricultural sector. On **13 June 1966**, as a result of its intensive growth, the Minister of Education issued an Order No. 2583 to set up a Higher Institute of Mechanical Engineering, Mechanization and Electrification of Agriculture. On **9 April 1981,** due to the widened scope of its engineering provision, including the sectors of transport, electronics and computing, it was transformed into 'Angel Kanchev' Technical University by a Decree No. 584 of the Council of Ministers. On **1 August 1995** a Decision of the National Assembly was made to establish "Angel Kanchev" University of Ruse, thus recognizing its academic expertise not only in the engineering fields, but also in natural sciences, education, law, public health and healthcare, business and management, which were introduced as a response to the societal changes.

Its mission and goals are based on commitments for:

Quality assurance of all its degree programmes

Excellence in fundamental and applied research

Internationalization of staff and student communities

National leadership in the European Union exchange programmes

Constant widening of lifelong learning opportunities

Building successful lives and careers for students and graduates

Proactive and reactive approach to societal needs and business demands

Attractive and creative environment for personal development

ACADEMIC CALENDAR

The academic year at the University of Ruse starts in September and is divided into two semesters – Fall and Spring. Each semester consists of:

- 15 weeks of classes;
- 4 weeks of regular examination session;
- 1 week for supplementary examination and 1 vacation week after the fall semester;
- Summer holidays (4-8 weeks) start after the end of the examination session and last till the beginning of the new academic year or till the beginning of the annual supplementary examination session in September for those students who have to resit exams left from the previous year.

The organisation of the training process is realised in the framework of the *Academic Calendar*, which is adopted each year by a resolution of the University's Academic Council.

BUSINESS CARD of the University of Ruse (UR)

Name of higher education institution	**"Angel Kanchev" University of Ruse**
Type of higher education institution	**State University**
Location and address	**8, Studentska Street, Ruse 7017, Bulgaria**

Rector Prof. Hristo Beloev, MEng, PhD

Number of students for the academic year 2008-09: 9200

Number of international students: 487 from **17** countries

Number of PhD students for the period 2000-2008: 270

Full-time personnel: 709

of which faculty **450**

full and associate professors **203**

Number of degree programmes offered:

41 in **6** of the **10** major fields of study (education, humanities, economics and management, mathematics and natural sciences, health care, engineering and technology)

The University of Ruse is the only university in the present and former Ruse region (with a population of approximately 1 million), which complies with the international index "one higher education institution per one million people".

The University of Ruse ranks 13th among the largest higher education institutions comparing indexes, such as: number of state-approved vacancies for admission, overall number of students, number of doctoral study students, size of state subsidy, applicants versus approved vacancies ratio, etc.

The University of Ruse is the only Bulgarian higher education institution, which is a regular member of the European Association of the Universities from the Danube Countries.

The University of Ruse was accredited on 26th January 2006 by the National Evaluation and Accreditation Agency for a six–year period with the highest grade – "very good".

International collaboration and admission of foreign students

International collaboration

The University of Ruse develops its international cooperation through:

- Participation in the scientific EC programmes NATO, SIXTH and SEVENTH FRAMEWORK PROGRAMMEs, PHARE
- Participation in the academic programmes CEEPUS, ERASMUS, LEONARDO DA VINCI, COMENIUS
- Participation in bilateral collaboration with traditional and new partners

The University of Ruse is one of the first Bulgarian universities which got involved in the ERASMUS programme. There are 80 Bilateral agreements signed with 24 European countries. At least 70 undergraduate, post-graduate and PhD-students are annually involved in all EU exchange programmes. The University of Ruse is the only university in Bulgaria which coordinates three thematic networks of about 70 participants each. It has contributed to the establishment of the first cross-border higher education centre in SEE – Bulgarian-Romanian Interuniversity Europe Centre (BRIE), which has been accredited in Germany and in Romania.

Admission of foreign students

Terms of study:

- ***For a Bachelor's degree*** - 4 years;
- ***For a Master's degree*** – 1 or 1,5 years following a Bachelor's degree programme;
- ***For a Doctoral degree*** – a minimum of 3 years

Degree programmes at the University of Ruse

Faculty of Agricultural and Industrial Engineering:

- Agricultural Machinery and Technologies
- Ecology and Environmental Protection
- Industrial Design
- Hydraulic and Pneumatic Equipment
- Agricultural Engineering
- Equipment Maintenance and Management

Faculty of Mechanical and Manufacturing Engineering:

- Machine Building Equipment and Technologies
- Computer-aided Design in Manufacturing Engineering
- Industrial Engineering
- Materials Science and Engineering

Faculty of Electrical Engineering, Electronic and Automation:

- Electrical Power Engineering
- Electronics
- Automatics, Information and Control Engineering
- Computer Systems and Technologies
- Communications and Communications Technologies

Faculty of Transport Engineering:

- Transport Engineering

- Transportation Technologies and Management

Faculty of Natural Sciences and Education:
- Mathematics and Informatics
- Informatics and Information Technologies
- Bulgarian Language and History
- Pre-school and Primary School Education
- Primary School Education and a Foreign Language

Faculty of Business and Management:
- Marketing
- International Economic Relations
- European Studies
- Business Administration
- Industrial Management

Bulgarian-Romanian Interuniversity Europe Centre (BRIE):
- European Studies (in German and English)
- European Public Administration (in English)

Faculty of Law:
- Law

Public Health and Health Care:
- Kinesitherapy
- Occupational Therapy

Silistra Branch:
- Bulgarian Language and Foreign Language
- Physics and Informatics
- Transportation Technologies and Management
- Electrical Power Engineering
- Automatics, Information and Control Engineering

Razgrad Branch:
- Biotechnologies
- Chemical Technologies
- Food Processing Technologies.

Other University Units and Services

- Quality of Education and Accreditation Directorate
- Public Relations Directorate
- Foreign Students Directorate
- Student Admissions and University Registrar
- Scientific Research Sector
- University Computing and Information Services Center (UCISC)
- Center for Distance Learning
- Center for European Integration, International Cooperation and Mobility
- Center for Continuing Education
- Center for Career Development
- University Library

The language of instruction for students in Bachelor and Master Degrees is Bulgarian.
For international students, who wish to study at the University of Ruse under the ERASMUS programme, selected courses are offered in English. The list of these courses can be found on the university WEB site.

Application Procedures

General Conditions and Documents for Admission of Foreign Students

Foreigners, who hold a higher school diploma, giving them access to universities in the country issuing this diploma, are eligible for admittance into the University of Ruse.

Preparatory Training

During the first year of their studies foreign students study Bulgarian in a 10-month intensive course. The course is organised by the Foreign Students Department.

Tuition Fees

Foreign citizens, studying at RU, pay tuition fees. The fees are paid in two installments: at the beginning of the academic year and at the beginning of the second (Spring) semester.

For sending applications and for more detailed information foreign applicants can address:

Foreign Students Department
University of Ruse
8 Studentska Street
7017 Ruse
Bulgaria
tel: +359 82 888 281
e-mail: chs@ru.acad.bg

Conditions and documents for admission of foreign students under Programmes of the European Union

Application, admission and forms of training of foreign students under different programmes of the European Union are settled in compliance with the individual bilateral or international agreements. For sending application forms under ERASMUS and for more detailed information foreign applicants can address the Centre for European Integration and International Cooperation:

Centre for European Integration, International Cooperation and Mobility
University of Ruse
8 Studentska Str.
Ruse 7017
Bulgaria
tel/fax: +359 82 888 650
e-mail: cicm@ru.acad.bg

The Application form can be obtained at:
http://cicm.ru.acad.bg/

General Information

Visa Requirements

According to the Law for Foreigners' Stay in the Republic of Bulgaria, each foreigner may enter the country with a valid passport (or other ID document) and an entry visa for Bulgaria. Entry visas are issued in all Embassies or Consulates of Bulgaria abroad. *No visas are required* for citizens of the countries of the European Union and of a number of other countries as well. On arrival in Bulgaria every foreigner, if not accommodated in a hotel, should, within 24 hours, register his/her address with the Passport Service for Foreigners. Foreigners who are admitted as students at the University of Ruse should present their

documents for admission issued by the University. This will allow them to get permission for longer stay in the country after their entry visas expire.

Traveling to Ruse

The distance from Ruse to Sofia (the capital of Bulgaria) is 315 km.

The distance from Ruse to Bucharest (the capital of Romania) is 60 km.

Travel to both capitals is by train and by bus.

There are also provisions for quick and easy transport to various parts of the city and other regions of the country.

After arriving at the University you are welcome to contact the office of the Vice Rector for International Relations and European Integration:

Living Expenses

The optimum amount of living expenses is connected with a balanced budget, including subsistence costs, accommodation costs, medical services, public transport, food and public services, tuition costs and other expenses. Minimum living costs are achieved through the use of the refectory and through modest expenses for transport and other public services. Under these conditions, the average living expenses amount to 150 – 250 Euro per month.

Accommodation and on-campus facilities

Accommodation can be found in several sectors:

In one of the many hotels in Ruse. The approximate price for a single room is about 40 – 80 Euro per night.

In one of the cheaper hotels. Offering less comfort, or in single rooms in hotel chains at prices about 15–25 Euro per night.

Renting a flat. The rent for such a flat (1 to 3 rooms) varies from 60 to 250 Euro per month depending on the degree of comfort, furniture and location. Rents exclude expenses for electricity, hot water, central heating and telephone, which may cost about 50–100 Euro per month.

The University of Ruse offers very good on-campus accommodation for 2400 students at rents of about 35 Euro per month. There are eight student hostels, two of which are for families.

The University of Ruse on-campus facilities offer excellent opportunities for study, research, recreation and sport. The student hostels, the refectory, the medical centre, the post office, the sports facilities and the student culture club are all situated on the campus, which is surrounded by green parkland and is within easy reach of the city parks, the river Danube and the city centre.

There is a variety of amateur clubs, forming the Student Cultural Club Society, which was established in 1954. Examples are the Folk Dance Society, the Artists Club, the Pantomime Studio, the Drama Society, the Photographer's club, the Literature Club, the Modern Dance Society, and the folk dance theatre. Their guidance is entrusted to distinguished performers, artists and musicians.

The University of Ruse offers on-campus sports facilities for volleyball, basketball, table tennis, bodybuilding, football, field and track events and other sports. The sports teams and clubs for football, athletics, volleyball, basketball, handball, aerobics and calisthenics are the responsibility of qualified teachers, which explains why they often win first prizes at various competitions.

The Tourist Society ACADEMIC unites a variety of clubs: for mountain climbing, water sports, skiing, cycling, rock climbing, mountaineering, speleology and cross-country walking. They attract large numbers of students, faculty members and administrative staff, who can take holidays in the university resort centres on the Black Sea coast, in the Balkan mountains, or along the bank of the Danube.

Medical Services and Insurance

There are many clinics, hospitals and private medical offices where you may ask for qualified medical help paying cash at quite reasonable rates. You may also get medical insurance in one of the numerous insurance companies in Bulgaria.

Other Useful Information

Public Transport: Trams, buses and trolley buses are the main public transport in Bulgaria. Tickets are sold at bus stations (bus stops), at newspaper stands or in some cases by drivers. Tickets should be perforated in the vehicle. There are also season travel cards for one day, one week or one month. The price of the ticket for public transport is 1.00 Lv. (about 0.50 Euro).

Taxi: There are many taxis in Ruse, provided mostly by private firms. Information about the firm and charge rates (day and night) can be seen on stickers on the front or rear windows of the car. Charge rates for 1 kilometre are between 0.70 and 0.90 Lv. (about 0.35–0.45 Euro).

Money Exchange: Popular currencies in Bulgaria are the USD and EURO. Open hours of the banks are usually between 9.00 a.m. and 4.00 p.m. There are also a lot of foreign exchange offices.

Food Stores. Restaurants: All food stores work usually till 7.00 or 8.00 p.m., but there are also 24-hour open stores and stores that work on Saturdays and Sundays. Most foodstuffs, vegetables and fruit are sold at prices, similar to those in Western Europe. Restaurants offer highly varied prices depending on their category. In some small and inexpensive restaurants the price of a meal is about 10 Euro.

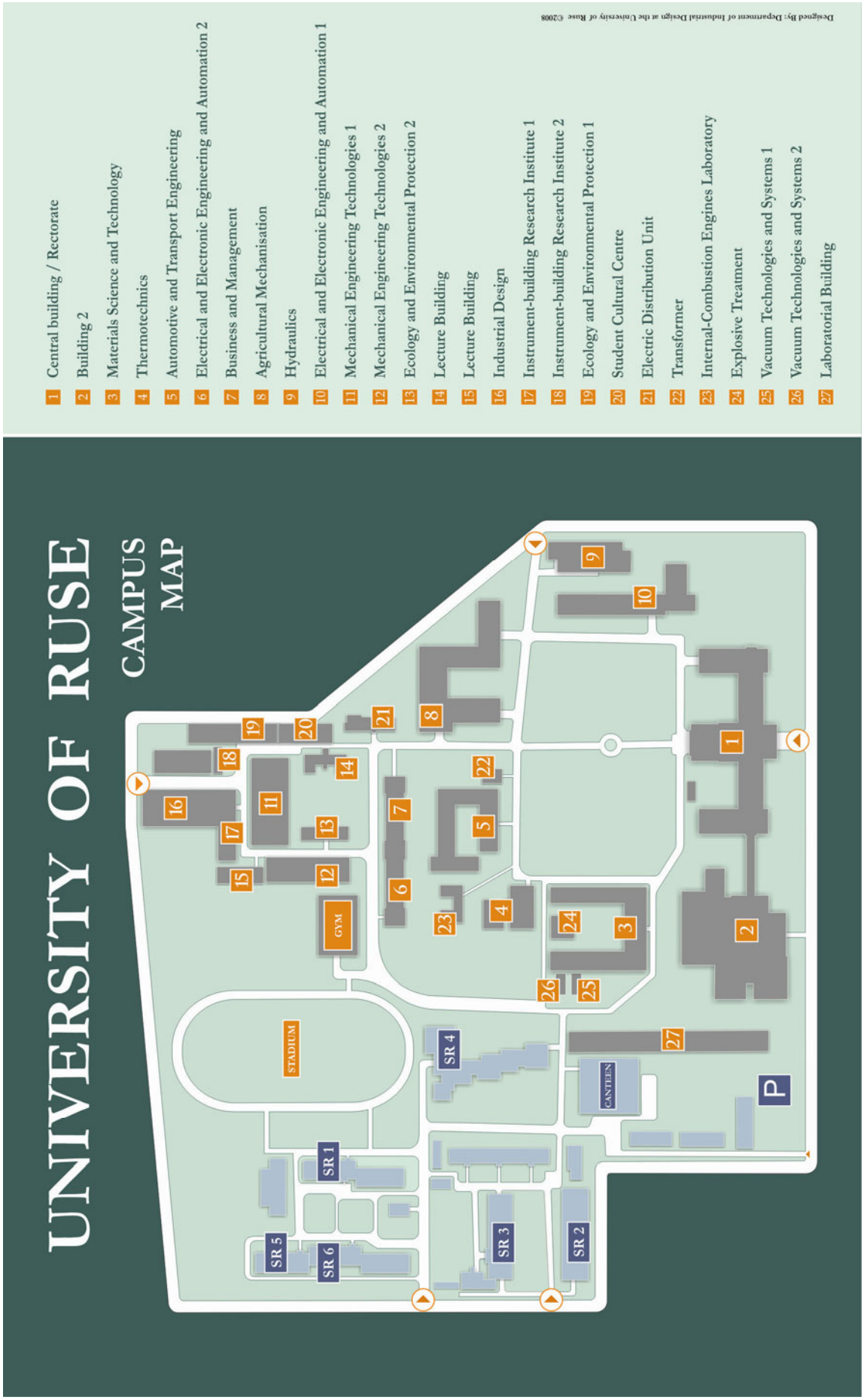
Phone Services: Street phones can be used with a phone card (either "Bulfon" or "Betkom"). Phone cards are available at post offices, stations of the public transport or news-stands. For international calls you may use the above phone cards or phones in post offices. There are 3 large mobile network operators on the territory of Bulgaria and these are M-Tel, GloBul and Vivatel.

Book Shops and Photocopying Services: Copy services, books, textbooks, manuals and other training aids are offered in the University bookshop and stationery shop.

Student Organisations

The Student Council is a body which protects the interests of the students. It is elected by full-time bachelor, master and doctoral students and includes student representatives in the General Assembly of the University. The Student Council at the University of Ruse maintains an information centre, located on the first floor of the Central Building.

Campus Map of the University of Ruse



INFORMATION ON THE AGRARIAN AND INDUSTRIAL FACULTY

Agrarian and Industrial Faculty

Agrarian and Industrial Faculty (AIF) was established in 1954 and consists of six departments: Agricultural Machines (AM); Repair, Reliability and Chemical Technologies (RRCT); Theory of Machines and Mechanisms and Hoist and Hauling Machines and Technologies (TMM and HHMT); Heat Technology, Hydraulics and Pneumatic Machines (HTHPM); Ecology and Environmental Protection (EEP); Industrial Design (ID).

Agrarian and Industrial Faculty employs 57 lecturers, including 5 professors, 30 associate professors and 6 doctors of engineering. About 800 full-time and 200 part-time students are being taught in the Bachelor programmes as well as 60 full-time students in the Master programmes and the total number of PhD students are 26. The Faculty also admits foreign students who are taught in Bulgarian or in English. Since its establishment to the present day, over 8000 higher education specialists have graduated from the Agrarian and Industrial Faculty.

The Faculty possesses sufficient facilities and resources which meet modern requirements and enables the conducting of quality training and research work. The AIF has more than 30 teaching and research laboratories, a room for specialised computer-aided training with Internet access. In every department there are work places equipped with PCs linked to the Web.

The Faculty maintains contacts with analogous faculties and university departments as well as with other organisations from Great Britain, Ireland, Portugal, Lithuania, Holland, Greece, Turkey.

In the AIF is training engineers with Bachelor's degree in the following degree courses: Agricultural Machinery and Technologies; Agricultural Engineering; Management and Servicing of Machinery; Hydraulic and Pneumatic Technics; Industrial Design; Ecology and Techniques for Environmental Protection and also specialists with Master's degree in the following courses: Agricultural Machinery and Technologies, Management Techniques in Agriculture; Management and Servicing of Machinery; Hydraulic and Pneumatic Technics; Heat and Gas Supplying; Industrial Design; Ecology and Techniques for Environmental Protection; Engineering ecology.

The training of PhD students is conducted in scientific fields with the following codes:

- 02.01.39 Agricultural and hydro-ameliorative machines
- 02.18.01 Mechanisation and electrification of crop-growing
- 02.18.02 Mechanisation and electrification of livestock breeding
- 02.01.04 Theory of Machines and Mechanisms
- 02.01.44 Hydraulic and Pneumatic Machines and Equipment
- 02.01.48 Material handling machinery
- 02.06.13 Industrial Thermal Technology

The major scientific fields in the departments of AIF are: mechanization on crop-growing, livestock-breeding and agricultural equipment, where they can conduct comprehensive analysis of agricultural production systems, optimize production processes, apply contemporary engineering methods in agriculture, provide expert solutions to current problems and exercise control functions; reliability, diagnosis and monitoring equipment; tribological trials of prevention and rehabilitation coatings; recovery of materials in the maintenance of equipment; composite materials; plastic lubricants; synthetic resins and oils; biofuels and products of vegetable oils; synthesis modificators of friction; non-traditional energy sources; installations for hydraulic and pneumatic transport and ventilation, analyzing and testing sophisticated hydraulic and pneumatic equipment; hydro and pneumo systems; synthesis and analysis of levers mechanisms, design of gear mechanisms; research, design and expert evaluations of hoisting and hauling equipment; development and research of friction materials and units of hoisting and hauling equipment; industrial product and form design; interior and space design; graphic design and industrial graphics; visual communications; advertising decisions; Synthesis of solutions for managing environmental protection; prevention, correction - and reducing compensation solutions for environmental protection.

The Agrarian and Industrial Faculty is organizer of The Specialized Agricultural and Automotive Machinery Expo, which is the only expo of its kind in the central northern part of the country and is the third biggest in the country. It is organized annually in May on the territory of the University of Ruse.

ECTS
Coordinators

Faculty ECTS Coordinator:

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Assoc. Prof. Boris Borisov, PhD
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Department of Thermotechnics, Hydro- and Pneumotechnics
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Department of Industrial Design
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Department of Theory of Mechanisms and Machines and Material Handling Engineering and Technologies
Senior Assistant Stoyan Stoikov, MEng
tel.: + 359 82 888 486, e-mail: sstoykov@ru.acad.bg

DEPARTMENTS IN THE AGRARIAN AND INDUSTRIAL FACULTY

DEPARTMENT OF AGRICULTURAL MACHINERY

BUSINESS CARD of the Department

The department was first established in 1954. As it developed further some reorganisation took place in 2002 and the Department of Agricultural Machines and the Department of Integrated Mechanization and Processing Lines in Agriculture joined to form the present Department of Agricultural Machinery.

Fourteen highly qualified members of the academic staff are involved in the teaching process at the department, including one professor, nine associate professors, three assistant professors with PhD degrees, one senior assistant and four technical staff.

The Department of Agricultural Machinery is accredited to teach students at Bachelor and Master's level as well as at PhD level.

The department carries out research in the following fields:

- Design, research and development of new machines, systems and technologies for agriculture and livestock breeding;
- Mechanization and automation of processes in soil-cultivating, sowing, harvesting and storage of agricultural and livestock products;
- Research, simulation modelling and environmental aspects of agricultural production;
- Selection, reproduction and health of cattle, poultry and bees;
- Application of statistical methods in agriculture and agricultural machinery.

The students taking Agricultural Machinery and Agricultural Engineering degree courses at the Department of Agricultural Machinery are encouraged to actively participate in research carried out by the department and to acquire additional knowledge and skills in their specific professional fields of study.

The teaching staff of the department is involved in various international educational and research programmes such as TEMPUS, ERASMUS, the Framework Programme of the European Community and NFNI. Within these programmes students can be trained at various leading universities in Britain, the Netherlands, Germany, Greece, Sweden and other countries.

Training is provided by highly qualified lecturers according to new teaching plans tailored to the state requirements and conforming to the latest European standards of the Agricultural Machinery and Technologies and Agricultural Engineering degree courses both at Bachelor and Master's degree level. The department is responsible for 4 Master's degree courses:

- Agricultural Machinery and Technologies
- Management Techniques in Agriculture
- Management Technologies in Plant-growing
- Management of technology in livestock breeding.

The Department of Agricultural Machinery is involved in the teaching of students at PhD degree level for the following academic subjects:

- 02.18.01 Mechanization and Electrification of Plant-growing
- 02.18.02 Mechanization and Electrification of Livestock- breeding
- 02.01.39 Agricultural and Hydromeliorative Machines

Undergraduate and PhD students are given free access to the Internet and the respective on-line services in two modern computer rooms.

Training sessions are conducted in modern laboratories equipped with a unique soil channel, real specimens, models with electronic and computer equipment and with diagnostic equipment and stands.

As a result of research new machines and technologies have been developed. They come off the assembly lines and are currently used: planter for direct sowing SDD-8; sowing machine underlayer MKPS-2, 8, maizesheller (RTS-1, RTSN-4, RTSU-15, RTSU-30); families of fodder shredders and foddermills (RGF-3, 6, RGF-5, RGF-2U, FU-330A and others.) thresher for beans and vegetables half-hanged universal grain combines US-101 and many others, most of which are patent protected.

The main purpose of the specialty Agricultural Machinery and Technologies is to prepare qualified specialists who can work in private and cooperative farms and associations such as engineers, designers and distributors in manufacturing companies which produce and distribute agricultural machinery, in agricultural services, expert committees and others.

The main aim of the Agricultural Engineering degree course is to prepare specialists in different fields of agriculture – crop-growing, livestock-breeding and agricultural equipment, where they can conduct comprehensive analysis of agricultural production systems, optimize production processes, apply contemporary engineering methods in agriculture, provide expert solutions to current problems and exercise control functions.

DEPARTMENT OF REPAIR, RELIABILITY AND CHEMICAL TECHNOLOGIES

BUSINESS CARD of the Department

The Department of Repair, reliability and chemical technologies was created in 1954.

The Department consists of 14 academic staff, of which 7 are Associate Professors, 2 are PhDs Assistant Professors, 1 Assistant Professor and 4 supporting staff members.

The Department of Repair, reliability and chemical technologies is accredited to teach **Bachelor and Master academic degrees** as well as **PhD degrees.** It is responsible for methodological majoring in “Management and servicing of machinery”.

The department carries out research in the following fields:

- Strategies for maintenance of machinery and equipment;
- Reliability, diagnosis and monitoring equipment;
- Tribological trials of prevention and rehabilitation coatings;
- Recovery of materials in the maintenance of equipment;
- Plastic lubricants;
- Composite materials;
- Synthetic resins and oils;
- Biofuels and products of vegetable oils;
- Synthesis modificators of friction.

Students of “Management and servicing of machinery" have the opportunity to actively participate in research carried out by the department and thus to acquire additional knowledge and skills in specific areas.

Specializations offered in three main areas:

- Repair and maintenance of equipment;
- Diagnostics and service of technology;
- Repair and utilization of resources.

Staff members of the department participate in various international teaching and research programs such as **TEMPUS, ERASMUS** and the **Framework Programs of the European Community**. Within the framework of international co-operation the students can teach in different leading universities of England, Germany, Greece, Turkey, etc. and Framework programs of EU. The department has a computer room, which offered students and post-graduate students free access and Internet connection.

Training of students is carried out by highly qualified teachers in new teaching plans tailored to state requirements and conforming to universal standards for training on this subject.
Training sessions are conducted in laboratories equipped with the necessary diagnostic and computer equipment, stands, installations and machinery.

Students trained on the subject "Management and servicing of machinery" have deep knowledge and acquire a wide range of professional skills in the management of the maintenance of machinery. After successfully degree they can work in various industries (agro-industrial, transport, engineering, processing etc.).

DEPARTMENT OF THERMOTECHNICS, HYDRO- AND PNEUMOTECHNICS

BUSINESS CARD of the Department

The Department of Thermotechnics, Hydro and Pneumotechnics was established at the beginning of 1967. Now at the department are working 12 regular lectures – 5 Associate professors, 7 assistant professors, two of them with PhD and 3 auxiliary staff.

The department offers classes to students from different specialities in **BACHELOR** and **MASTER** degrees and is responsible for the training of subjects such as **"Hydraulic and Pneumatic Technics"**, **"Heat and Gas Supplying"** and **"Energy Technics and Technologies"**. The department is authorized for **PhD** training in 2 scientific subjects: 02.01.44 **"Hydraulic and Pneumatic Machines and Equipment"** and 02.06.13 **"Industrial Heattechnics"**.

The training of the students is carried out by highly qualified lecturers according to a new curricula conformable to the national requirements and the world's standards. The students have the possibility to take part in the scientific and research activities of the department. In this way they can obtain additional knowledge and experience in different fields and participate in student's scientific conferences.

The basic aim of the course "Hydraulic and Pneumatic Technics" is to train qualified specialists for managing the design, assembly and operation of hydraulic and pneumatic systems and equipment; design and operation of pump stations, systems for heating ventilation and airconditioning; diagnostics and repairing of machines, devices and systems.

The Master's degree course is conformable with the modern requirements for training highly qualified specialists who can work in the field of design, assembly and operation of heating systems, heat and gas supply systems, heat utilization systems and effective utilization of energy sources.

The department has two independent buildings – "Heattechnics" and "Hydro and pneumothechnics".

There are two new modern laboratories in the building of Heattechnics:

- Laboratory for combustion and heating technics, equipped with the assistance of **"Erato"** company;
- Laboratory for gas technics **„Etore RIELLO"** built by **"Caloria"** company.

The teaching rooms are situated on the second floor of the building.

In the building of Hydro and pneumothechnics there are three teaching rooms (on of them is a computer laboratory), scientific and research laboratories. The laboratories are equipped with special facilities for carrying out of laboratory exercises. There is a great variety of different models of hydraulic and pneumatic machines and equipment.

Scientific research and applied activities are in the field of: Heating, Ventilation and Airconditioning, Drying and Refrigerator Technics, Utilization of Secondary Energy Sources, Mathematical Modeling of Heat Exchange and Mass Exchange Processes; Investigation of Centrifugal Pumps (including water-air mixtures); Investigation of Wind Wheels; Cavitation Investigation of Centrifugal Pumps; Investigation of Vane Type Pumps, Roller Pumps, Vane Type Vacuumpums and Compressors; Investigation of Possibilities for Application of Vegetable Oil in Hydraulic Drive Systems. Design and Manufacturing of Hydro and Pneumo Systems; Design and Repairing of Different Pump, Hydraulic Motors and Actuators.

DEPARTMENT OF INDUSTRIAL DESIGN

BUSINESS CARD of the Department

The Department of Industrial Design at the University of Ruse “Angel Kunchev” was established in 1991 to conduct training in the sphere of major industrial designs. Then discontinued teaching second major of Engineering ergonomics and industrial design (EEID), which was founded in 1985. It is the first of its kind study unit in Bulgaria for training engineer-designers. The aim of the speciality is to prepare an integrated engineering and design training students from all majors in three professional fields: Machinery and Instrument, Electrical and Electronics and Automation.

The main purpose is to provide courses for wide interdisciplinary training of students, designers, focused on absorbing the artistic and scientific knowledge, skills and approaches necessary for the successful adaptation and competitiveness of graduates in the vocational and intellectual market. So far more than 255 engineer-designers have graduated in major Industrial design, with the second major EEID.

The Department of Industrial Design is proud of the extraordinary honor to be inspired by the work of one of the greatest designer is the 20th century, doctor honoris causa of the University of Ruse Dzhudzharo Giorgio (Italy).

The degree in Industrial Design is one of the most attractive and modern speciality in the University and it inspires high and permanent interest in the students of secondary schools. The interest is provoked by the fact that all graduates work in the same professional field, as collaborators in companies, creative teams or can have individual careers.

The teaching staff of the department provides training at an advanced level using original and progressive technologies. In compliance with the requirements of the curriculum the degree comprises courses which are of general and special nature. Thus, students acquire knowledge and skills in implementing in practice problems of various kinds, scope and focus.

Training on Industrial Design is offered as a full-time training in both degrees Bachelor's and Master's. Bachelor's degree consists of four years of training. The Master's degree comprises two semesters for graduates with major Industrial Design and four semesters for all the other engineering specialities.

The department has its own facilities situated on an area of 680 meters, including specialized training room, halls and studios.

The department enjoys a high professional and artistic reputation. Evidence of this is attracting and academic network in cooperation CUMULUS, consisting of renowned European universities and academies of art and design.

DEPARTMENT OF ECOLOGY AND ENVIRONMENTAL PROTECTION

BUSINESS CARD of the Department

The Department of Ecology and Environmental Protection was established in 1996. It is a successor of the department of "Citizen and National Economy Organization and Protection" and the department of "Labour and Environmental Protection" (1988-1996 year).

The department consists of 7 regular lecturers – 2 professors, 2 chief assistants, 3 senior assistants and 2 auxiliary technical personnel.

The research work in the department is in the following fields:

- Techniques and technologies for environmental protection;
- Ecology and ecosystems protection
- Risk management
- Ecological and industrial safety

The Department organizes and runs courses for the following educational qualification degrees:

- Bachelor in the specialty "Ecology and techniques for environmental protection"
- Master in the specialty "Ecology and techniques for environmental protection", "Engineering ecology".

A "Risk Engineering and Risk Management Center" works for the department.
The aim of the Center is to organize the protection of the humans, the environment, the national economy and resources, look after the corporative and labor safety, the infrastructure in compliance with the best European and world's practices in risk management.

A student's ecological association named "Green Life" has been established in the department. Public beneficial, educational and research work is the main activity of the association. It is a connection between all governmental institutions and the young people interested in ecology and environmental protection.

DEPARTMENT OF THEORY OF MECHANISMS AND MACHINES AND MATERIAL HANDLING ENGINEERING AND TECHNOLOGIES

BUSINESS CARD of the Department

The Department "Theory of the Mechanisms and Machines and Material handling engineering and technologies" is one of the first established departments of Ruse University. Founded simultaneously with the establishment of VIMMESS in 1954.

The Department consists of 8 academic staff, of which 5 are Associate Professors, 1 is Ph.D. and 2 Assistant Professors.

The Department "Theory of the Mechanisms and Machines and Material handling engineering and technologies" is accredited to teach Bachelor and Master academic degrees as well as PhD degrees.

The Department has a computer room, equipped with modern computers and multimedia equipment, a school hall and two research laboratories. Teaching methods involve kinematic models of mechanisms, equipment for experimental research and advanced technical resources for training. Simulation software and visuals directly related to laboratory exercises and the course project, unique not only for our country but also in European scale, has been developed.

The Department carries out research in the following fields:

- structure, synthesis and analysis of levers mechanisms
- design of gear mechanisms;
- geometry and decipher of involute, cycloidal, chain and non-traditional gear transmissions;
- shaping of cylindrical, bevel, worm gears;
- computer modelling, simulation of shaping mechanisms and processes;
- research, design and expert evaluations of hoisting and hauling equipment;
- development and research of friction materials and units of hoisting and hauling equipment.

UNDERGRADUATE PROGRAMS

UNDERGRADUATE STUDIES IN AGRICULTURAL MACHINERY AND TECHNOLOGIES

PROFESSIONAL STANDARDS
OF A BACHELOR IN

AGRICULTURAL MACHINERY AND TECHNOLOGIES

DEGREE COURSE: Agricultural Machinery and Technologies
Degree: Bachelor
Qualifications: Machine Engineer
Duration: 4 years (8 semesters)

The main objective of training: The course of studies and training are designed to produce high quality graduates possessing adequate knowledge and skills in the field of agricultural machinery and technologies.

The first four semesters are dedicated to general training and provide the base for the development of the young engineer. The main subjects of this particular degree course are Mathematics, Physics, Computer science, Materials and machine elements as well as subjects that provide general knowledge for the study of specific disciplines.

Semesters 5-7 build up specific professional skills; they prepare agricultural engineers to cope effectively with the complexity of a changing and competitive agricultural business environment. Therefore certain subjects are given a prominent place in the training program – mechanised technology in agriculture, hydraulic and pneumatic machinery, electronic systems and maintenance of agricultural machinery.

In the eight semester students can choose subjects in the following fields of study: design and construction of agricultural machinery, farming technologies, agricultural machinery repair technologies. The course of studies ends with the defense of a graduation project or sitting for a state exam (students are given the right to choose the alternative they prefer).

Graduates in "Agricultural machinery and technologies" with a Bachelor's degree can start and build their careers in the field of the design, development and manufacture of agricultural machinery, the evaluation and selection of mechanised technologies in agriculture, the maintenance of agricultural machinery; they can also do research work related to the numerous issues of agriculture. They can work as experts, consultants and managers in business dealing with agricultural machines and modern agricultural production.

CURRICULUM

of the degree course in

AGRICULTURAL MACHINERY AND TECHNOLOGIES

First year

Code	*First semester*	*ECTS*	*Code*	*Second semester*	*ECTS*
0380	Applied geometry and engineering graphics I	5	1610	Training practice	5
			2068	Mathematics II	6
0381	Technological Training practice	3	2069	Physics	6
0410	Chemistry	4	2070	Applied geometry and engineering graphics II	4
1024	Mathematics I	5			
1038	Informatics I	5	2071	Mechanics I	5
2073	Material science	4	0002	Informatics II	4
	Elective courses - students elect a course				
0383	English	4			
0843	German	4			
0950	French	4			
0983	Russian	4			
	Total:	***30***		***Total:***	***30***

Second year

Code	*Third semester*	*ECTS*	*Code*	*Fourth semester*	*ECTS*
2402	Strength of materials I	5	0067	Repairing of agricultural machinery - training practice	2
2529	Fluid mechanics	6			
2530	Electrical and electronic engineering	6	2430	Theory of mechanisms and machines	4
2531	Mechanics II	4			
2532	Technology of materials	5	2443	Theory of mechanisms and machines - course project	3
3268	Mathematics III	4			
			0077	Operation with agricultural machinery - training practice	1
			2543	Machine elements I	6
			2544	Strength of materials II	4
			2546	Heat technology	5
			2555	Technology of engineering	5
	Total:	***30***		***Total:***	***30***

Third year

Code	*Fifth semester*	*ECTS*	*Code*	*Sixth semester*	*ECTS*
2453	Machine elements - course project	2	3272	Economics	5
2454	Metrology and measuring equipment	5	3273	Hydro- and pneumatic machines in agriculture	5
2561	Machine elements II	3			
0109	Practical basis of plant-growing and stock-breading	6	3274	Tractors and automobiles	4
			3275	Basic elements of agricultural machinery repairing	6
3269	Machines for soil-cultivating, sowing and harvesting I	5			
			3276	Machines for soil-cultivating, sowing and harvesting II	5
3270	Electronic systems in agricultural machinery	5			
			3277	Reliability and diagnostics in agricultural machinery	3
3271	Auto-tractor engines	4			
			3278	Reliability and diagnostics in agricultural machinery - course project	2
	Total:	***30***		***Total:***	***30***

Fourth year

Code	*Seventh semester*	*ECTS*	*Code*	*Eighth semester*	*ECTS*
3280	Technical safety	4	3287	Road safety	2
3281	Technical servicing of machines	4	3288	Transport-manipulation technologies in agriculture	3
3282	Mechanized technologies of agriculture	6	3289	Exploitation materials in agricultural machinery	2
3283	Stock breeding machines	4			
3284	Stock breeding machines - course project	3	3291	Agricultural construction and design fundamentals	3
3285	Setting in motion in agricultural machinery	4	3292	Special design and technologies in agriculture	3
3286	Utilization and resource equipment of agricultural machinery	5	3293	Repair and refurbishing technologies	3
			3297	Diploma practice	4
			3298	Diploma project	10
	Total:	***30***		***Total:***	***30***

Total for the training course: 240 ECTS credits

1024 Mathematics I

ECTS credits: 5 **Weekly workload:** 2lec+0sem+0labs+2ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department AG, Faculty of Natural Science and Education
Lecturers:
1. Assoc. Prof. Docho Trifonov Dochev, PhD, Dept. AG, tel.: 888-489
2. Assoc. Prof. Stoycho Dimitrov Dimitrov, PhD, Dept. AG, tel.: 888-453

Abstract:
The course is designed to lay the basis of engineering education. It uses the mathematical knowledge from secondary school and extends it on a higher level. It is essential for the mathematical subjects which follow in the course of studies: Physics, Mechanics, general and special engineering courses.

Course content:
Complex numbers and polynomials. Systems of linear equations and determinants. Matrix calculus. Line in plane. Lines and planes in space - forms of determining and common positions. Linear space and linear operators. Second order curves and surfaces. Functions and sequences. Limits and derivatives. Basic theorems of differential calculus. Applications of derivatives for investigating functions. Indefinite integral – definitions and basic properties; methods for calculation - integration by parts, integration by substitution, integration of rational, irrational and transcendental functions.

Teaching and assessment:
The theoretical basis of the topics presented at lectures is acquired at seminars through solving problems; individual practice and reinforcing is accomplished by weekly assignments. Three written tests are administered and students with grades above 4.50 don't have to take the exam and their mark is formed on the basis of an interview with the lecturer. Students are given six problems at the exam and they have to solve at least three to pass.
Each student is required to prepare a course assignment. Its successful presentation at seminars and a regular class attendance are a necessary prerequisite to have the term validated.

1038 Informatics I

ECTS credits: 5 **Weekly workload:** 1lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** test
Departments involved: Department IIT, Faculty of Natural Science and Education
Lecturers:
1. Assoc. Prof. Margarita Stefanova Teodosieva, PhD, Dept. IIT, tel: 888-464, e-mail: mst@ami.ru.acad.bg
2. Principal Assistant Marko Toshev Markov, Dept. of IIT, tel.: 888-754, e-mail: markov@ami.ru.acad.bg

Abstract:
The subject is aimed at introducing students to the computer and its components as a technical aid and to the most widely spread programme products - operating systems, word processing systems, systems for processing information in spreadsheets, data bases, information systems, artificial intellect systems, computer graphics systems, data base management systems. The aim of the practical classes is to provide students with knowledge on the use of the most widely spread application programme systems – Windows, Word, Excel.

Course content:
History and classification of computers. Hardware. Operating systems. Application software. Word processing systems. Spreadsheets. Data bases: relation data base, data base management systems, data exchange and computer networks.

Teaching and assessment:
Lectures are carried out in blocks of two periods every other week. Practical classes are carried out in computer laboratories and represent practice under the guidance of a lecturer. At the beginning of the class ten minutes are allotted for monitoring the students' progress: by a test, short written or oral testing. Students' practical knowledge of the studied programme product is controlled and assessed at the end of each part of the course. The course assignments are meant to show that students are able to work individually with the studied programme systems. They are also assessed. At the end of the semester students' theoretical competence is controlled with a test, including 100 questions, covering all the material studied.
The term mark is formed on the basis of the results from the main test, the grade for the performance at the practical classes and the average grade from the course assignments.

0410 Chemistry

ECTS credits: 4 **Weekly workload:** 2lec+0sem+1labs+p
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Dimitar Jordanov Pavlov, PhD, Dept. RRCT, tel.: 888-733, e-mail: chimia@ru.acad.bg
Abstract:
The subject helps students obtain specific knowledge of the structure of substances and the chemical phenomena and processes related to engineering. Laboratory practice sessions simulate these processes showing how they are used and how they can be avoided in engineering practice. The basic aim of the course is to achieve a relatively equal level of competence and to promote the acquisition of knowledge and skills for the following courses of Physics, Materials and Manufacturing Engineering, Strenght of Materials, etc.
Course content:
Structure of substances. Kinetics of chemical processes. Chemical equilibrium. Chemical thermodynamics. Metals and alloys. Electrochemical processes. Dispersions. Surface phenomena. Review and classification of the main groups of organic compounds used in engineering practice. Isomerism of the organic compounds and its influence on their properties.
Teaching and assessment:
Laboratory classes provide students with the opportunity to receive visual notion of important theoretical issues, such as: chemical properties of metals and alloys, functions of electric cells, electrolysis, surface phenomena, etc. Progress is monitored regularly – otal or written tests on basic topics at the beginning of each class check the students' performance throughout the semester and help them prepare for the exam.

0380 Applied Geometry and Engineering Graphics I

ECTS credits: 5 **Weekly workload:** 1lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EG, Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Nikola Stoyanov Nikolov, PhD, Dept. EG, tel.: 888-491
Abstract:
The subject introduces students to the methods and means of presentation of three-dimensional objects by plane images and to the ways of analysis, transformation and optimization of graphic images. A necessary precondition is basic knowledge on geometry and technical drawing. It develops students' steric imagination, as well as skills to cope with graphic and technical information. This subject is a base for further studies of other technical branches of science.
Course content:
Types of projection. Complex drawing. Reciprocal position of principal geometric objects. Transformation of a complex drawing. Methods for projection. Reciprocal crossing of geometric objects. Images in drawings. Axonometric projection.
Teaching and assessment:
The theory, presented at lectures by didactic means, provides the needed base for practical classes and course assignments. During the practical classes problems are solved, instructions are given, examples are considered. Students are required to do a course assignment, which represents a number of plans with different images of steric objects.
The final mark is formed on the basis of the grades in two tests and the course assignment results. The requirements to have a term validated are regular class attendance and course assignment submission.

2073 Material Science

ECTS credits: 4 **Weekly workload:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department MME, Faculty of Mechanical and Manufacturing Engineering
Lecturers:
1. Prof. Mitjo Jordanov Kanev, PhD, Dept. MME, tel.: 888-688, e-mail: kanev@ru.acad.bg
2. Prof. Rusko Ivanov Shishkov, PhD, Dept. MME, tel.: 888-204, e-mail: rish@ru.acad.bg

Abstract:
This subject studies the composition, structure and property connections in materials, which are used both in technology and daily life, as well as the opportunities given to change and redirect these properties in a certain way. Basic knowledge of physics and chemistry is needed. Students acquire useful knowledge and experience, which can be applied in other subjects related to material processing or new product construction.

Course content:
Main notions of the structure and properties of metals, dielectrical and semiconductor crystal materials. Structure analyzing methods. One-, two-, and multi-component systems. Balance equilibrium diagrams of conditions. Regularity of crystallization and transformations in solid materials – mechanisms and kinetics. Metastable conditions. Iron, steel and cast iron, copper, titanium, aluminum and their alloys. Other kinds of metal material. Ceramics and metal ceramics. Polymeride materials. Composition materials.

Teaching and assessment:
Theoretical knowledge taught at lectures is assimilated, specified and extended during the laboratory classes. They concern mainly the material structure and the thermal methods of its change. Three tests are administered during the semester. The test results make an important part of the final mark given on passing the exam.

0381 Technological Training Practice

ECTS credits: 3 **Weekly workload:** 1lec+0sem+0labs+3ps+0
Assessment: oral exam **Type of exam:** practical exam and discussion
Departments involved: Department MME, Faculty of Mechanical and Manufacturing Engineering
Lecturers:
Prof. Georgi Stefanov Popov, PhD, Dept. MME, tel.: 888-314, e-mail: gpopov@ru.acad.bg

Abstract:
The subject provides preliminary knowledge of the main stages of the mechanical engineering manufacturing process, machine equipment and tool facilities in the manufacturing unit. It also builds up some relevant specific skills. The acquired knowledge and skills serve as basis for the general and specific subjects and the active educational forms connected with them.

Course content:
The seminar classes deal with the main practice-related data about the separate technological processes and operations from metal and mechanical engineering technology (metal casting, welding, plastic deforming, cutting, metal cutting machines and instruments). The practical classes are connected with performing of manual and machine molding operations, manual electric arc welding and cutting, open manual and machine forging, universal lathe work, drilling, crosswise-grating machine work, milling and performing of manual locksmith (fitter) operations.

Teaching and assessment:
The practical exercises are held in the university workshop, where the work stations are prepared in advance. Students are divided in groups, each of which uses a separate working place. Control is carried out through an oral exam. A certain practical assignment is done, as well as a short discussion of a theoretical issue.

0383 English, 0843 German, 0950 French, 0983 Russian

ECTS credits: 4 **Weekly workload:** 0lec+0sem+0labs+4ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department FL, Faculty of Law Studies
Lecturers:
English: 1. Sr Lecturer Iliyana Gancheva Benina, Dept. FL, e-mail: Ibenina@ ru.acad.bg
2. Sr Lecturer Tsvetelina Andreeva Nedelcheva, Dept. FL, e-mail: tsandreeva@ ru.acad.bg
German: 1. Sr LecturerSergei Vassilev Bartenev, Dept. FL, e-mail: sbartenev@ ru.acad.bg
French: 1. Sr Lecturer Roumyana Ivanova Milanova, Dept. FL, e-mail: rmilanova@ ru.acad.bg
Russian: 1. Sr Lecturer Iliyana Gancheva Benina, Dept. FL, e-mail: Ibenina@ ru.acad.bg
Abstract:
At this level students have some knowledge of the main grammatical areas of English but they are frequently unable to use what they know appropriately, accurately and confidently as they come from a variety of learning backgrounds. The basic aim of the course is to achieve a relatively equal level of language competence through reading, listening and problem-solving tasks related to the students' degree course. It is also important to promote language acquisition from the texts, systematic word-building skills and lexical development from the practice exercises, as well as good study habits.
Course content:
The course contains a wide range of topics related to the specific professional area, it deals with the social, historical and business environment of the world: people and their life in big cities, life styles, climate, months, dates, telling the time, jobs and job opportunitie,materials and machines (countability, measures, packaging), future plans and arrangements, likes and dislikes, countries, cities and places –space orientation, etc.
Teaching and assessment:
Personal involvement and motivation are encouraged in order to achieve the teaching aims. Target language is practised in a controlled way – activities (reading, listening and writing) are combined to enable learners to make the right choices in communicative situations. New language models are recycled to build up confidence and accuracy. Progress is monitored regularly – oral and written performance (at least two tests) is checked throughout the semester. Teaching materials include a coursebook, workbooks, handouts, recordings, etc. Students are encouraged to use dictionaries, grammar books and keep their own vocabulary records.

2071 Mechanics I

ECTS credits: 5 **Weekly workload:** 2lec+0sem+0labs+2ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineering
Lecturers:
Assoc. Prof. Stoyan Stoyanov, PhD, Dept. TM, tel.: 888-572, e-mail: sgstoynov@ru.acad.bg
Abstract:
The students are acquainted with the methods for investigation of various kinds of rigid body motion, for different force transformations, and for investigation of the mechanical interaction in rigid bodies in equilibrium. The subject provides a basis for modelling of structures, mechanisms, dynamic processes and gives engineering methods for practical problem solution. Preliminary knowledge in Mathematics and Physics is necessary for this course. The discipline is fundamental for the engineering courses dealing with analysis and design of mechanical structures and machines.
Course content:
Particle kinematics. Translational, rotational, and plane rigid body motion. Relative motion of a particle. Equilibrium of a rigid body. Reduction of a system of forces. Equilibrium of a multi-body system. Equilibrium in presence of friction. Gravity center.
Teaching and assessment:
The theoretical basis of the topics is dealt with in lectures and is illustrated by examples. The students solve problems in their practical classes. They apply the acquired knowledge in their course assignment, which is different for every student. A special grading system is used to assess the students' progress. The students can choose to take two tests to get a higher grade. If a student has scored at least 50% of the maximum grade, he or she can get the final grade and doesn't have to take the final exam. The exam consists of 4 questions and 4 problems. Regular attendance of classes and a completed course assignment are required to have the semester validated.

2068 Mathematics II

ECTS credits: 6 **Weekly workload:** 3lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department MA, Faculty of Natural Science and Education
Lecturers:
Prof. Stepan Agop Tersian, D Maths, Dept. MA, tel.: 888-226, 888-587
Abstract:
The subject acquaints students with basic notions of mathematical analysis, necessary for further study of Mathematics Part III, Applied Mathematics, theoretical basis of Electrical Engineering, Mechanics, etc.
Course content:
Basic topics: Functions of more than one variable; Differential geometry in plane and space; Ordinary differential equations; Multiple integrals; Field theory; Numerical and functional series.
Teaching and assessment:
At lectures students are introduced to main theoretical issues, logically presented and provided with appropriate examples. The theoretical basis of the topics presented at lectures is extended at seminars through solving problems, having theoretical and applied character. Three written tests are administered during the term. The final control is carried out by a written exam consisting of solving problems and answering theoretical questions. During the term consultations are held - two classes per week. The requirement to have a term validated is regular attendance and participation in practice sessions.

0002 Informatics II

ECTS credits: 4 **Weekly workload:** 2lec+0sem+0labs+1ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department IIT, Faculty of Natural Science and Education
Lecturers:
1. Assoc. Prof. Margarita Stefanova Teodosieva, PhD, Dept. IIT, tel: 888-464, e-mail: mst@ami.ru.acad.bg
2. Principal Assistant Marko Toshev Markov, Dept. IIT, tel.: 888-754, e-mail: markov@ami.ru.acad.bg
Abstract:
Students are introduced to one programming language. They work out elementary algorithms, which are aimed at the development of their logic thinking. The lecture topics comprise the main algorithm structures – branch, cyclic recurrence, multiple choices. Various types of data are analyzed: scalar data, structured data. The problems solved find application in engineering practice. At practical sessions students create programmes and work with them.
Course content:
Algorithms: main notions. Branch algorithms. Cycle algorithms. One dimension arrays of algorithms. Two dimension arrays of algorithms. Structure of a Pascal programme. Types of data in Pascal. Data input and output. Branch statement, multiple choice statements. Cycle statements. Types of arrays, work with arrays. Procedures and functions. Strings. Records. Files. Text files.
Teaching and assessment:
Lectures are carried out in blocks of two periods per week.
The classes are practical with duration of two periods every other week. At the beginning of the class the assistant-professor first explains the issues which students find difficult. Then they solve problems on algorithm compiling and write programmes. At the end of the class a short test is administered.

2069 Physics

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+p
Assessment: exam **Type of exam:** written and oral
Departments involved: Dept. of Physics, Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
1. Assoc.Prof. Nadezda Marinova Nancheva, PhD, Dept. of Physics, e-mail: nancheva@ru.acad.bg
2. Assoc.Prof. Parvoleta Ivanova Docheva, PhD, Dept. of Physics, e-mail: docheva@ru.acad.bg

Abstract:
The course aims at acquainting the students with the physical character of processes and phenomena in nature and the methods for their investigation, with the general properties of matter and the material objects. The laboratory exercises aim at creating skills for experimental investigation of physical phenomena and solving of physical problems.

Course content:
Measuring physical quantities. Kinematics and dynamics of material point and rigid body. Interaction in nature. Work and energy. Mechanical preservation laws. Special theory of relativity. Molecular physics and thermodynamics. Transformation phenomena. Periodic processes and waves. Electric field and electric current. Magnetic field and electro-magnetic induction. Optical phenomena. Atoms, atom nuclei. Elementary particles.
Contemporary investigation theories and methods in physics and practical applications of the physical effects and phenomena are accented.

Teaching and assessment:
Lectures give the main theoretical material, supported by some demonstrations of physical phenomena and processes. At the laboratory classes the students work independently and investigate particular physical phenomena.
The knowledge of lecture material and laboratory classes is tested regularly. If the results of this assessment are good, the students are allowed to the exam. The final assessment is formed after a discussion with the student.
At the exam the students answer two theoretic questions and do a laboratory exercise.

2070 Applied Geometry and Engineering Graphics II

ECTS credits: 4 **Weekly classes:** 1lec+0sem+0labs+2ps+cw
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EG, Faculty of Automotive and Transport Engineering
Lecturers:
Assoc. Prof. Violeta Stoyneva Encheva, PhD, Dept. EG, tel.: 888-846

Abstract:
The subject analyzes the rules for making out plans, schemes and technical text documents, norms and instructions of Bulgarian and international standards concerning with drawing up technical documents. It develops students' steric imagination and their skills to cope with technical documents. This subject is a base for further studies of other technical branches of science as well as for working on course projects and a diploma paper.

Course content:
Different connections: threaded, key, spline and permanent connections. Drawing of a machinery piece – content, composition, images, dimensions, tolerance of dimensions, method of indicating surface texture, text information. Special documentation of some technical products. Drawings of assembled units. Item list. Text documents. Schemes. Building drawings.

Teaching and assessment:
The theory, presented at lectures by didactic means, provides the needed base for practical classes and course assignments. During practical classes problems are solved, instructions are given, examples are considered. Students are required to do a course assignment, which represents a number of plans with different images of steric objects.
The final course mark is formed on the basis of the grades of two tests and the course assignment results. The requirements to have a term validated are regular lectures and classes attendance and course assignment submission.

1610 Training Practice

ECTS credits: 5 **Weekly workload:** 0lec+0sem+0labs+6ps+0
Assessment: oral exam **Type of exam:** discussion
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Hristo Ivanov Beloev, PhD, Dept. AM, tel.: 888-553, e-mail hbeloev@ru.acad.bg
2. Senior Assis. Jordan Ivanov Josifov, MEng, Dept. AM, tel.: 888-484, e-mail jjosifov@ru.acad.bg
3. Senior Assis. Kiril Iliev Hadjiev, MEng, Dept. ICE, FTE, tel.: 888-332, e-mail: khadjiev@ru.acad.bg
4. Assis. Georgi Penchev Kadikianov, MEng, Dept. TAFLT, FTE, tel.: 888-526, e-mail: kadikqyanov.abv.bg

Abstract:
The course introduces students to the general structure of machinery for soil-cultivating and growing crops, machinery for harvesting in livestock breeding, the overall structure of tractors and cars and drive operation and regulation of their mechanisms and systems, operating principles of petrol, diesel and gas engines for tractors and their structure and diversity.

Course content:
Machines for primary and further processing of soil. Machines for sowing and fertilizing. Machines for harvesting cereals. Machines for cleaning livestock and poultry facilities. Milking machines and equipment for primary processing of milk. Introduction to tractor and car engines. Transmission of tractors and automobiles. Stockyard system of the tractor and car. Steering systems of tractors and automobiles. Braking systems of the tractors and cars. Additional operating equipment of tractors and automobiles. General structure and working principle of internal combustion engines. Gas distribution mechanism. Cooling system. Lubricating system. Fuel system. Ignition system. Starting systems. Electrical equipment of the vehicle.

Teaching and assessment:
Posters, slides, transparencies and videos are used and machines are futher examined in the course of the practical sessions and in laboratories. Tests are administered after each cycle and the final mark is given on the basis of an oral exam.

2530 Electrical and Electronic Engineering

ECTS credits: 6 **Weekly workload:** 3lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** oral
Departments involved: Dept. TEEEM, Faculty of Electrical and Electronic Engineering, and Automation
Lecturers:
1. Assoc. Prof. Georgy Rashkov Georgiev, PhD, Dept. TEEEM, e-mail: grashkov@ru.acad.bg
2. Assoc. Prof. Svilena Vasileva Todorova, PhD, Dept. TEEEM, tel.: 888-224, e-mail: svito@ru.acad.bg
3. Assoc. Prof. Venelin Iliev Lakov, PhD, Dept. TEEEM, tel.: 888-269
4. Principal Assistant Docho Rusev Ivanov, Dept. TEEEM, tel.: 888-501

Abstract:
The subject of Electrical and Electronic Engineering is a part of the curriculum for the bachelor degree of non-electrical degree-courses. The aim of the course is to introduce students to main theoretical issues in the fields of Main Laws of the Theoretical Electrical Engineering, Electrical Measurement, Electrical and Non-electrical Quantities, DC and AC Electrical Machines, Electronic semiconductors and schemes. Preliminary knowledge in Physics and Mathematics is necessary. The knowledge of Electrical and Electronic Engineering is used in the following courses and when student work on their diploma thesis..

Course content:
Basic elements and magnitudes of electrical circuits: DC and AC, three-phase and magnetic circuits, electrical measurements of electrical and non-electrical quantities, DC machines, transformers, synchronous and induction AC machines. Main electronic devices: diodes, thyristors, transistors and operational amplifiers. Amplifiers. Digital networks.

Teaching and assessment:
The teaching process is organized in lectures and laboratory classes. At laboratory classes students obtain practical knowledge. There is a test control on basic topics at the beginning of each class, which could be either written or oral. The test results are taken in consideration when the student is given his final mark after an oral exam.

2402 Strength of Materials I

ECTS credits: 5 **Weekly workload:** 2lec+0sem+0labs+2ps+cw
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1. Assoc. Prof. Ivelin Ivanov, PhD, Dept. TM, tel.: 888-472, e-mail: ivivanov@ru.acad.bg
2. Assoc. Prof. Nedka stancheva, PhD, Dept. TM, tel.: 888-474, e-mail: nedka@ru.acad.bg

Abstract:
The subject provides students with systematic knowledge of the methods to assess by calculations the relevance, reliability, and effectiveness of the shapes and dimensions of structural elements. Preliminary knowledge of basic Mechanics (Statics) and Mathematics is necessary. The subject is fundamental for the further studies in other subjects of the methods for design and specific mechanical engineering objects.

Course content:
Introduction. Basic terms and principles, stress, deflections, strain. Internal forces in trusses. Tension and compression. Testing of materials, basic mechanical properties. Shear and crushing. Torsion of circular and noncircular bars. Moments of area of cross sections. Plane bending and 3D bending, deflections in bending, deflected axis of a beam. Non-axial tension and compression. Buckling of struts.

Teaching and assessment:
The theoretical basis of the topics, presented in the lectures, is used by the students in the exercises sessions for solving problems. The students work on an individual complex course assignment, which is graded every two weeks. The students participate in three tests, which are graded. The final grade is accumulated from the grades at the tests and from the grade of the course assignment defence. Regular attendance of classes and course assignment submission are the requirements for having the semester validated.

2531 Mechanics II

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+1ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
Assoc. Prof. Stoyan Stoyanov, PhD, Dept TM, tel. 888-572, e-mail: sgstoyanov@ru.acad.bg

Abstract:
The sublect deals with the methods and possibilities to investigate the mechanical interaction and motion of rigid bodies and the dynamic processes in mechanical multi-body systems. The students learn how to build dynamic models of mechanical systems in order to solve practical engineering problems. Preliminary basic knowledge of Mathematics and Mechanics I is necessary. The course gives the basis for the following subjects: Strength of Materials, Applied Mechanics, Machine Elements, Lifting and Transportation Machinery.

Course content:
Newton's law. Basic problems of particle dynamics. D'Alembert's principle. Linear oscillation of a particle. Relative motion dynamics of a particle. Dynamic characteristics of a particle and of a multi-body system. Theorems of dynamics. Mass inertia moments and centrifugal inertia moments. Kinetostatics. Dynamics of a body in translational, rotational, and plane motion. Impact theory.

Teaching and assessment:
The theoretical basis and the methods of dynamics are explained in the lectures; modelling problems are solved. The students solve problems in the practical classes, too. There is a complex course assignment problem administered to each student. The course assignment is scheduled for assessment, which is based on a specific grading system. The students can participate in up to 2 written tests included in the grading system. If at the end of the semester, the students have higher than the average grade they can get this grade as a final and miss the exam. The exam consists of solving problems and short theoretical questions. The semester grade is accounted for in the final grade. Regular attendance at practical classes and successfully defended course assignment are required for semester validation.

2529 Fluid Mechanics

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Ivanka Mitkova Jeleva, PhD, Dept. HTHPM, tel.: 888-582
Abstract:
The subject introduces students to the main relationships and physical treatment of the phenomena analyzed in hydrostatics, kinematics and fluid dynamics from the perspective of their application in engineering practice. Basic knowledge of Mathematics, Physics, Theoretical Mechanics is a prerequisite for the acquiring of Fluid Mechanics and it in its turn is a prerequisite for the acquiring of hydraulic and pneumatic machines and drives, agricultural machines, internal combustion engines, etc.
Course content:
Main properties of fluids. Equilibrium of fluids. Kinematics and dynamics of ideal and real fluids. Hydraulic resistances and calculation of pipelines and channels. Resistance of streamlined bodies and wings. Liquid leakage from openings, end-pieces, jets.
Teaching and assessment:
Lectures provide students with the opportunity to get acquainted with the main laws of fluid mechanics before the laboratory exercises, during which the acquired knowledge is consolidated and its practical application is clarified. For each laboratory class students work out a written statement. The exam starts with a written test on two questions from the course syllabus and a practical task, followed by an oral testing. Students work out a course assignment by stages; it consists of solving particular tasks related to the studied material. The requirement to have a term validated is submission of the course assignment and the written statements from the laboratory classes.

3268 Mathematics III

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+2ps+
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Lyuben Georgiev Valkov, PhD, Dept. NMS, tel.:888 466, e-mail: vulkov@ami.ru.acad.bg
2. Principal Assistant Violetka Atanassova Kostova, Dept. NMS, tel.:888 466, e-mail: leta@nami.ru.acad.bg
Abstract:
The discipline is aimed at providing students with skills for data processing and teaching them how to put these skills to practice when analysing data from experiments in the field of engineering. This is based on:

- Relativity theory mathematical apparatus
- Mathematical statistics methods for experimental data processing
- Methods for planning an experiment

Course content:
The course includes elements from: relativity theory, mathematical statistics, regression and correlation analysis, linear algebra, numerical methods and mathematical analysis.
Teaching and assessment:
The training process is organized in lectures, seminars and practical classes. At lectures theoretical issues are presented and illustrated with appropriate exemplary problems, connected with the students' degree course. At seminars students solve problems, connected with engineering practice and requiring the application of the theory of relativity mathematical apparatus, as well as mathematical statistics.
Each student is required to do an individual course assignment.
The final course mark is formed on the basis of the following formula:
Final course mark= 2/3 the grade in the test + 1/3 the grade in the practice sessions.

2532 Technology of Materials

ECTS credits: 5 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department MME, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1. Assoc. Prof. Georgi Ivanov Nikolov, PhD, Dept.MME, tel.: 888-311, 888-210
2. Assoc. Prof. Mladen Tzvetanov Trifonov, PhD, Dept. MME, tel.: 888-206, E-mail: mtr@ru.acad.bg
Abstract:
The subject aims at supplying knowledge and skills on the fundamentals of the following technological processes – casting plastic deformation and welding as well as the fields of their application where machine manufacturing and some non-machine manufacturing materials and goods are processed. Some general knowledge of physics, chemistry and strength of materials is a necessary prerequisite for studying this subject. It is basic for studying other subjects in the field of mechanical engineering technologies.
Course content:
Main principles of the casting technology – a process diagram, working out of a casting form, casting of metal materials, special methods for getting mouldings. Main principles of the plastic deformation technology – process diagram methods of volume and sheet deformation, special deformation methods, plastic deformation of metal materials. Main principles of welding technology – process diagram methods of welding through melting and pressure, special welding methods, thermal cutting, welding of metal materials. Fundamentals of plastic and metal-ceramic materials processing.
Teaching and assessment:
Training is carried out through lectures and laboratory classes. Three tests are scheduled during the lectures. The final exam includes written answers to three questions on the material covered with an oral discussion. Final assessment is worked out on the basis of the tests and exam results.

2543 Machine Elements I

ECTS credits: 6 **Weekly classes:** 2lec+0sem+1labs+1ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department MSME, Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Petar Jivkov Stamatov, PhD, Department MSME, tel.: 888-592, e-mail: stamatov@.ru.acad.bg
Abstract:
The discipline is a linking unit between a number of general-theoretical subjects / Mechanics, Strength of Materials, Theory of Machines and Mechanisms, Applied Geometry and Engineering Graphics, Materials and Manufacturing Engineering, Metrology and Measuring Equipment, etc./ and some engineering courses, included in the main module. The course introduces students to the theoretical fundamentals of general-purpose machine elements and to the methods for their calculation and construction.
Course content:
Volumetric and surface strength of machine elements. Fatigue limit. Types of joints: threaded, riveted, welded, key, clamp joints. Rotary motion elements: axes, shafts, friction and anti-friction bearings, controlled, uncontrolled and automatic couplings.
Teaching and assessment:
Lectures are presented to all groups of students of the degree course at one and the same time. Students' current work on the lectured material is controlled trough two tests during the semester. Practical classes are carried out in a computer laboratory equipped with 12 modern computers. Students have a wide variety of didactic materials at their disposal: charts, a rich compilation of standards and catalogues, samples of machine elements, slide and over-head projectors. Laboratory classes demonstrate visually a number of theoretical issues, already presented at the lectures. There is a test control on basic topics at the beginning of each laboratory class and the results, processed on a computer, are presented in standard report forms. Students are required to do two individual course assignments during the semester: one on a screw-jack design and another one – on a friction clutch design. The course assignments are supervised at weekly consultations, controlling the accomplishment of the graphic and calculation parts. Students defend both course assignments. The total continuous assessment mark on Machine Elements I is formed on the basis of the tests and course assignments results.

2544 Strength of Materials II

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+1ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1. Assoc. Prof. Ivelin Ivanov, PhD, Dept. TM, tel.: 888-472, e-mail: ivivanov@ru.acad.bg
2. Assoc. Prof. Nedka Stancheva, PhD, Dept. TM, tel.: 888-474, e-mail: nedka@ru.acad.bg

Abstract:
The subject provides students with a system of knowledge about the methods of assessing by calculations the relevance, reliability, and effectiveness of the shapes, dimensions, and the material of structural elements. Preliminary knowledge of basic Mechanics and Mathematics are necessary. The discipline is fundamental for other educational courses related to designing of specific machines.

Course content:
Introduction in theory of stress and strain. Failure criteria. Energy methods (Castegliano's theorem) for deflection calculation in trusses. Statically indeterminate systems. Unit force method. Dynamic loading. Buckling of struts. Thick tubes and high-velocity rotating disks.

Teaching and assessment:
The theoretical basis of the topics, presented in the lectures, is used by the students in the exercises sessions for solving problems.The students work on an individual complex course assignment, which is graded every two weeks. The students participate in three tests, which are graded. The final grade is accumulated from the grades at the tests and from the grade of the course assignment defence. Regular attendance of classes and course assignment submission are the requirements for having the semester validated.

2430 Theory of Mechanisms and Machines

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department TMM and HHMT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Atanasov Koev, PhD, Dept. TMM and HHMT, tel.: 888-486, E-mail: pkoev@ru.acad.bg

Abstract:
This subject introduces the students to the methods of investigation (analysis) and design of machines and mechanisms according to structural, geometrical and dynamic indications. The subject forms a basis for mechanism and machine studying with specific application.

Course content:
Structure and classification of mechanisms. Leverage, cam mechanism and gear transmission kinematics. Theory of gear trains with involute toothed gears. Kinetostatics of mechanisms. Dynamics of the machine unit (aggregate). Balancing of leverage mechanisms and rotors.

Teaching and assessment:
The essence of the methods for mechanism synthesis – analysis is presented at lectures. Specific problems for mechanism investigation are solved during the practical classes. Overhead projectors, computer simulations for motion passing and transformation, mechanism models in motion (metal, polymethilmethacrylate, paxoline for showing through a projector), as well as real constructions are used for presenting the matter in a realistic way. Learning assimilation is controlled through tests, assignments and an individual complex course project, which is presented and assessed at different stages of its development. The final mark is formed on the basis of the test and the assignments.

2443 Theory of Mechanisms and Machines – course project

ECTS credits: 3 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department TMM and HHMT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.prof. Ognyan Lyubenov Alipiev, Dept. of TMMHHET, tel.: 888-593, e-mail: oalipiev@ru.acad.bg
2. Assoc.prof. Tanya Petkova Grozeva, Dept. of TMMHHET, tel.: 888-258, e-mail: tgrozeva@ru.acad.bg
3. Assoc.prof. Petar Atanasov Koev, Dept. of TMMHHET, tel.: 888-486, e-mail: pkoev@ru.acad.bg
4. Assoc.prof. Dimitar Ivanov Zafirov, Dept. of TMMHHET, tel.: 888-428, e-mail: dzafirov@ru.acad.bg

Abstract:
The goal of the course project is to help students acquire and rationalize the general methods of research (analysis) and design (synthesis) of different types of mechanisms and machines. It aids the students in building practical skills to discover the main features of mechanisms and prepares them for independent solving of specific engineering problems. The project in Theory of Mechanisms and Machines (TMM) is the first stage of machine-building design, connecting the knowledge acquired in a number of general science courses with the course design of real technical objects, studied in specialized courses.

Course content:
A machine unit is designed in which the driving and the operating machines are an electric motor and a flat leverage mechanisms respectively, joined through involution gear. The course project includes the following stages: structural and kinematical analysis of leverage mechanism; kinetostatic investigation of leverage mechanism; optimization geometric synthesis of gear mechanism. It consists of a calculation part, structured as explanatory calculation notes and a graphic part with a specified number of blueprints.

Teaching and assessment:
The course project is developed individually, using detailed methodological guidance and calculation and simulation software developed for this purpose by the department staff. The work on the separate stages is carried out both at home and in the project lab, equipped with modern computers, multimedia, and a number of models in motion and real constructions of mechanisms. The calculation and graphic part of the project solutions are controlled in stages and evaluated based on their reliability and the way they have been explained, as well as on the analysis of the results obtained.

2546 Heat Technology

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Valentin Vassilev Bobilov, PhD, Dept. HTHPM, tel.: 888-844, e-mail: bobilov@ru.acad.bg

Abstract:
The subject consists of three parts: Technical Thermodynamics, Heat Transfer and Applied Heat Technology. The aim of the course is to provide future specialists with the necessary engineering knowledge of the main laws of thermodynamics and heat transfer and to build up practical skills for solving real technical problems in the areas of drying, refrigerating and heating and ventilation equipment.

Course content:
Main notions: thermodynamic system, heat equilibrium, work and heat of processes. Main laws of ideal gas. State equation. Mixtures of indifferent ideal gases. First law of thermodynamics. Main thermodynamic processes – constant-volume, constant-pressure, constant-temperature, adiabatic and polytropic processes. Second law of thermodynamics. Karno's cycling process. Serviceability of thermodynamic systems. Real gasses. Van der Vaals' equation. Water steam and water steam processes. Renkin's cycle. Humid air thermodynamic properties. Leakage of gasses and steam trough a nozzle and a diffuser. Throttling. Cycles of working machines and heat motors. Cycle of a compressor refrigerator machine. Heat conduction – Furie's equation. Radiant heat exchange. Laws of radiant heat exchange. Complex heat exchange and heat transfer. Heat exchanging appliances. Fuels and combustion processes. Steam and water heating boilers. Heat balance and efficiency coefficient. Steam and gas turbines. Heat energy consumption for technological processes, heating, ventilation and air-conditioning. Alternative and secondary energy sources.

Teaching and assessment:
Lectures provide students with theoretical knowledge. A part of the laboratory classes are carried out using laboratory installations, another part – on real industrial sites. For each laboratory class students work out a written statement, including processing and analysis of the experimental data. The assessment is done on the basis of students' performance during the laboratory classes and their written statements. The exam is in written form, followed by an oral testing. The final mark is a complex one, based on the results of the exam and the student's performance at the laboratory classes.

2555 Technology of Engineering

ECTS credits: 5 **Weekly classes:** 3lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** written
Departments involved: Department TECM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1. Assoc. Prof. Stefan Vesselinov Vichev, PhD, Dept. TECM, tel.: 888-451, e-mail: svichev@ru.acad.bg
2. Assoc. Prof. Mikhail Kolev Karshakov, PhD, Dept. TECM, tel.: 888-508, e-mail: mkarshakov@ru.acad.bg

Abstract:
The subject provides general knowledge and skills related to the methods, instruments and machines for mechanical processing of machine details. It analyzes the design stages of technological processes.

Course content:
General information and theoretical base of the process of cutting metals. Metal cutting machines and instruments. Methods and processes for treatment through shavings removal: turning, scraping, shaping, drilling, reaming, pull-broaching, push-broaching, milling, grinding, carving, gear-tooth milling. Design of technological processes for mechanical processing.

Teaching and assessment:
Students are introduced to main theoretical issues at lectures. The use of the recommended literature and the active participation at laboratory classes are prerequisites for the students' individual work, which is of great importance. The questions of the exam syllabus are divided into three groups according to their difficulty, which is aimed at raising the efficiency of their exam preparation. Depending on which group their knowledge corresponds to, they receive a relevant exam mark.

0067 Repairing of Agricultural Machinery – Training Practice

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+2ps+0
Assessment: colloquium **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Plamen Ganchev Kangalov, PhD, Dept. RRCT, tel.: 888-441, e-mail: kangalov@ru.acad.bg
2. Assoc. Prof. Todor Nikolov Delikostov, PhD, Dept. RRCT, tel.: 888-441, e-mail: delikostov@ru.acad.bg

Abstract:
The subject provides preliminary knowledge and skills concerning the operating of the technological equipment, used in machine repairing. It also helps students acquire certain practical habits in the field of agricultural machinery servicing.

Course content:
The syllabus incorporates topics related to the repair and maintenance of important machine joints and to real repair and reconditioning processes which restore the smooth functions of the machines.

Teaching and assessment:
Practical knowledge is acquired during the laboratory classes, at separate work stations. Students are divided into groups and are given the opportunity to participate personally in the technological operations.

0077 Practical Utilization of Agricultural Machinery Units

ECTS credits: 1 **Weekly classes:** 0lec+0sem+0labs+2ps+0
Assessment: oral discussion **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Dimitar Petrov Dimov, PhD,Dept. AM, tel.: 888-242
2. Assoc. Prof. Petar Todorov Radulov, PhD,Dept. AM, tel.: 888-242
3. Assoc. Prof. Chavdar Zlatkov Vezirov, PhD,Dept. AM, tel.: 888-442

Abstract:
The subject provides students with preliminary knowledge and skills to start, drive and maintain tractors; they are introduced to the service manipulations carried out on a daily basis; examine the steering and control systems and how they work. The students take an introductory course on how to operate a crawler tractor and a wheel tractor in any terrain conditions; how to form agricultural aggregates and work with them.

Course content:
Safety and fire-protection rules. Agricultural aggregates classification. Necessity of implementing and procedures for conducting the monthly technical servicing. Introductory class on crawler tractors. Measuring instruments and controls. Control manipulation. Introductory class on wheel tractors. Preparation rules and starting the driving motor and the engine. Driving a wheel tractor in a straight line and on acomplicated terrain. Shift of power transmission. Main principles (ways) of constituting agricultural aggregates. Specification and positioning of the necessary cross base. Attachment systems and special devices for unitization. Unit composition.

Teaching and assessment:
The practical sessions are held in groups and on suitable sites, in a way that allows everyone maximum personal participation. As for driving and labour – it is held individually under the guidance of the instructor and his staff.
Students already qualified as “tractor-driver” and “machine-operator” do not need to attend classes.
To have the semester validated the students have to attend classes regularly and make considerable progress in the acquisition of practical skills for using agricultural machines and aggregates.

0109 Practical Basis of Plant-Growing and Stock-Breeding

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Ilija Ivanov Muhtanov, PhD, Dept. AM, tel.: 888-312

Abstract:
This subject includes information about the technological processes which form the basis for plant and animal products manufacture, about the biological peculiarities and requirements of cultivated plants, farm animals and poultry, connected with their growing or breeding.

Course content:
The first part – “Plant-growing” includes information about soil farming, composition and characteristics, types of soil in our country and their characteristic features concerning cultivation, fertilizing, irrigation, sowing, its preservation from erosion processes, main factors for plant development, weed and pest fighting, botanical and biological characteristics and agricultural practices of the main field, fruit, vegetable cultures and the vine. The second part- “Stock-breeding” is concerned with the growth progress, reproduction and breeding, the kinds of forage used, the microclimate in the premises and the main technological processes in pig, cattle, sheep and poultry breeding.

Teaching and assessment:
The teaching methods include lectures and practical classes. The lectures are supported by using slides, films etc. The students are expected to be prepared for the practical classes and they work out a written report on each of them. The exam includes a written lay out of two issues and an oral discussion.

2561 Machine Elements II

ECTS credits: 3 **Weekly classes:** 1lec+0sem+1labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department MSME, Faculty of Automotive and Transport Engineering
Lecturers:
Assoc.Prof. Petar Jivkov Stamatov, PhD,Dept. MSME, tel.: 888-592, e-mail: stamatov@ru.acad.bg
Abstract:
This subject is a link to a number of general theoretic subjects as “Mechanics”, “Strength of materials”, “Theory of mechanisms and machines” etc. and some technical subjects included in the main course module. The course is aimed at studying the theory of the machine elements with a general use and their calculation and construction methods.
Course content:
Mechanical gears. Cylindrical involute tooth gears – geometry kinematics, calculation of contact strength and bending. Planet, wave, conical, screw and worm gears. Reduction gears. Chain and belt gears. Rubbing gears and variable-speed drives.
Teaching and assessment:
Lecture material and the way it is taught is similar to the one described in “Machine elements – part I”. The practical classes are taught in groups in a computer room. Students use boards, a set of standards and brochures, model samples, overhead projectors. The laboratory classes are based on various topics. There are tests for incoming and continuous control. The practical results are computer-processed and are singled out in reports. The course project is computer-controlled in consultation classes each week. Issues are individually solved through projecting cylindric, conic, worm and other reduction gears. The total assessment for this subject includes the students’ work on the course assignment of “Machine elements – part II” and is formed on the basis of a written exam which includes two issues for discussion.

2454 Metrology and Measuring Equipment

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department MTM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
Assoc.Prof. Branko Dushkov Sotirov, PhD,Dept. of MTM, tel.: 888-493, e-mail: bsotirov@ru.acad.bg
Abstract:
The subject forms the basis of the fundamental technical training in the field of “Agricultural machinery and technologies” and “Automotive machinery and technologies”. The main purposes of this subject are: to give basic knowledge about the main notions, principles and rules of measuring and examining equipment control, as well as evaluating measuring precision; to introduce the structure and metrological characteristics of measuring appliances; to elucidate the principles, methods and devices of measuring the main physical quantities – length, angle, mass, temperature, time, pressure etc. To form real practical skills for operating certain measuring appliances.
Course content:
Theoretical basis of metrology. Legislative basis of metrology. Measuring and examining equipment control. Main metrological characteristics of SI. Precision classes of SI. Choice of SI. Primary converters used in SI. Length measuring. Measuring appliance for linear dimensions. Angle measuring. Methods and means for control and measuring of form deviations, natural location and roughness of surfaces and axle. Measurement precision. Noise and vibration measurement. Mass measurement. Time and temperature measurement. Mechanic quantity measurement. Measurement of quantities characterizing substances’ composition and qualities.
Teaching and assessment:
The lectures introduce different topics for discussion. They include main principles, methods and devices for measuring different physical quantities. During the laboratory classes students do the following: diagram, method and device choice for measuring certain technical details; independent work with universal and specific devices for technical measurement, standard and guide work. The laboratory classes are assessed continuously. Each laboratory class is preceded by report preparation. Final assessment is actually the average of the following: the course assignment mark; the results in two test papers. The results from the incoming test control are added to the final assessment too.

3271 Auto-Tractor Engines

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department ICE, Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Stancho Angelov Stanchev, MSc(Eng), PhD, Dept. ICE, tel.: 888-331
Abstract:
The theory, characteristics, fuel and electrical installations (systems) of auto-tractor engines are studied in this subject. This is achieved on the basic knowledge of thermodynamics, chemistry, mechanics, strength of materials, machine elements, fluid mechanics and exploitation materials. On the other side it forms the basic for the subjects concerning automotive (self-propelled) farming machines.
Course content:
Classification of internal combustion engines. Real (actual) cycles. Internal combustion engines processes. Indicator and effective indexes of internal combustion engines. Working regimes and internal combustion engines characteristics. Mixture forming in diesel engines. Combustion systems of diesel engines. Electrical installation.
Teaching and assessment:
Slides are used during the lectures. An entry test is taken during the first week. Students are acquainted with the practical systems and stands. A laboratory practical class is held during the second week. After each third week there is a test on the lecture material. At the end of the semester students go through a general test on the lecture material taught. Final assessment is formed on the basis of the entry control, semester tests and the final test.

3269 Machines for Soil-Cultivating, Sowing and Harvesting I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Jivko Jordanov Demirev, PhD, Dept. AM, tel.: 888-324, e-mail: jdemirev@ecs.ru.acad.bg
Abstract:
The subject focuses on machines for soil-cultivation, sowing and plant-growing and aims at providing knowledge on the technological principles and the theory of the interaction of soil-cultivating and plant-growing machines with the cultivable land. The mutual connections between the quality indicators of the technological results and the technological and regulating parameters of the machines are studied too.
Course content:
General information on the technological processes in agriculture, environmental characteristics and types of performance problems of the machines. Soil-cultivating machines. Fertilizing machines. Sowing machines. Chemical and plant protecting machines. Cultivating reclamation machines.
Teaching and assessment:
The theoretical and the real (practical) interactive connections between the technological result indicators and the machine indicators are studied at the lectures. The practical classes are held on the bank of an irrigation canal with real technological processes and statistic assessment of the quality indicators. A course assignment is administered in which an operating body is developed. The exam is based on three issues – two of them on the lecture material and one of them on the practical classes. Additional questions concerning important subject issues are also dealt with.

3270 Electronic Systems in Agricultural Machinery

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Miroslav Dimitrov Mihaylov, PhD, Dept. AM, tel.: 888-324, e-mail: mmihaylov@ru.acad.bg
Abstract:
The operating principles, the structure and applying of electronic systems in carrying out various technological processes in agriculture are viewed and discussed in the subject. Students are acquainted with the internal structure, the characteristics, the advantages and the peculiarities of the existing electronic systems and appliances. The practical orientation of the subject leads to their successful implementation in agriculture and to the development of efficient agricultural machinery.
Course content:
Use of the electronic means for receiving, processing and transferring information about the agricultural technological processes. Main technological processes and machines – object of the agricultural electronization. Main notions and diagrams in electronic appliances. Electronic systems used in soil cultivation and culture growing, in harvesting machines and stock-breeding.
Teaching and assessment:
Lectures acquaint students with operational principles, different types of electronic components and devices applied in agriculture. Multimedia products, videos and foliograms are used. Laboratory classes are concerned with studying the properties of essential electronic elements and diagrams, with investigation and analysis of the properties, possibilities and parameters of particular electronic systems for control of agricultural machines and processes. The students are expected to work out a report. coming control is Students answer two written questions at the exam and solve a problem. Then follows an oral discussion.

2453 Machine Elements – Course Project

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment: project defence **Type of exam:** oral
Departments involved: Department MSME, Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Petar Jivkov Stamatov, PhD, Dept. of MSME, tel.: 888-592, e-mail: stamatov@ru.acad.bg
Abstract:
The course project aims at acquiring skills for scheme reading, chart drawing of constructions and their loading as well as reinforcing the habits in strength calculation of machine elements, which have been acquired as the course assignment was carried out. The subject is a linking unit between the subject “Engineering graphics” and course projects in the specializing subjects.
Course content:
While developing the course project main issues are explained, connected with the projecting, construction and strength inspection of complex machine elements such as shafts, bearing supports, cylinder, conic and worm tooth transmission.
Teaching and assessment:
The course project is carried as weekly consultations in a computer equipped room. The projecting assignments are individual and various as far as construction and initial parameters are concerned. The project consists of two parts – calculating and graphic. The graphic part includes an assembly drawing, a list of the components and non-standard detail drawings. The calculating part is formed as explanatory.
The project is developed at stages and the lecturer approves each stage.
The defence of the finished work is public. It is assessed and both the result and the course assignment assessments form the final subject mark.

3272 Economics

ECTS credits: 5 **Weekly classes:** 3lec+1sem+0labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department of Economics, Faculty of Business and Management
Lecturers:
1. Assoc. Prof. Djanko Minchev, PhD, Dept. of Economics, tel.: 888-557,e-mail: Dminchev@ru.acad.bg
2. Assoc. Prof. Emil Georgiev Trifonov, PhD, Dept. of Economics, tel.: 888-557

Abstract:
The subject is concerned with the general problems, laws and categories of the contemporary market economy. Thus it creates a certain basis for the remaining economic subjects. It also gives general knowledge, which helps develop an alternative way of economic viewing, and creates abilities for an independent and expert choice in various economic surroundings. It is preceded by some basic knowledge of mathematics and is related to several other economic subjects.

Course content:
Main economic issues. Market mechanism. Public sector and taxation. Demand and supply of the individual markets. Consumer demand and behavior. Manufacture, company assets and expenses. Imperfect competition and supplying. Price formation and incomes depending on production factors: Gross domestic product and economic rise. Economy cycle, unemployment and inflation. Microeconomic balance. Budget policy. Monetary policy. Foreign policy in the open-plan economics.

Teaching and assessment:
Material is taught in two ways – lectures and practical classes, which elucidate and develop further some of the issues discussed at lectures. Continuous assessment is carried out. It includes two test assignments and personal activity during the semester. The final mark is based on the test results.

3273 Hydro- and Pneumo- Machines in Agriculture

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Rusev Petrov, PhD, Dept. HTHPM, tel.: 888-585

Abstract:
The subject aims at giving knowledge about the main issues related to the theory of construction and exploitation of various hydro- and pneumo-machines, which are used in agriculture. These are centrifugal, axle pumps, ventilators and compressors, as well as volumetric pumps and hydroengines – piston and rotor-piston, toothed lamination, roller, screw etc. Statics and dynamics of hydro and pneumo cylinders is discussed too. Students are acquainted with the machine characteristics, their operation in a system and regulation. Pump stations are studied – irrigating and dewatering, as well as the fittings used.

Course content:
Main indicators of pumps, ventilators and hydroengines. Structure and operational principle of turbo-machines-pumps, ventilators and compressors. Theory fundamentals of turbo machines – speed triangles and main equation. Turbo machines similarity and classification. Centrifugal and axle pumps – structure, classification, main elements of the pumps, constructions, cavitation and characteristics. Centrifugal and axle ventilators – structure, classification and constructions, calculating a ventilator according to similarity ventilators for agricultural machines. Machine operating in a regulation system. Volumetric pumps and hydro engines – piston and membrane, rotor-toothed, laminated, roller, screw, with rotating pistons, axis and radial rotor piston. Hydro and pneumo cylinders – structure, statics and dynamics. Operation of large pumps in a regulation system. Volumetric vacuum pumps and compressors – structure, thermodynamic processes, multistep compression. System operation and regulation. Pump stations – types, choice and pump aggregates position. Fitting elements used in the pump stations – types, structure and choice. Automatic operation of pump stations.

Teaching and assessment:
The learning process is organized in lectures and laboratory classes. Lectures enable students to get theoretical knowledge of the main issues and they precede the laboratory classes. In the latter the students are acquainted with the practical appliances diagrams, the methods of carrying out experiments and processing of practical data. A report is worked out for each practical class. The exam includes a written paper on two issues and an oral discussion.

3274 Tractors and Automobiles

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department TAFLT, Faculty of Transport Engineering
Lecturers:
1. Assoc. Prof. Roussi Getsov Roussev, PhD, Dept. TAFLT, tel.: 888-524
2. Assoc. Prof. Ivan Iliev Evtimov, PhD, Dept. TAFLT, tel.: 888-527

Abstract:
Students get acquainted with the theory of the movement of cars and tractors in various working conditions and they also learn how to work with them. The subject teaches the principal dynamic processes in machinery and transport equipment units and how they are influenced by different structural and operational factors as well as the work processes in the basic mechanisms.

Course content:
Key operational characteristics and working conditions, transmission of energy from the engine. Systems, and dynamics of tracked vehicles, towing calculation and determining the basic parameters of machinery tractive and dynamic properties and energy economy, braking properties, resistance movement, management and practicability of the machines.

Teaching and assessment:
The lectures deal with the theoretical foundations of the topics; special laboratory equipment is used to explore the main features of cars and tractors. The acquired knowledge is assessed on the basis of the laboratory reports following practice sessions and their defence.

3275 Basic Elements of Agricultural Machinery Repair

ECTS credits: 6 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written and oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Mitko Ivanov Nikolov, PhD, Dept. RRCT, tel.: 888-223
2. Assoc. Prof. Daniel Likasa Bekana, PhD, Dept. RRCT, tel.: 888-701

Abstract:
The subject aims at providing purposeful management of the process of wearing out of machines in order to maintain and preserve their efficiency and useful features, as well as their technical-economic characteristics in the field of repairing-servicing manufacture.

Course content:
Nature and causes for fault formation in machines. Character and classification of wearing-out processes. Determining of the limit condition. Structure and methods of organisation of machine repairing.

Teaching and assessment:
Lectures are delivered in a traditional way. Slides and foliograms are used. Laboratory classes are held at separate work stations in groups of 3-4 students. While learning students use laboratory appliances, measuring and recording apparatus.

3276 Soil Cultivating, Sowing and Post Harvesting Machines II

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Atanas Leshkov Mitkov, PhD, Dept. AM, tel.: 888-553, e-mail: amitkov@ru.acad.bg
2. Principal assistant Jordan Ivanov Josifov, Dept. AM, tel. 888-484, e-mail: jjosifov@ru.acad.bg

Abstract:
The subject includes crops gathering machines and processing of the production. Students get to know machine constructions and the link between the parameters (construction, technological etc.) and the machine indicators (most often quality and power engineering). A prerequisite for studying the subject is some fundamental knowledge of mathematics, technical mechanics, mechanism and machine theory, thermotechnics, hydraulics etc. It is further related to agricultural technologies and agricultural projecting and service.

Course content:
Technologies and machines for gathering grain crops. Harvesting machines classification. Combine power-producing balance. Straw-gathering. Usage of air current in agricultural machinery. Corn gathering machines. Grain cleaning and sorting machines. Drying techniques of agricultural crops. Industrial crops harvesting machines.

Teaching and assessment:
The main issues, presented at lectures, concerning the machine construction and the technological processes performed by them are additionally reinforced at the laboratory classes and the development of an individual course assignment. The exam is based on two theoretical issues and a laboratory practical exercise. The quality of the course assignment is part of the students' final mark, too.

3277 Reliability and Diagnostics in Agricultural Machinery

ECTS credits: 3 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Todor Nikolov Delikostov, PhD, Dept. RRCT, tel.: 888-441, e-mail: delikostov@ru.acad.bg
2. Assoc. Prof. Plamen Ganchev Kangalov, PhD, Dept. RRCT, tel.: 888-441, e-mail: kangalov@ru.acad.bg

Abstract:
The subject provides certain scientific and practical knowledge in the field of machine reliability and technical diagnostics. It takes into consideration the methods and devices used in determining the technical condition of agricultural machinery and the balance resource of the separate units and aggregates.

Course content:
Purpose and essence of reliability and diagnostics of agricultural machinery. Main reliability indicators. Choice of structural and diagnostic parameters. Methods and devices of functional parameters diagnostics of working and preceding parameters and of structural parameters of machines, aggregates and units. Determining the balance resource. Diagnostical technologies.

Teaching and assessment:
Lectures are delivered in the traditional way. Posters, slides and foliograms are offered to the students' attention. Laboratory classes are held at separate work stations in groups of 3-4 students. Real machines, aggregates and their units, as well as up-to-date diagnostical equipment are used.

3278 Reliability and Diagnostics in Agricultural Machinery – Course Project

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment: exam **Type of exam:** written and oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Todor Nikolov Delikostov, PhD, Dept. RRCT, tel.: 888-441, e-mail: delikostov@ru.acad.bg
2. Assoc. Prof. Plamen Ganchev Kangalov, PhD, Dept. RRCT, tel.: 888-441, e-mail: kangalov@ru.acad.bg

Abstract:
The project on the subject "Reliability and diagnostics in agricultural machinery" includes the development of a key card diagnostics device and diagnostics. The diagnostics device is designed according to the developed diagnosis technology.

Course content:
Developing a diagnostics algorithm. Development of a technological map of diagnosis. Design of device (scheme).

Teaching and assessment:
The project, incorporating 28 ... 32 standard pages, is developed during the semester and submitted in the last week before the validation of the course. Consultations and advice on the course project are given during the practice sessions. The defense of the course project is assessed and forms a part of the final exam mark.

3280 Technical Safety

ECTS credits: 4 **Weekly classes:** 2lec+0sem+1labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Vladimir Tomov Vladimirov, DSc, Dept. EEP, tel.: 888-481, e-mail: vtomov@ru.acad.bg

Abstract:
This is a general technical subject. It aims at providing knowledge and certain skills for analysis and synthesis application of technical and organization decisions about labour safety. Main issues: learning the analysis methodology of the safety of the technical and production system-resources, characteristics, standardizing, measuring and evaluation of the dangerous and harmful production factors; mastering the methods of projecting of safe technical systems; technical appliances projecting and justifying organization decisions about labour safety.

Course content:
Technical safety – main notions and definitions. Projecting methodical basis of safe technical and production systems. Mechanical safety of technical systems. Electrical safety. Electromagnetic safety. Emission and safety. Noise and vibration safety. Radiation safety. Management and ways of presenting information in technical and production systems. Labour safety control.

Teaching and assessment:
The lectures include the three specializing directions. Visual aids are used. The laboratory classes are experimental and focus on the analysis of experiments.Students have to be prepared, which is ascertained with tests. Two test papers are administered during the practical classes. Final assessment is based on the laboratory tests, test paper results and class participation.

3281 Technical Servicing of Machines

ECTS credits: 4 **Weekly classes:** 1lec+0sem+2labs+0ps+cp
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. Dimitar Petrov Dimov, PhD,Dept. AM, tel.: 888-242
2. Assoc. Prof. Bozidar Rusanov Kolev, PhD,Dept. AM, tel.: 888-610

Abstract:
The technical servicing is a complex of operations, connected with the exploitation development, shift, plan and seasonal TS storage during non-working periods. The subject gives knowledge about the factors influencing the serviceability and work-efficiency, the technology and management of TS and the machine storage. Prerequisites for the successful study of the subject – Internal combustion engines, Automobiles, tractors and forklifts and Agricultural machinery.

Course content:
Changes in the machine technical conditions in the process of their use, factors related to the serviceability and work efficiency. Main structure-forming elements of the technical servicing system, agricultural machinery storage – necessity and essence. Technical servicing storage technology of agricultural machinery. Premises and resources for technical servicing and storage. Technical servicing and storage management.

Teaching and assessment:
Lectures are given in a traditional way and aim at providing knowledge about the theoretical basis of TS and machinery storage. During the laboratory practice classes the students learn how to apply the methods and means of experimental conducting and controlling of TS operations. All laboratory classes are carried out with real working tractors, automobiles and agricultural machines. Students work in groups of 3-5 people, and they participate in the realization and result analysis. To take part in these exercises students undergo preliminary control and each class finishes with a final record of proceedings (written report) and a test.

3282 Mechanized Technologies in Agriculture

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Georgi Velikov Mitev, PhD, Dept. AM, tel.: 888-610, e-mail: gmitev@ru.acad.bg

Abstract:
This subject explores the main issues of the plant-growing production activities and aims at introducing the students to the main technological processes connected with the mechanised cultivation and storage of the farming cultures. It also acquaintants students with the biological features and main technological processes, structural features and setting of different kinds of agricultural machines. Other elements connected with the analysis and ecological aspects of the farming (agricultural) production are viewed. The subject is closely connected with the following subjects: Practical basis of plant-growing and stock-breeding and Agricultural machines.

Course content:
The main groups of cultures are studied, such as grain, forage, industrial crops, vegetable and perennial-plant stands. Attention is paid to the specific cultures and respective cultivation technologies. Each crop is examined in terms of its biological peculiarities aspect and climate-soil requirements aspect. Special attention is paid to the cultivation technology as well as the means of mechanization of the working processes, materials supply and technical support and their economic essence.

Teaching and assessment:
Teaching includes lectures and laboratory classes. The lecture topics enable the students to get theoretical knowledge of the principal issues studied and these precede the laboratory classes in which students are introduced to the production technologies, logical schemes of the technological processes, their computer development and experimental data-processing. There is a report on each laboratory class. The field measurement and observations are also a necessary part of the learning process. The “Learning through doing” motto is used, which means accomplishing the necessary calculation, followed by the adequate adjustments (regulations), new measurements and data-processing. Preliminary control for each practice session is necessary. The final exam is written – two questions have to be answered; the course assignment is also assessed and has some influence on the final mark.

3283 Stock Breeding Machines

ECTS credits: 4 **Weekly classes:** 3lec+0sem+2labs+0ps
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Boris Georgiev Borisov, PhD, Dept. AM, tel.: 888-325, e-mail: bborisov@ru.acad.bg
Abstract:
The subject aims at giving knowledge in the field of mechanization and automation of the stock breeding processes by means of studying the appliances, operational principles, calculating methods and choice of technological and constructive parameters of working bodies, machines and appliances. Preliminary knowledge of mathematics, mechanics, heat engineering, hydraulics, plant-growing and stock breeding fundamentals are used for elucidating the material. The subject serves as basis for designing machines, assembly lines, farms and diploma reports for practical needs.
Course content:
Characteristics and requirements of stock breeding. Types of farms and technological decisions. Water supply and feeding, microclimate and cleaning, milking, clipping and egg collecting. Gathering, processing storage and giving the forage. Technological equipment of fodder preparing sections. Milk processing. Calculation and choice of machines and facilities. Technological diagrams, general structure and operating principles. Elements of automation and computerization of a certain process by means of applying “high-tech” technologies.
Teaching and assessment:
Lecture material is made clearer by using multimedia products, slides, foliograms, models, posters, video films. Laboratory classes are held at separate work stations with real machines or some of their working bodies imitating a real working process. Students study the general structure and operating principle, draw technological, kinematic and construction diagrams and calculate the main parameters of a separate machine in laboratory conditions and then form conclusions. Results are presented in individual written reports, which are defended at the end of the class. During the semester students work out a course assignment on a technological line, process or farm. They have the right to choose the topic. The semester is validated on the basis of regular attendance at the practice classes and the course assignment.

3284 Stock-Breeding Machines – course project

ECTS credits: 3 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment:exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Boris Georgiev Borisov, PhD, Dept. AM, tel.: 888-325, e-mail: bborisov@ru.acad.bg
2. Assoc. Prof. Jivko Jordanov Demirev, PhD, Dept. AM, tel.: 888-342, e-mail: jdemirev@ru.acad.bg
Abstract:
‘Stock-Breeding Machines – course project’ focuses on building up skills and knowledge of the general methods for investigating (analysis) and projecting (synthesis) of agricultural machinery.
Course content:
Basic principles, rules and consistency in drawing up the the development of the project. Methods of design. Development of individual elements of the structure of agricultural machinery and equipment used in the field of soil-cultivating, sowing, gathering production and livestock farms. Choice and design of technology and kinematical scheme. Technological, kinematics and strength calculations of individual items. Drawing of the general view of the machine, basic unit and working drawings. Using automated and computerized systems in machine design.
Teaching and assessment:
At the beginning of the semester students have the opportunity to choose a particular task for the project; it could be a real problem of stock-breeding, or a task suggested by the students. Practice sessions take place in laboratories and computer rooms; students have separate work stations as well as access to real machines or some of their working bodies imitating a real working process. Students study the general structure and operating principle, draw technological, kinematic and construction diagrams and calculate the main parameters of a separate machine in laboratory conditions and then form conclusions. The final mark is given after the defence of the project.

3285 Agricultural Machinery Drives

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Petar Rusev Petrov, PhD, Dept. HTHPM, tel.: 888-585
2. Assoc. Prof. Emil Konstantinov Kuzmanov, PhD, Dept. AICS, tel.: 888-269

Abstract:
This is a specialising subject and aims at providing the necessary knowledge of the positive-displacement hydraulic drive and the specialised electromotion in agricultural machinery. It is taught in two parts. In part I students get to know the operational principle and the classification of elements and systems for the positive-displacement hydraulic drive. They are used in the hydraulic drive systems. Synthesis and analysis, principle motion diagrams and separate machines are viewed. In the second part the students study the mechanics of electromotion, electromechanical devices of direct current and asynchronous engines, and the power generation of electric motion. They are taught the methods for type and power choice of electric engines.

Course content:
Motion principle, advantages and disadvantages of positive-displacement hydraulic drives. Operation fluids. Valves (safety, pouring, support, reduction and reversive) – structure, operation characteristics, system position, choice. Throttle valves. Distributors. Debit regulators and stabilizers. Debit divider. Hydrodevices assembly. Hydraulic accelerators and proportional devices. Principal information on tracking systems. Main principles in design and synthesis of hydrosystems for setting in motion. Elements of thermal measurement of a hydraulic system with an open and shut circulation of operation fluids. Mechanical characteristics for production mechanisms. Stability of the co-operative work of electrical engine and production mechanism. Speed regulation of electric motion. Electromechanical properties of direct current and inverse current electromotions. Power generation of electrical motion. Choice of type and power of the electrical engine.

Teaching and assessment:
Two lectures per week. Lectures follow traditional methods. Additional technical aids are used. Laboratory classes are held at different working places. Written reports are worked out for the laboratory classes. Four tests have to be taken. They are based on pre-taught information. Final assessment is formed on the basis of the test results and a discussion.

3286 Utilization and Resource Equipment of Agricultural Machinery

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Dimitar Petrov Dimov, PhD, Dept. AM, tel.: 888-242
2. Principal assistant Branimir Jordanov Neikov, MSc(Eng), Dept. AM, tel.: 888-442

Abstract:
This subject exposes the scientifically substantiated choice of suitable power-generated and operating machines and their optimal combination in agricultural units, the methods of high-efficiency usage, the organization of exploitation material supplying (providing), grain fertilizers, spare parts and determining of the store availability of these materials. It is related to Internal combustion engines, Automobiles and tractors, Agricultural techniques and is an important part of the knowledge required for the development of a diploma thesis.

Course content:
Dynamics of mobile agricultural aggregates (Agricultural Aggregates). Resistance (strength) of machines and factors determining it. Structure determination and regime choice of AA. Exploitation-economic indications for using AA. Resource supply, access and availability – essence and meaning. Determining of container capacity and store availability of exploitation materials, grain, fertilizers and spare parts. Management of the resource supply.

Teaching and assessment:
The lectures view the main theoretical issues of using and resource providing. The laboratory classes focus on concrete problems involving using of real units in laboratory and experimental -field conditions. Students take part in the accomplishment of concrete issue processes, analyze results and write reports. The course assignment includes a plan development for the mechanized implementation of the types of work for a particular agricultural enterprise, placing an order for the necessary agricultural materials and its total resource providing. Students are allowed to take the exam after they have handed in their course assignments and achieved positive results on them.

3287 Road Safety

ECTS credits: 2 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Dimitar Petrov Dimov, PhD, Dept. AM, tel.: 888-242
2. Assoc. Prof. Chavdar Zlatkov Vezirov, PhD, Dept. AM, tel.: 888-442
3. Assoc. Bojidar Rusanov Kolev, PhD, Dept. AM, tel.: 888-610

Abstract:
The larger part of the agricultural machinery (AM) is mobile, complex, with off-gauge overall dimensions, multifunctional combined with different kind of machinery or people in a complex environment. There is a great variety in the types of self-propelled and other kinds of machines and different operations in agriculture which are conducted through them. This makes it necessity for the students to be well-acquainted with the road safety (RS) rules while they operate the AM.

Course content:
The following main topics are considered: Road traffic law and rules and regulations concerning agricultural machinery; AM regulations and safety rules while in motion; RS of agricultural machinery while operating; agricultural machinery road safety while co-working with transport appliances; agricultural machinery road safety while working with people; RS in emergencies; RS during night shifts and slope-work; RS in farms, on sites, in specialized AM etc.

Teaching and assessment:
Lectures and practice classes are held in a traditional way using of didactic materials such as posters, slides, videos, as well as different technical learning aids. The teaching-learning methods also include instructions, specification papers, solution of RS cases etc. Two test papers are considered during the semester – respectively on the first and second part and the final mark is formed on the basis of these two tests and the students' performance during the practice classes.

3288 Transport-Manipulation Technologies in Agriculture

ECTS credits: 3 **Weekly classes:** 3lec+0sem+4labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department TMM and HHMT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Ivan Atanasov Popov, PhD, Dept. TMM&HHMT, tel.: 888-239, e-mail: ipopov@ru.acad.bg
2. Assoc. Prof. Georgi Kenarov, PhD, Dept. TMM&HHMT, tel.: 888-239, e-mail: gkenarov@ru.acad.bg

Abstract:
This subject introduces the construction, the technical-exploitation parameters, the grounds of calculation and appropriate choice of transport-manipulation machinery (TMM), as well as the transport-manipulation technologies in the mechanization of load-unloading and storage processes of different agricultural loads. It is based on the knowledge already received from the following subjects: "Mechanics", "Transport manipulation machines", "Machine elements", "Stock-breeding machines", 'Mechanized technologies" etc. It helps studying the subjects in agricultural machinery and technologies and developing the graduation project.

Course content:
General information: Transport-manipulation and storage characteristics of agricultural loads. Classification, propelling and adequate choice criteria for TMM. Permanent transport machines. Load-unloading and lifting capacity of machines and loaders. Secondary appliances and equipment. Transport-manipulation technologies for bulk, single, palletized and container agricultural loads. Storage farm and storage technologies in agriculture.

Teaching and assessment:
The lectures give theoretical knowledge about essential subject issues. Experimental and functional investigations of real samples of transport-manipulation systems are carried out during the laboratory classes. Part of these classes is practical and they are carried out on suitable agricultural farms and sites. The final mark is formed on the basis of the laboratory classes grading and two test papers.

3289 Exploitation Materials in Agricultural Machinery

ECTS credits: 2 **Weekly classes:** 2lec+0sem+0labs+1ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Dimitar Jordanov Pavlov, PhD, Dept. RRCT
Abstract:
The subject provides the main knowledge and skills for essential theoretical and practical issues concerning the properties and use of fuels, greasing materials, hydraulic oils, cooling and braking fluids. Main information on the classification and interchangeability of greasing materials. The influence of the exploitation materials on the machines and aggregates in tractors and automobiles are studied.
Course content:
Carburettor engine fuels. Diesel engine fuels. Motor greases. Transmission greases. Industrial and hydraulic greases. Plastic lubricants. Cooling fluids. Antifreezing agents.
Teaching and assessment:
The subject is taught through lectures and practice classes. The lecture course includes eight topics for discussion. Demonstration experiments, photos, posters and slides are used during the lectures. The practice classes form practical skills and do-it-right habits. Assessment is based on test results..

3291 Agricultural Construction and Design Fundamentals

ECTS credits: 3 **Weekly classes:** 2lec+0sem+1labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Jivko Jordanov Demirev, PhD, Dept. AM, tel.: 888-342, e-mail: jdemirev@ru.acad
2. Assoc. Prof Hristo Ivanov Beloev, PhD, Dept. AM, tel.: 888-342, e-mail: hbeloev@ru.acad
Abstract:
The subject aims at studying systematically-methodical and complex methods of solving design-construction problems. Knowledge of analysis, assessment and choice of technical decisions are aimed at as well as introduction to economic, exploitation, ergonomic and ethical indicators. The subject forms a basis of course and diploma design of agricultural machinery and design.
Course content:
Design and construction fundamentals of agricultural machinery. Problems system in project-construction decisions, functional-structural analysis. Assessment of decision options. General design and rules, regulation and construction of agricultural machinery. Accessories units of agricultural machinery.
Teaching and assessment:
The material taught at the lectures is reinforced at the practice classes. Technological and kinematics diagrams concerning agricultural machinery are drawn, different construction decisions of agricultural units are compared, and analytical conclusions are drawn.
The exam includes written reports from the laboratory classes and oral discussion.

3292 Special Design and Technologies in Agriculture

ECTS credits: 3 **Weekly classes:** 2lec+0sem+1labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Chavdar Zlatkov Vezirov, PhD, Dept. AM, tel.: 888-442
2. Assoc. Prof. Petar Dimitrov Dimitrov, PhD, Dept. AM, tel.: 888-542
3. Assoc. Prof. Bojidar Rusanov Kolev, PhD, Dept. AM, tel.: 888-610

Abstract:
The subject introduces methods for the design of specific mechanised technologies for the most common cultivated crops. The focus is on special technologies for cultivating reclamation and post-harvesting. The students will use the acquired knowledge in the optimisation of technological processes and in the development of their diploma theses.

Course content:
The main topics are concepts land design, energy-power balance, the design of the deployment, soil erosion, soil conservation methods and technologies, irrigation, quality of agricultural production afterharvesting processing, grain drying, storage.

Teaching and assessment:
Lectures provide basic knowledge on the subject of the course. In the laboratory, students study the practical methods of planning and specialized technologies for agriculture. The final assessment is based on the students' performance at pactice classes and written tests.

3293 Repair and Refurbishing Technologies

ECTS credits: 3 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Mitko Ivanov Nikolov, PhD, Dept. RRCT, tel.: 888-223
2. Assoc. Prof. Vasil Antonov Stojanov, PhD, Dept. RRCT, tel.: 888-480

Abstract:
The course is designed to give students the necessary theoretical knowledge and practical skills for correct maintenance of agricultural machines and equipment; it focuses on the methods, processes and technologies for the repair and reconditioning of joints and damaged parts of agricultural machinery.

Course content:
Production and technological process of repairing machine repair. Technology of the disassembly washing and cleaning processes. Fault detection and reassembly. Technology of the assembly of standard components, joints and units. Testing and storage of repaired machines.

Teaching and assessment:
The lectures are delivered in the traditional way. Slides and other visual aids are used. The laboratory classes give the students the opportunity to work with real equipment on real machine parts and joints, on samples under the lecturer's guidence. The students' progress is assessed at the final exam.

3297 Diploma practice

ECTS credits: 4 **Weekly classes:** 0lec+0sem+0labs+30ps+0
Assessment: exam **Type of exam:**
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors
Abstract:
The diploma practice aims at giving the students the opportunity to get acquainted with contemporary scientific and technical achievements in the sphere, in which they develop a diploma project and with the existing state of the problem in the organization, which has suggested the topic for the diploma project.
Course content:
In relation to the topic of the diploma project, the students get acquainted with literature sources, patents, inventions etc., with methods for theoretical and experimental investigations and the results from them; with constructive and technological solutions; with laboratory equipment, measurement devices, tools patterns, machines for mechanical treatment, casting, welding, plastic deformation and thermal treatment; with methodology for constructive and technological calculations; with software packages for solving engineering problems; with quality management systems, etc.
Teaching and assessment:
The diploma practice is carried out in the department laboratories, mechanical and mechanical-mounting workshops, constructive and technological offices or divisions of machine-building companies, libraries, etc. The tasks of the practice are administered by the tutor of the diploma project and are reported to him. The results from the practice are used in compiling the list of reference books for the diploma project and the development of its specific sections.

3298 Diploma project

ECTS credits: 10 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: exam **Type of exam:** oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors
Abstract:
The diploma project aims at giving the students the opportunity to apply the obtained knowledge and skills in an independent and complete development of an engineering project. The students who have excellent results in exams are given topics with research character. The final year project gives the students practical skills and experience for the future engineering practice or for continuing their studies in a Master's degree course.
Course content:
Review of the information regarding the diploma project topic. Formulating the aim and the tasks. Analysis of the initial data and the work conditions. Methodology of the research. Design of repair technologies. Design of the necessary equipment and devices. Running of tests and processing of the results. Technical and economical analysis of the developed variants. Development of technical documentation and graphical representation of the results of the research.
Teaching and assessment:
The diploma project is developed following a given routine. The students work individually, using paper or electronically based information, the equipment of the department or other departments, and their instructor's help. The diploma project instructor assesses the degree the student's work and presents his opinion in a written form. The student defends the diploma project in front of the State Exam Committee: the defence is open to the public. The State Exam Committee evaluates both the diploma project and the way it is defended.

UNDERGRADUATE STUDIES IN AGRICULTURAL ENGINEERING

PROFESSIONAL STANDARDS
OF A BACHELOR IN

AGRICULTURAL ENGINEERING

DEGREE COURSE: Agricultural Machinery and Technologies
Degree: Bachelor
Qualifications: Agricultural engineer
Duration: 4 years (8 semesters)

The main objective of the study:
Development of modern and widely profiled qualified professionals to develop sustainable agricultural production.

General and specific training:
Common training is conducted within 1 - 3 semester, including teaching methods courses help build professional knowledge and skills: broad competence in solving problems in the field of engineering, plant and livestock.
Specialized training is conducted during semester 4-8, including a learning process disciplines contribute to building a professional culture in agriculture: specific competence in solving complex problems in the agricultural production systems.

General and special skills:
General professional skills find expression in shaping career in one of the selected wide branches, such as crop, livestock and / or mechanization of agriculture.
Special skills are formed in accordance with individual characteristics and preferences of students in several areas: systems analysis of agricultural production, optimizing production processes, application of engineering studies, making expertise, application of controls and more.

Job opportunities:
Graduates will be very good because adaptiruemi wide and interdisciplinary nature of their preparation and in its three major professional fields of agricultural production - crop, livestock and machinery.

General description and features of the curriculum:
The curriculum was developed in accordance with the requirements of the European educational system complexity in training and requirements for training in agriculture.

Summary structure of the curriculum:
The structure is based on the adopted model of education adopted and approved by the University Academy advice.

CURRICULUM

of the degree course in

AGRICULTURAL ENGINEERING

First year

Code	*First semester*	*ECTS*	*Code*	*Second semester*	*ECTS*
0669	Mathematics	5	0679	Agricultural experiment	6
0670	Physics	4	0680	Power Generating Machines Plant	7
0671	Chemistry	5	0681	Physiology and Biochemistry	5
0672	Botany	6	0682	Animal Anatomy, Physiology and Biochemistry	6
0673	Zoology	6			
	Elective courses - students elect a course		1350	Materialscience	3
				Elective courses - students elect a course	
0674	English I	4			
0675	German I	4	0685	English II	3
0676	French I	4	0687	German II	3
0677	Russian I	4	0702	French II	3
			0703	Russian II	3
	Total:	***30***		***Total:***	***30***

Second year

Code	*Third semester*	*ECTS*	*Code*	*Fourth semester*	*ECTS*
3425	Applied Mechanics	9	3431	Mechanization in Plant-growing I	6
3426	Economics	5	3432	Technical Drawing and Machine Elements	6
3427	Technical Safety	3			
3428	Microbiology	5	3433	Livestock Feeding	5
3429	Informatics	5	3434	Agricultural Economics	3
3430	Electrical Engineering and Electronics in Agriculture	3	3435	Soil Science and Agricultural Chemistry	6
			3436	Thermotechnics	4
	Total:	***30***		***Total:***	***30***

Third year

Code	*Fifth semester*	*ECTS*	*Code*	*Sixth semester*	*ECTS*
3437	Mechanization in Livestock Breeding	5	3445	Utilization and Maintenance of Agricultural Machinery	5
3438	General Plant-growing	6			
3439	Livestock Breeding	5	3446	Utilization and Maintenance of Agricultural Machinery - Course Project	3
3440	Processing, Storage and Quality of Farm-grown Commodities	5			
3441	Mechanization in Plant-growing II	5	3447	Plant-growing I	6
	Elective courses - students elect a course		3448	Animal Health Care	4
			3449	Fruit-growing	3
3442	Hydraulics and Hydraulic Machines	4	3450	Information Technologies in Agriculture	5
3443	Agrometeorology				
3444	Animal Reproduction and Selection	4		***Elective courses - students elect a course***	
		4			
			3451	Irrigation and Land Reclamation Machinery and Technologies	4
			3452	Vegetable-growing	4
			3453	Animal Hygiene	4
	Total:	***30***		***Total:***	***30***

Fourth year

Code	*Seventh semester*	*ECTS*	*Code*	*Eighth semester*	*ECTS*
3455	Systems of Agricultural Production	5	3464	Agricultural Management	4
3456	Systems of Agricultural Production - Course Project	3	3465	Crop Protection and Technologies for Crop Protection	4
3457	Plant-growing II	5	3466	Cadastre and Land Assessment	4
3458	Agromarketing	3	3467	Technology of Repair of Agricultural Machinery	4
3459	Viticulture	6			
3460	Agricultural Buildings and Storage Technologies	4	3468	Diploma Practice	4
			3469	Diploma Project	10
	Elective courses - students elect a course				
3461	Repairing Principles	4			
3462	Plant Breeding and Seed Production	4			
3463	Technologies of Milk and Meat Products	4			
	Total:	***30***		***Total:***	***30***

Total for the training course: 240 ECTS credits

0669 Mathematics

ECTS credits: 5 **Weekly classes:** 3lec+2sem+0labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department MA, Faculty of Natural Science and Education
Lecturers:
Prof. Stepan Agop Tersian PhD, Dept. MA, tel.: 888-226, e-mail: tersian@ami.ru.acad.bg
Abstract:
Applied Mathematics acquaints students with the basic concepts of higher algebra, analytic geometry, mathematical analysis and their application.
Course content:
Determiners and matrices. Vectors and operations with them. Coordinate systems-coordinates of points and vectors. Equations of a straight line, a plane, a circumference, an ellipse, a hyperbola,a parabola. Differential calculus of a function of one or multiple variables; Integral calculus - indefinite and definite integral; Application of definite integrals. Numeric and functional sequences.
Teaching and assessment:
Lectures deal with fundamental concepts and give examples. At seminars students solve problems. Two written tests are administered. At the written examination students answer questions and solve problems. To have the semester validated students are required to attend seminars regularly.

0670 Physics

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department Physics, Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
1. Assoc. Prof. Tamara Grigorievna Pencheva, PhD, Dept. Physics, tel.: 888-218, e-mail: tgp@ru.acad.bg
2. Principal Assistant Mladenka Angelova Angelova, Dept. Physics, tel.: 888-218
Abstract:
The course aims at familiarizing the students with the physical characteristics of processes and phenomena in nature and some methods of investigation of these characteristics, the most essential properties of matter and material objects, with the structure and properties of the earth atmosphere. Laboratory sessions are meant to give students some experience in solving physical problems and to help them acquire practical skills in carrying out experiments.
Course content:
Measurement of physical values. Kinematics and dynamics of a material point. Interaction in time. Work and energy. Kinematics and dynamics of a rigid body. Law of conservation of mechanical energy. Molecular physics and thermodynamics. Transfer phenomena. Structure of the earth atmosphere, atmospheric circulations. Electric field and electric current. Magnetic field and electro-magnetic induction. Periodic processes and waves. Optical phenomena and laws. Emission and absorption of light. Thermal emission of the Sun and the Earth, hothouse effect. Optical phenomena in the atmosphere. Ecological problems of the Earth.
Teaching and assessment:
Teaching is by lecture. Physical phenomena are demonstrated and investigated at laboratory sessions where students work on their own. Testing is carried out on a regular basis. If the results are good, the student may have his semester validated without having to take the exam.
The exam comprises two theoretical questions and one laboratory session.

0671 Chemistry

ECTS credits: 5 **Weekly classes:** 2lec+0sem+3labs+0ps+p
Assessment: exam **Type of exam:** written and oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Vassilev Kopchev, PhD, Dept. RRCT, tel.: 888-733
Abstract:
This subject examines chemical processes in plants, animals and soils. These are phenomena in solutions, colloid dispersive systems, on interphrase surfaces. Basic classes of organic compounds and their relation to chemical and biochemical processes in soils and living organisms are examined.
Course content:
Solutions, Solutions and electrolytes. Equilibrium in solutions. Electrode equilibrium. Colloid dispersive systems and surface phenomena. Classification of organic compounds. Carbohydrates - monosaccharides and polysaccharides. Nitrogen organic compounds. Basic classes of heterocyclic compounds.
Teaching and assessment:
Lectures acquaint students with the nature and the properties of the most common substances in soils and living organisms. Laboratory classes are organised in two modules. Students are given detailed instructions and are required to perform two or three tasks. At the end of the class the students report and justify the results from the experiments and the conclusions they have drawn.

0672 Botany

ECTS credits: 6 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Sr. Research Associate Siyka Stoyanova Pavlova, PhD, Agricultural and Seed Science Institute - Ruse
Abstract:
On completion of this course students will have an understanding of the basic concepts of botany and its constituents: cytology, anatomy, morphology, taxonomy, ecology, plant physiology and microbiology. The basic laws and relationships in the anatomy and morphology of cells, tissues and organs as well as their functions will be examined.
Course content:
Botany – subject and branches. The cell. Plant tissues. Vegetative organs. Reproduction of cells – cell division. Types of reproduction. Reproduction organs. Taxonomy of plants. Types, structure, way of life and reproduction. Orders, families, genera and species of arable crops.
Teaching and assessment:
Lectures and laboratory classes will be illustrated with drawings, graphs, tables and photos. Some laboratory classes will be held in the Agricultural Research Institute where some aspects of the growth of plants will be observed using environmental test chambers and thermostats.

0673 Zoology

ECTS credits: 6 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Prof. Stefan Assenov Venev, PhD, tel.: 888-242
Abstract:
The aim of this subject is to familiarise students with the basic types of animals on the planet Earth. Their biology, origin, classification, ecology and significance is examined.The evolution, aetiology and distribution of animals is treated in brief. This subject is linked to morphology and physiology of domestic animals and their parasites.
Course content:
Introduction. Unicellular animals. Animals proper. Primary animals. Segment worms. Arthropods. Echinodermata. Invertebrates. Vertebrates. Aetiology of animals. Secondary-mouthed animals. Distribution of animals. Animals with significance to economy. Evolution of animals.
Teaching and assessment:
Lectures examine the basic features of particular groups of animals. At the beginning of the laboratory classes there is a quiz to check students' knowledge. After that students observe and study various objects and exhibits from the Natural History Museum. For their course assignment students prepare a poster and a description on two or three pages of a significant zoological object. Regular attendance of laboratory classes is required. At the examination students answer two questions in writing, they perform a task and answer some more questions orally.

0674 English I, 0675 German I, 0676 French I, 0677 Russian I

ECTS credits: 4 **Weekly classes:** 0lec+0sem+0labs+4ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department FL, Faculty of Law Studies
Lecturers:
English: Sr Lecturer Elga Kirilova Naoumova, Dept. FL; tel.: 888-803; e-mail: enaoumova@ecs.ru.acad.bg
German: Sr Lecturer Tinka Karaivanova, Dept. of FL, tel.: 888-824, e-mail: tkaraivanova@ecs.ru.acad.bg
French: Sr Lecturer Roumyana Ivanova Milanova, Dept. FL, e-mail: rmivanova@ecs.ru.acad.bg
Russian: Sr Lecturer Iliyana Gancheva Benina, Dept. FL, e-mail: Ibenina@ecs.ru.acad.bg
Abstract:
The foreign language module 1 is aimed at achieving communicative competence in the area of the subject specialism and the future job. The teaching objectives comprise the development of reading comprehension skills to handle specialist texts and the acquisition of communication skills to interact successfully in professional settings and everyday situations.
Course content:
Meeting people. Talking about the present and the past. Plans. Describing objects and places. Comparing things. Searching for information in catalogues. Linking facts and ideas. Applying for a job.
Teaching and assessment:
To acquire the necessary language knowledge and to develop skills in using the language as a means of communication a wide range of authentic and specially constructed texts (i. e. articles, diagrams and tables, brochures and catalogues etc.) as well as audio and video materials are used. In class students participate in role plays, pair and group activities and discussions. The oral exam is based on the topics discussed during the semester.

0679 Agricultural Experiment

ECTS credits: 6 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Atanas Leshkov Mitkov, PhD, Dept. AM, tel.: 888-553, e-mail: amitkov@esc.ru.acad.bg
2. Assoc. Prof. Todot Tsanev Todorov, PhD, Dept. NMS, tel.: 888-556, e-mail: ttodorov@ru.acad.bg
Abstract:
The course examines a number of methods for agricultural experiments, as well as methods for the analysis of the results. Students learn how to define the statistical characteristics and properties of various biological and technical objects by means of checking the statistical hypotheses about them and their correlation. They carry out single-factor experiments, process the data, analyse the results and compare them with results from other experiments. Mathematics is a prerequisite for this degree course, which, in turn, is a prerequisite for another course – Agricultural Experiment II, and for all other courses dealing with measuring, observation and experiment.
Course content:
General approach to the experimental study of objects. Significance of experiment in scientific research. Measuring and observation data, data processing – defining the experimental values of mathematical expectation, variance, root-meansquare deviation and deviation ratio of the studied properties. Defining the integrals of the main statistical characteristics of these properties. Defining the correlation between the two properties. Factorial regression analysis. Single-factor variance analysis.
Teaching and assessment:
Teaching is by lecture. At laboratory sessions students solve problems based on the material covered in lectures and connected with real-life agricultural issues. Acquire skills in using data processing software. Students' results from two written tests and the mark given for their course assignment make up the final semester mark.

0680 Power Generating Machines

ECTS credits: 7 **Weekly classes:** 3lec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1**.** Assoc. Prof. Dimitar Petrov Dimov, PhD, Dept. AM, tel.: 888-242
2. Assoc. Prof. Bozhidar Russanov Kolev, PhD, Dept. AM, tel.: 888-610
Abstract:
The course is aimed at providing a firm grounding in the basic principles of operation, construction and function of the power generating machines used in agriculture.Topics are selected to bring the pre-university knowledge of students to more or less the same level as a prerequisite for the study of follow-up subjects which are meant to familiarize students with the variety of power generating machines.
Course content:
Subject and main principles of the course. Types of power sources used in agriculture. Mechanical, electrical, integrated and other power sources. Converters of different types of power and their use in agriculture. Power sources requirements in agriculture, types. Internal combustion engines – structure and operation. Engine mechanisms, units and systems and other power generating machines in agriculture. General arrangement of motor cars, tractors and other agricultural machines. Mechanisms, units and systems of tractors, self – propelled machines and other vehicles in agriculture – structure, operation and principles.
Teaching and assessment:
Lectures give extended treatment of fundamental issues, concerning the description and use of power generating machines in agriculture. Graphs and operating diagrams are used. Students do some preparatory work prior to laboratory and practice sessions. They investigate different approaches to technical problems and evaluate their feasibility. The course finishes with an exam (written and oral) and a presentation of a course project.

0681 Plant Physiology and Biochemistry

ECTS credits: 5 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Senior Research Associate Siika Stoyanova Pavlova, PhD, Agricultural and Seed Science Institute
Abstract:
The course provides sound understanding of the main principles of living processes of plants and more specifically of the structure and function of plant cells, water and minerals management, photosynthesis, breathing, growth and development and the resistance of plans to adverse environmental conditions, biochemical processes and relationships, the transformation of substances and biochemical energy.
Course content:
Cell biology. Biology of water management, minelaral nutrition. Plant biochemistry and bioenergetics. Enzymes, photosynthesis. Breathing. Metabolism of carbohydrates. Growth and development of plants. Growth regulators. Plant resistance to unfavorable conditions. Interaction of internal and external factors in plant growth.
Teaching and assessment:
Lectures and practice sessions are made clear with visual aids, graphs, photos and slides. Some laboratory sessions are to be held at the Agricultural and seed Science Institute where all the necessary conditions-climatic chambers and devices made to display some physiological characteristics of plans.
To have the semester validated a student should attend all practice sessions and at least half the lectures. The exam includes a written presentation of two questions chosen at random by the student and oral testing on the material covered.

0682 Animal Anatomy, Physiology and Biochemistry

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Prof. Stefan Assenov Venev, DSc
Abstract:
The course is aimed at providing the students with basic knowledge of the constitution, functions and processes in the animal body in general, as well as at cell, tissue and organ level.It studies the interaction between animals and the environment in order to protect the animals' health and their productivity.
Course content:
Body structure - cells, tissues, organs and systems.Anatomy and physiology of muscles, digestion, blood circulation, excretion, nervous system.Animal metabolism – biochemical processes at cellular and tissue level.
Teaching and assessment:
Lectures provide theoretical treatment of the subject matter.Laboratory sessions give access to microscope observation of various objects and dead body organs.Body systems and processes are studied with the help of diagrams,models and atlases.Objects, prepared by the students themselves are examined under the microscope.Physiological experiments and biochemical analyses are carried out.
The final exam is written (the student writes on two questions chosen at random) with follow-up conversation with the examiner.

1350 Materialscience

ECTS credits: 3 **Weekly classes:** 2lec+0sem+1labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department MME, Faculty of Mechanical and Manufacturing Engineering
Lecturers:
1. Prof. Mitjo Jordanov Kanev, PhD, Dept. MME, tel.: 888-688, e-mail: kanev@ru.acad.bg.
2. Prof Rusko Ivanov Shishkov, PhD, Dept. MME, tel.: 888-204, e-mail: rish@ru.acad.bg.
Abstract:
To study the links between composition, structure and properties of materials used in art and daily life, and opportunities to change the construction to properties in a certain direction. Basic knowledge of physics and chemistry. Experience, which can be applied in other disciplines related to processing or design new products.
Course content:
Basic concepts of structure and properties of metal, dielectrical and semiconductor crystal materials Methods for the Study of the structure. Structure of one-, two-and multi-component systems Equilibrium diagrams. Regularity of crystallization and transformations in solid state - mechanisms and kinetics. Metastable conditions. Iron, steel and cast iron, copper, titanium, aluminum and their alloys. Other metal materials. Ceramics and metal. Polymeric materials. Composites materials
Teaching and assessment:
Taught theoretical knowledge is specified and expanded in laboratory exercises. They are devoted mainly to the structure of materials and thermal methods of changing it. During the exercises take place controls knowledge (3 times a semester). The assessment is based on results of the investigation.

0685 English II, 0687 German II, 0702 French II, 0703 Russian II

ECTS credits: 3 **Weekly classes:** 0lec+0sem+0labs+4ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department FL, Faculty of Law
Lecturers:
English: Sr Lecturer Elga Kirilova Naoumova, Dept. FL; tel.: 888-803; e-mail: enaoumova@ecs.ru.acad.bg
German: Sr Lecturer Tinka Karaivanova, Dept. of FL, tel.: 888-824, e-mail: tkaraivanova@ecs.ru.acad.bg
French: Sr Lecturer Roumyana Ivanova Milanova, Dept. FL, e-mail: rmivanova@ecs.ru.acad.bg
Russian: Sr Lecturer Iliyana Gancheva Benina, Dept. FL, e-mail: lbenina@ecs.ru.acad.bg
Abstract:
The foreign language module 1 is aimed at achieving communicative competence in the area of the subject specialism and the future job. The teaching objectives comprise the development of reading comprehension skills to handle specialist texts and the acquisition of communication skills to interact successfully in professional settings and everyday situations.
Course content:
Meeting people. Talking about the present and the past. Plans. Describing objects and places. Comparing things. Searching for information in catalogues. Linking facts and ideas. Applying for a job.
Teaching and assessment:
To acquire the necessary language knowledge and to develop skills in using the language as a means of communication a wide range of authentic and specially constructed texts (i. e. articles, diagrams and tables, brochures and catalogues etc.) as well as audio and video materials are used. In class students participate in role plays, pair and group activities and discussions. The oral exam is based on the topics discussed during the semester.

3425 Applied Mechanics

ECTS credits: 9 **Weekly classes:** 3lec+0sem+2labs+2ps+cw
Assessment: exam **Type of exam:** written
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineering
Lecturers:
1. Assoc. Prof. Stoyan Ganchev Stoyanov, PhD, Dept. TM, tel.: 888-572, e-mail:sgstoyanov@ru.acad.bg
2. Assoc. Prof. Tania Grozeva, PhD, Dept. TMM&MMHT, tel.: 888-486, e-mail: tgrozeva@ru.acad.bg
Abstract:
The course comprises two parts: 1) Technical Mechanics; 2) Mechanics of Mechanisms.The first one includes basic concepts of kinematics, statics, strength of materials and dynamics.The second deals with concepts of structure, kinematics and dynamics of machines.The course provides general knowledge in some elementary methods of study of the dynamic processes in mechanical systems and builds up the beginnings of a professional approach to engineering issues.
Course content:
1) Technical Mechanics: Kinematics of particles, kinematics of relative motion, kinematics of rigid bodies, fundamental principles of statics, equilibrium of rigid body and mechanical systems, friction, internal forces and stress, stress, strain and deflection in tension, compression, shearing, torsion and bending, dynamics of particles,rectilinear vibrations of particles, D'Alembert's principle, dynamics of rotational, translatory and plain motion of a rigid body. 2) Mechanics of Mashines: Schematization and classification of mechanisms, lever mechanisms, cam mechanisms, cogged mechanisms,mechanisms with bendable parts, compound mechanisms.
Teaching and assessment:
The lectures provide theoretical grounding of the presented methods supplemented with related example tasks. Practice sessions familiarize students with real-life engineering approaches. Models, kinematic mechanisms and computer simulations make laboratory sessions more effective. Each student is assigned a course project to develop on his own and it is checked and marked at different stages of the work. Continuous assessment is possible but not compulsory. It includes tests which comprise problems and theoretical questions. The same refers to the exam, too. The marking system is made clear at the beginning of the semester. If the student has achieved satisfactory results in the continuous assessment tests, his semester is validated and he does not have to take the exam.

3426 Economics

ECTS credits: 5 **Weekly classes:** 2lec+2sem+0labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department Economics, Faculty of Business and Management
Lecturers:
1. Assoc. Prof. Dyanko Minchev, PhD, Dept. Economics, tel.: 888-557, e-mail: dminchev@ esc.ru.acad.bg
2. Assoc. Prof. Emil Georgiev Trifonov, PhD, Dept. Economics, tel. 888-557

Abstract:
The course examines the general problems, laws and categories of modern market economy, providing firm grounding for all other related subjects.It builds up an independent approach to the issues of market economy and allows of a confident choice in a competitive market-orientated business environment. Mathematics is a prerequsite for economics and in turn Economics is a prerequisite for other more specific branch and functional economics courses.

Course content:
Introduction – the economic system and the fundamental economic theory. Economy – general issues. Market economy. The public sector and the tax system. Supply and demand on individual markets. Consumer demand and behaviour. Production, expenses and company income. Imperfect competition and goods supply. Price – formation and income from production. Gross national product and economic growth. Economic cycle, unemployment and inflation. Macroeconomic balance. Budget policy. Monetary policy. Foreign affairs and open economy.

Teaching and assessment:
Teaching is by lecture; practice sessions are meant to expand and test the material covered by lectures; self-study based on additional reading is optional. Final assessment is based on a written test or written answers to questions on the material taught.

3427 Technical Safety

ECTS credits: 3 **Weekly classes:** 2lec+0sem+0labs+1ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Vladimir Tomov Vladimirov, DSc, Dept. EEP, tel.: 888-481, e-mail: vtomov@ru.acad.bg

Abstract:
This is a general technical subject. It aims at providing knowledge and certain skills for analysis and synthesis application of technical and organization decisions in labor safety. Main issues: learning the analysis methodology of the safety of the technical and production system-resources, characteristics, motion, standardizing, measuring and evaluation of the dangerous and harmful production factors; mastering the methods of projecting of safe technical systems; technical appliances projecting and explaining organization decisions in labour safety.

Course content:
Technical safety – main notions and definitions. Projecting methodical basis of safe technical and production systems. Mechanical safety of technical systems. Electrical safety. Electromagnetic safety. Immission and safety. Noise and vibration safety. Radiation safety. Management and ways of presenting information in technical and production systems. Labour safety control.

Teaching and assessment:
The lectures include the three specializing directions. Visual aids are used. The laboratory classes are experimental and analyzing in their essence. Students have to be prepared, which is ascertained by an incoming test. Two test papers are carried out during the practical classes. They are based on preliminary stated learning issues. Final assessment is achieved on the basis of the laboratory tests, test papers and class participation.

3428 Microbiology

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+p
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Prof. Stefan Assenov Venev, DSc
Abstract:
The course is designed to equip the students with general knowledge of microorganisms, of the processes (both wanted and unwanted) they can cause and how these processes can be studied. The main taxonomic groups are studied – their morphology, taxonomy, physiology, genetics, metabolism and the influence of external factors on regulating the microbal processes. The accent is on processes in the soil resulting from the functions of microorganisms – nitrogen fixation, ammonification, etc. Some laboratory skills specific to microbiology are taught, too.
Course content:
Morphology of microorganisms – viruses, bacteria, actinomyctes, yeast, fungi. Physiology of microorganisms. Chemical structure of the microbe cell, nutrition, bioenergetic and biosynthetic processes, metabolism and nitrogen compounds. Genetics of microorganisms. Heredity, mutability, selection. Microorganisms – distribution. Microflora of the soil, water, air, raw materials, stored products. Microorganisms and environment protection. Microorganisms causing common or pestiferous diseases significant to the country's economy or human health.
Teaching and assessment:
Teaching is by lecture, mostly on key issues from the different topics mentioned above. Visual aids and diagrams are used. Laboratory sessions take place at the Dispensary for the prevention of tuberculosis in Ruse.
Continuous assessment is based on written tests in the course of the semester and on students' performance at the lab sessions.

3429 Informatics

ECTS credits: 5 **Weekly classes:** 1lec+0sem+0labs+3ps+cw
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Chavdar Zlatkov Vezirov, Dept. AM, tel.: 888-442, e-mail: vezirov@ru.acad.bg
Abstract:
The course gives general knowledge and skills in Agricultural Informatics. The basic principles of agricultural technologies and some knowledge of agricultural machinery are a prerequisite for a successful learning process. Students acquire the ability to look up, sort out, disseminate and transfer agricultural information. Agroinformatics can have valuable contribution to the solution of practical problems – the diploma thesis being one of them.
Course content:
Subject matter and basic semesters. Core issues of communication. Data compilation. Search in libraries, the Internet, through E-mail, telephone, other networks. Publishing, database and compression. E-commerce, social implications of information technologies, computer crime. Algorithmic presentation. Word processing. Precision in agriculture.
Teaching and assessment:
Teaching is by lecture. Extended treatment to the basic topics of Agricultural Informatics is given at laboratory sessions. They are also meant to provide students with some practical skills in working on a computer and using agriculture – related software products. Assessment is based on open class discussion and exam results.

3430 Electrical Engineering and Electronics in Agriculture

ECTS credits: 3 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Miroslav Dimitrov Mihaylov, PhD, Dept. AM, tel. 888-342, e-mail: mmihaylov@ru.acad.bg
2. Prof. Ivan Yordanov Palov, PhD, Dept. EPSE, FEEEA, tel.: 888-364, e-mail: ipalov@ru,acad.bg

Abstract:
The course provides basic understanding of the main concepts and laws of Electrical Engineering, as well as of the principles of their application in agriculture. Students are equipped with some knowledge of electrical energy transfer and distribution, electrical equipment in agriculture, electronic components and their structure, advantages of electronic devices and systems in solving practical engineering problems in agriculture.

Course content:
Basic notions and laws of alternate/ direct current circuits. Measurements in Electrical Engineering. Electrical energy transfer and distribution. Electrical wires and equipment, Electronic devices in agriculture, Basic components in analogue and digital electronic devices, Electronic systems used in tillage, sowing, cultivating, fertilizing and crop harvesting, Electronics in livestock farming, Precision and electronics in agriculture.

Teaching and assessment:
Teaching is by lecture; multimedia, video, films, slides, etc., are used to illustrate the material covered. Laboratory sessions contribute to investigation and analysis of the properties and structure of the electrical and electronic components and devices. Students are expected to do some preliminary work before the laboratory sessions and they have to complete reports and submit them at the end of each session. They also take a written exam (two questions from those covered during the semester), and the final mark is given after a discussion with the examiner.

3431 Mechanization in Plant-growing I

ECTS credits: 6 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Zhivko Yordanov Demirev, PhD, Dept. AM, tel.: 888-342, e-mail: jdemirev@ru.acad.bg

Abstract:
Students are given a basic understanding of the principles of mechanical soil treatment. The accent is on the structure of agricultural machines and their adjustment and setting into a working mode.

Course content:
Technological basis of the mechanical soil treatment. Share ploughs, cultivators, toothed harrows, disk harrows, soil tillage machines with active working tools, sowing, planting and second planting machines, fertilizing and crop-protection machines. Some attention is given to modern trends and developments in agricultural machinery – harvesting machines, different units and combines and other working tools.

Teaching and assessment:
Lectures are supplemented with practical experience at the laboratory sessions where the students adjust and set the machines by themselves and study their structure and working principles. They develop and present a course assignment. The exam consists of a written part and an oral discussion on two theoretical questions.

3432 Technical Drawing and Machine Elements

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written
Departments involved: Department MSME, Faculty of Transport Engineering
Lecturers:
1. Assoc. Prof. Vasko Iliev Dobrev, PhD, Dept. MSME, tel.: 888-492, e-mail: vdobrev @ru.acad.bg
2. Assoc. Prof. Petar Dimitrov Pantileev, PhD, Dept. EG, tel.: 888-491, e-mail: pantileevp@ru.acad.bg

Abstract:
The course provides a firm grounding in the basic principles of technical drawing, familiarizing students with methods of design engineering, reading engineering documentation, norms and specifications, theory of general purpose machine elements and how to design them. Physics, Applied Mathematics, Informatics, Mechanization in Plant-growing I, are a prerequisite for this course which, in turn, is a prerequisite for Mechanization in Plant-growing II, Hydraulics and Hydraulic Machines, Usage and Maintenance of Agricultural Machinery, Foundations of Machine Repair. Students will appreciate the course in full when they start working on their diploma theses and in their job as agricultural engineers.

Course content:
Designing of geometrical objects. Types of representation. Views, sections, cross-sections. Joints. Technical drawing of components. Engineering documentation requirements. Simplified representation in technical drawing. Automated design Engineering. Criteria for machine elements design. Choice of materials. Joints – pin joints, key joints, spline joints, press joint. Elements of rotational movement – axes, shafts, friction and roller bearings. Clutches. Mechanical transmission – gear drive, chain drive, belt drive.

Teaching and assessment:
Students attend lectures and laboratory sessions. An overhead projector, experiment stands, models, etc., are used toillustrate the material covered. The Machine Science and Machine Elements Dept. laboratory makes it possible for the students to experiment and learn through doing things and solving engineering problems. A two-hour written exam is to be taken at the end of the course.

3433 Livestock Feeding

ECTS credits: 5 **Weekly classes:** 2lec+0sem+1labs+0ps+cw
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Prof. Stefan Assenov Venev, DSc, Dept. AM

Abstract:
The course is meant to provide students with both theoretical and practical knowledge of the principles of balanced feeding. Adequate treatment is given to the composition and nutritious value of basic feeds and additives used in livestock farming, the biological significance of different nutritive substances, forage digestability, protein evaluation systems, grading and forage marketing. The course is a starting point for further study of the rational feeding of farm animals.

Course content:
Introduction. Composition of feed and nutrients – carbohydrates, proteins, fats, minerals, vitamins – and their biological significance. Digestability. Forage energy and protein value. Livestock feeding – needs analysis and how to determine them. Forages. Classification, preparation, storage, nutritious and market value. Evaluation, grading, processing and pricing of forages.

Teaching and assessment:
Lectures precede laboratory and practice sessions, which are meant to recycle the material covered in lectures and give some idea of the practical aspect of the problems. Each student is given an individual assignment; it is a written assignment and the student is expected to develop it, guided by the lecturers and submit it a month before the end of the semester.
Students also have some field practice at a forage shed and a livestock farm.

3434 Agricultural Economics

ECTS credits: 3 **Weekly classes:** 2lec+1sem+0labs+0ps+p
Assessment: exam **Type of exam:** written
Departments involved: Department Economics, Faculty of Business and Management
Lecturers:
Assoc. Prof. Lyubomir Lyubenov, PhD, Dept. Economics, tel.: 888-347, e-mail: llyubenov@ru.acad.bg
Abstract:
The course is designed to equip graduates with specialized knowledge in the field of micro- and macroeconomics, which is needed to enable them to make independent and confident decisions when solving practical problems in agriculture, to develop adequate economic and social policies and, in general, to acquire sound understanding of how modern agricultural economics works.
Course content:
Economic characteristics of agriculture and the subject matter of Agricultural Economics. Interaction of factors in the manifold agricultural production. Investment and dynamics in agriculture. Capital investment, time and capital market in agriculture. Risk, inflation and capital investment effectiveness. Production cost in agriculture. Land management. Valuation of land. Price – formation and production factors in agriculture. Production and agricultural effectiveness. Distribution of income in agriculture. Rural resource management. Agricultural policy.
Teaching and assessment:
Teaching is by lecture. Slides, diagrams, etc. are used if relevant. Extended treatment is given to real-life problems at practice sessions.

3435 Soil Science and Agricultural Chemistry

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written and oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Vassilev Kopchev, PhD, Dept. RRCT, tel.: 888-228
Abstract:
The course is meant to give students fundamental understanding of the variety of soil types, their composition and properties and the relationship between soil cultivation and irrigation. Extended treatment is given to plant nutrition and fertilization, classification and agro-chemical characteristics of artificial fertilizers. Some basic processes of interaction between plants, soil and nutritious substances are also dealt with. Attention is paid to the connection between the chemical composition and structure of the soil formation minerals and the soil properties and its fertility.
Course content:
Introduction. Basic soil formation rocks and minerals. Soil formation. Factors affecting soil formation. Composition, structure and properties of the soil. Types of soil and their distribution according to the standard classification. Soil erosion. Chemical and industrial waste pollution of the soil. Theoretical basis of plant nutrition and fertilization. Solid soil phase as a nutritive source for plants. Physiological reaction of alkalis, degree of relative toxicity. Chemical and physico-chemical characteristics of the different types of soil acidity. Nitrogen, phosphorus and calcium treatment of plants. Treatment with potassium and trace elements. Agrochemical characteristics of fertilizers and trace elements. Complex and compound fertilizers – administration and advantages.
Teaching and assessment:
Lectures familiarize students with important characteristics of soil types in Bulgaria and how this is related to the growth and development of cultivated plants. Most topics are illustrated with diagrams, slides, transparencies, films, etc. 1.Laboratory sessions comprise two series with 6 topics in each of them. Soil Science sessions precede Agro-chemistry sessions. Students work in groups of three. They are given methodology instructions and some basic theoretical principles to develop two or three practical problems. When the experiments are over and the data compiled, students discuss their work with the teacher, explain and defend the results they have arrived at.
2.To have the semester validated students have to attend at least half of the lectures and all the practice sessions. The exam is written (students answer two theoretical questions) and it is followed by an oral discussion with the examiner.

3436 Thermotechnics

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Yassen Dochev Georgiev, Dept. HTHPM, tel.: 888-203. e-mail: jdg@ ru.acad. bg
Abstract:
The course provides some fundamental knowledge of the main principles of thermotechnics ; it deals with the structure of heat generating equipment, the most economical methods of heat generation, its conversion and utilization in industry, agriculture and everyday life. Good knowledge of Mathematics, Physics, Mechanics and Electrical engineering is a prerequisite for working successfully in this course.
Course content:
Basic concepts of thermodynamics. First law of thermodynamics. Formulation of the first law of thermodynamics for open and closed systems. Specific heat capacity, thermodynamic bases of equilibrium conditions. Second fundamental law of thermodynamics. Mathematical expressions of the second law of thermodynamics. Enthropy, convertibility and inconvertibility of processes. Thermodynamic consummation of processes, calculation of strength and energy. Thermodynamic processes of real gases. Heat exchange: basic concepts and definitions. Complex heat exchange and heat transmission. Heat insulation. Thermodynamics of a cooling machine. Basic concepts of the drying process. Drying methods. Ventilation devices. Natural and forced ventilation of livestock sheds. Uncommon energy sources and methods for their utilization.
Teaching and assessment:
Lectures are meant to provide theoretical knowledge which is extended at laboratory sessions. Students submit reports with the experimental data compiled during laboratory sessions as well as analysis and conclusions on the experiment results. Assessment is based on students' performance at laboratory sessions and their test results.

3453 Animal Hygiene

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Prof. Stefan Assenov Venev, DSc
Abstract:
The course is designed to provide students with sound understanding of the interaction between animal health and productivity and environment. The course includes two parts – general and specific. 'Animal hygiene' - the general part - treats environment factors, and the specific part deals with the hygiene requirements which have to be met in the process of rearing different types of animals.
Course content:
Air hygiene. Hygiene of water, water supply and watering. Soil and forage hygiene and hygiene of feeding. Hygiene requirements to the buildings where animals are kept and their equipment. Hygiene requirements to the rearing of cattle, sheep, pigs and poultry; animal health problems when farmers fail to meet these requirements and agricultural law acts are neglected.
Teaching and assessment:
Teaching is by lecture and laboratory sessions are meant to consolidate students' knowledge. Laboratory classes take place at the University laboratory as well as at specialized laboratories for the analysis of environment parameters in town. Students look into practical problems testing air, water, soil and forage samples. Special attention is given to the correct interpretation of test results and the interaction between animal health and productivity and the environment.
The exam is written, based on two questions from the material covered. At the end of each part of the course students answer one question in a written form and the results add up to make the final mark.

3437 Mechanization in Livestock Breeding

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Boris Georgiev Borissov, PhD, tel.: 888-325, e-mail: bborisov@ru.acad.bg
Abstract:
The course is aimed at broadening the students' knowledge in the field of mechanization of processes. It provides engineering graduates with a blend of methods and skills in making proper technical and technological decisions in the process of livestock rearing. Taught topics include machines, equipment and methods in rearing cattle, pigs, sheep, poultry, buffalos, rabbits, ostriches, etc. Special attention is paid to milking, feeding, egg collection, water supply, cleaning, milk processing and maintaining favourable environment parameters.
Course content:
Livestock breeding requirements and basic characteristics; types of technological approaches. Mechanization and automation of the processes connected with maintaining a healthy environment, water supply, feeding, cleaning, milking, shearing, egg collection. Harvesting, processing, storage of forages and formulation of balanced rations. Forage kitchens, forage sheds and forage factories. Milk processing production lines – cooling, pasteurization and creaming. Classification, general structure, adjustment and function principles of technological schemes and automation elements.
Teaching and assessment:
Lectures are illustrated with multimedia products, slides, transparencies, models, videos. Real-life processes are simulated at laboratory sessions and students are trained how to work with real machines – they study their structure, how to adjust them and how to design technological plans for their use. The results are presented in reports. Students also develop an individual course assignment on a topic of their choice. A functioning farm is visited to give students some first-hand experience in the subject matter.
Students have to attend all laboratory sessions and to submit their course assignment in due time to have the semester validated.

3438 General Plant-growing

ECTS credits: 6 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Iliya Ivanov Muhtanov, PhD, Dept. AM, tel.: 888-312
Abstract:
The course deals with the most general problems of agronomy, the vegetation, growth and development of cultivated plants. The students will acquire some knowledge and skills in plant growing – how to achieve the highest possible soil fertility and put to use the most efficient methods.
Course content:
The subject matter comprises the study of the most important ecological factors and their significance for the development of plants, crop rotation, soil tillage, systems of soil tillage, fertilizers and administration of fertilizers, seed production and sowing, weeds and weed control. Laboratory sessions are meant to equip students with some essential practical skills.
Teaching and assessment:
Lectures are delivered in the traditional way. Illustrations are used where appropriate – tables, slides, films, herbaria.
Laboratory sessions take place in the fields and aim at giving students some practical skills. They usually start with theoretical instruction on the topic which is to be consolidated and after that students work on their own. Final results are submitted in a written report.

3439 Livestock Breeding

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Prof. Stefan Assenov Venev, DSc, tel.: 888-556
Abstract:
The course aims at providing agricultural engineering graduates with a blend of knowledge and skills connected with livestock breeding, animal rearing and obtaining products from different farm animals – cattle, sheep, pigs, poultry, horses and rabbits. Evaluation and grading of farm-produced commodities – milk, meat, wool, eggs, hides, etc. The interaction between the animals' health and their productivity and fertility is also examined.
Course content:
Animal productivity and its biological basis. Quantitative and qualitative characteristics of animal products. Animal breeds. Breeding, reproduction and selection methods. Feeding technologies. Methods of livestock rearing and obtaining products from different types and categories of farm animals. Animal health and productivity.
Teaching and assessment:
Teaching is by lecture. Laboratory sessions are held in specially equipped laboratories, and field practice is in farms in the region of Ruse. Students are to do some preliminary work before the lab session and fieldwork training.
Each student is assigned an individual task, which has to be developed in writing.
The exam comprises a practical and a theoretical part. The practical exam is based on a concrete practical task; in the theoretical exam the students answer two theoretical questions in a written form, and then take part in an oral discussion on the subject matter with the examiner. The final mark takes into account the students' performance in the tests during the semester, as well as in the written and oral exams.

3440 Processing, Storage and Quality of Farm-grown Commodities

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Petar Todorov Radulov, PhD, Dept. AM, tel.: 888-242
2. Assoc. Prof. Bozhidar Russanov Kolev, PhD, Dept. AM, tel.: 888-610
Abstract:
During the period of time between gathering in and selling the farm-grown products on the market, a number of processes are carried out aiming at improving the products' appearance and preserving their nutritious qualities. Products are evaluated, graded and stored. These processes form the core topics of the course.
Course content:
The course deals with technologies and equipment for grain drying, cleaning, separating and grading of fruit and vegetables, Physico-chemical and biological characteristics of fruit and vegetables and the optimal conditions for their preservation are studied. Students are given some knowledge about storehouse repositories and their ventilation and cooling, about storing fruit and vegetables in controllable environment at low temperatures, about taking test samples to be used for grading the products.
Teaching and assessment:
Lectures are accompanied by appropriate visual aids. Laboratory sessions are meant to recycle and consolidate students' knowledge. Students' performance is checked through tests and the semester is validated after submitting written lab reports.

3441 Mechanization in Plant-growing II

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Atanas Leshkov Mitkov, PhD, Dept. AM, tel.: 888-553, e-mail: amitcov@ru.acad.bg
2. Assoc. Prof. Hristo ivanov Beloev, PhD, Dept. AM, tel.: 888-553, e-mail: hbeloev@ru.acad.bg

Abstract:
The course gives fundamental knowledge of harvesting machines and harvest processing. Topics range from machine structure to correlation between parameters (constructional and technological) and indicators (qualitative and power) of harvesting machines. Sound grounding in Mathematics, Technical Mechanics, Theory of Machines and Mechanisms, Hydraulics, Heat Technology, etc., is a prerequisite for this course which, in turn, is a prerequisite for Agricultural Technologies and Agricultural machinery Design and Maintenance.

Course content:
Introduction. Grain harvesting machines and technologies. Classification of harvesting machines. Cutting devices and connecting rocker. Threshing devices and straw threshing. Straw harvesting. Utilization of the air flow in agricultural machines. Maize harvesting machines. Grain cleaning and grading. Machines for grain drying. Machines for industrial plants harvesting.

Teaching and assessment:
Teaching is by lecture. Laboratory sessions are to extend and consolidate students' knowledge of machine structure and technological processes. The exam comprises a written answer to two theoretical questions and a laboratory session question. A well developed course assignment will contribute to a good semester mark.

3442 Hydraulics and Hydraulic Machines

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Russev Petrov, PhD, Dept. HTHPM, tel.: 888-585

Abstract:
The course provides fundamental instruction in the basic laws of fluid movement, canal and pipe flows, and calculation of pipeline parameters. It includes some principal issues concerning the construction and utilization of different types of hydraulic and pneumatic machines in agriculture. The course also examines some hydro-systems and some fluid-power drive machines.

Course content:
Fluid properties. Basic equation of hydrostatics. Bernoulli's equation. Modes of movement and hydraulic resistance. Computing of hydro- and air-pipes. Structure and working principles of turbo-machines, displacement machine-pumps, fans, compressors and fluid-powered engines. Structure, adjustment and performance of machine systems. Hydraulic elements. Some hydraulic systems used as machine driving force.

Teaching and assessment:
Teaching is by lecture; lectures precede laboratory sessions, which take place when students already have some theoretical knowledge of the subject matter. At laboratory sessions students have access to experiment stands and are able to find out for themselves how the basic hydraulic machines and systems function. Reports are submitted after each lab session.
Three written tests in the course of the semester give the basis for the final mark.

3443 Agrometeorology

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Chavdar Zlatkov Vezirov, Dept. AM, tel.: 888-442, e-mail: vezirov@ru.acad.bg
Abstract:
The purpose of the course is to equip Agricultural Engineering graduates with some general knowledge in Meteorology and the key factors relevant to the life cycle of plants and animals. Physics, Botany and Mathematics are important prerequisites for the studies in Agrometeorology, and, on the other hand, it is closely connected with all subjects related to the study of plants. Extended treatment is given to some of the principles, methods and concepts describing the relationship between climate, weather and agricultural activities.
Course content:
Taught topics range from the most general to some very specific: Subject matter and basic concepts in Agrometeorology. Atmosphere. Sun radiation. Temperature of the ground and of water expanses. Air temperature and humidity. Evaporation. Rainfall, snowfall and soil water management. Wind. Weather forecasting Climate hazards in agriculture. Plant pathology, pest management and agrometeorological factors. Climate, micro- and phytoclimate. Climate estimation.
Teaching and assessment:
Lectures give a basic understanding of the relationship between agricultural production and the climate and weather, with emphasis on the acqusition of some practical skills to cope with real problems – this is where laboratory sessions come in. Open class discussion and exam results contribute to the assessment of the students' knowledge.

3444 Animal Reproduction and Selection

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Prof. Stefan Assenov Venev, DSc
Abstract:
The course familiarizes students with some fundamental principles of selection processes and reproduction – two problems of utmost importance from technological and economic point of view.
Extended treatment is given to heredity, biology of reproduction, animal growth, constitution, exterior, picking and selection of animals, as well as to breeding methods and their significance.
Course content:
Livestock growth and development. Heredity, variability, breeds and breed-formation. Productivity – management and control factors. Breeding methods. Picking and selection. Reproduction - mating, artificial insemination, embryo transplantation, fertility. Problems of reproduction and selection – management and prevention methods.
Teaching and assessment:
The approach is based on lectures, laboratory practice and individual study.
Fieldwork training is planned – at the Livestock Reproduction Centre in Ruse – which will give students first-hand experience in livestock selection and artificial insemination.
The students have to take a written exam supplemented with oral discussion.

3445 Utilization and Maintenance of Agricultural Machinery

ECTS credits: 5 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Dimitar Petrov Dimov, PhD, Dept. AM, tel.: 888-242
2. Assoc. Prof. Bozhidar Russanov Kolev, PhD, Dept. AM, tel.: 888-610

Abstract:
The course provides fundamental instruction in the approach to selecting appropriate power-generating and working machines for specific cultivating tasks, the methods of determining optimal modes of work of agricultural aggregates, the technology and management of machinery maintenance, the storage of machines when they are not needed. The following subjects are a prerequisite for this course: Internal Combustion Engines, Automobile Transport, Agricultural Machinery and agricultural technologies in general.

Course content:
Dynamics of mobile agricultural aggregates. Resistance of machines and factors that determine it. Structure and working modes of agricultural aggregates. Kinematic characteristics and aggregates movement. Utilization of aggregates, economic significance. Machine efficiency control methods. Elements of machine maintenance. Agricultural machinery preservation. Maintenance and preservation methods.

Teaching and assessment:
Lectures provide theoretical knowledge, which is expanded at laboratory sessions where students work with real aggregates. They process and analyse the compiled data and prepare a report. To have the semester validated the student has to attend all the laboratory sessions and to defend his course project.

3446 Utilization and Maintenance of Agricultural Machinery – Course Project

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment: defence **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Dimitar Petrov Dimov, PhD, Dept. AM, tel.: 888-242
2. Assoc. Prof. Bozhidar Russanov Kolev, PhD, Dept. AM, tel.: 888-610

Abstract:
The course project is meant to prepare the students for making independent engineering decisions in the field of utilization and maintenance of agricultural machinery, maintenance planning, calculation of working hours and number of workers needed for efficient maintenance of machines and aggregates.

Course content:
The course project comprises: working out a general plan for mechanization of agricultural work which takes into account the type and the number of aggregates necessary for a particular task, the number of transportation units, the parameters of their functions, the amount of fuel necessary to complete the task; working out of an annual plan for the forthcoming maintenance tasks, calculation of the working hours and the number of workers needed for efficient maintenance work; each student has to complete an individual assignment in dimensioning an agricultural aggregate.

Teaching and assessment:
Each student is given a production plan /cultivated area and the type of plants grown on it/. The course project is developed under the guidance of lecturers on the basis of theoretical resources and is accompanied by an explanatory report. Students have to be able to explain and analyse the results they have arrived at. The semester is validated after a successful defence of the project.

3447 Plant-growing I

ECTS credits: 6 **Weekly classes:** 2ec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Iliya Ivanov Muhtanov, PhD, Dept. AM, tel.: 888-312
Abstract:
Plant-growing is a fundamental course which is the basis for all agro-biological knowledge. It comprises issues concerning both the botanical and the biological characteristics of plants, their cultivation and machine harvesting.
Course content:
Cereal plants /wheat, barley, rye, oats, maize, rice, millet, sorgho/, leguminous plants /beans, soya, peas, lentils, chick-peas/. Oleaginous plants /sunflower, peanuts, rape/, root crops /sugar beet, potatoes/, fibre crops /cotton, flax, hemp/, ethereal oil plants /rose, peppermint, lavender, coriander, anise/, narcotic plants /tobacco/, fodder plants /common vetch, alfalfa, red clover/, etc.
Teaching and assessment:
Teaching is by lecture. Tables, diagrams, overhead projector transparencies, films, etc., are used when appropriate. Students have to submit reports for the laboratory sessions. The course assignments are individual and students have to prepare a field management plan for the cultivation of a particular plant. On submitting the course assignment the semester is validated. The exam starts with written answers to two questions from the material covered and finishes with an oral discussion with the examiner.

3448 Animal Health Care

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Prof. Stefan Assenov Venev, DSc
Abstract:
The course deals with the main diseases characteristic of farm animals, prevention and treatment of these diseases. Extended treatment is given to important contagious, non-contagious and parasitic diseases, prevention measures and fighting epidemics. There is a special accent on infection, insect and rat management and the ecological aspect of the problem.
Course content:
Patho-physiology – basic pathological changes and processes in the tissues and organs, internal, non-contagious diseases. Contagious diseases. Parasitic diseases. Disinfection of places where farm animals are kept. Fundamentals of prevention.
Teaching and assessment:
Lectures deal mainly with theoretical issues. Laboratory sessions are to consolidate students' practical skills in identifying the cause and symptoms of various diseases and in working on their prevention. Some laboratory sessions take place in clinics in Ruse and the area; students are given the opportunity to work in close to real conditions, to acquire some knowledge of the veterinary instruments and medicines.
At the exam the students answer to two questions in writing. The written exam is followed by an oral discussion with the examiner.

3449 Fruit-growing

ECTS credits: 2 **Weekly classes:** 2lec+0sem+1labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Senior Research Associate Ivan Zhelev Hristov, PhD, tel.: 032/442745
Abstract:
The course provides fundamental knowledge in the field of fruit-tree plantations, types of fruit-trees, strawberries and raspberries. Botany, Soil Science, Agrochemistry, Plant Physiology and Biochemistry, Agrometeorology and Agricultural Mechanization are a prerequisite for this course and in turn it is connected with all other plant-growing courses. The present state and the modern tendencies in fruit-growing.
Course content:
The course familiarizes students with the origin of fruit-tree species, their biological characteristics, their requirements and reactions to the ecological parameters of the environment. It covers problems connected with the production of planting material, perennial plant-stands and cultivation technologies.
Teaching and assessment:
Lectures precede laboratory sessions and provide students with the necessary theoretical knowledge. Students do some preliminary work to get ready for the laboratory sessions – tasks are completed individually, and the final mark is based on their performance at lectures, laboratory sessions and the exam.

3450 Information Technologies in Agriculture

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Chavdar Zlatkov Vezirov, PhD, Dept. AM, tel: 888-442, e-mail: vezirov@ru.acad.bg
2. Assoc. Prof. Miroslav Dimitrov Mihaylov, PhD, Dept. AM, tel.: 888-556
Abstract:
The course aims at providing students with general knowledge and skills in using information technologies in agriculture. Teaching is based on previous concepts of agricultural machinery and technologies. Practical problems are solved at laboratory sessions. Students learn how to compile sort out, spread and transfer specific agricultural information. The course will contribute to the development of the diploma thesis as well.
Course content:
Subject matter and basic concepts. Sources and consumers of agricultural information. Technical devices and their specific characteristics for agriculture. Application packages, data banks and information systems in agriculture. Structure and basic approaches of setting up agricultural information systems. Geographical information systems, multimedia, nets and communication in agriculture. Efficiency of information technologies.
Teaching and assessment:
Teaching is by lecture. Laboratory sessions aim at providing students with practical skills in using application packages relevant to agricultural issues. Assessment is based on oral communication with the students at laboratory sessions and the exam results.

3451 Irrigation and Land Reclamation Machinery and Technologies

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Petar Todorov Radulov, PhD, Dept. AM, tel.: 888-242
2. Assoc. Prof. Georgi Velikov Mitev, PhD, Dept. AM, tel.: 888-610
Abstract:
Land reclamation, including irrigation, is an important element of agricultural technological processes. These processes are labour- and time-consuming; they are carried out in various conditions and seasons. To manage land reclamation successfully, agricultural engineering graduates have to know them very well and this is what this particular course is aimed at.
Course content:
Taught topics cover: Soil fertility management through controlling its chemical composition and structure. Preventing water and wind erosion, Levelling, draining and preparing the fields for irrigation. Mechanization of overhead irrigation, implementation of long-range irrigation units, types of irrigation techniques.
Teaching and assessment:
Teaching is by lecture and appropriate visual aids are used when it is necessary. The university laboratory base is used as well as other laboratories in the region. Continuous assessment is based on two written tests and students' performance at lab sessions.

3463 Technologies of Milk and Meat Products

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Hristo Lukov Sahanekov, PhD, tel.: 032/225610
Abstract:
The aim of the subject is to acquaint students with the main technological processes in the production of traditional and newly-developed milk products, with the changes in milk due to transportation, storage and processing, with the utilization of secondary dairy products.
The aim of this subject is to acquaint students with the main technological processes for production and processing of meat. In addition students will become familiar with the structure, the chemical composition and the technological properties of raw materials used in meat production. Changes in the raw materials due to processing, storage and transportation will be examined. Utilisation of secondary products (nutrient and technical) and some associated ecological problems will be investigated.
Course content:
Milk as raw material in dairy industry. Nutritious qualities and composition of milk. Pretreatment of milk – sterilization, cooling and homogenizing. Heat treatment. Flow charts for pasteurized fresh milk, various types of yogurt, butter and cheese. Utilization of secondary dairy products. Calculation of the yield and the level of utilization of nutritious substances in milk in its processing.
Preliminary treatment of animals in slaughterhouses. Refrigeration of meat. Utilisation of secondary products (nutrient and technical). Basic raw materials and ancillary materials in the production of meat. Primary and secondary treatment of meat and raw materials. Basic technological processes. Specific technology of particular types of meat products. Control and quality assurance in the meat processing industry. Ecological problems of the meat processing industry.
Teaching and assessment:
Lectures deal with theoretical issues and laboratory sessions are designed to supplement them. Final assessment is based on students' performance at lectures, laboratory sessions and written tests.
Teaching and assessment:
Lectures deal with theoretical issues and laboratory classes are designed to supplement them. Some laboratory classes will be held in meat processing factories so that the students can observe technological processes in action.

3452 Vegetable-growing

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Kolyu Atanassov Vassilev, DSc, tel. 888-442
2. Assoc. Prof. Chavdar Zlatkov Vezirov, PhD, Dept. AM, tel: 888-442, e-mail: vezirov@ru.acad.bg
Abstract:
The course is designed to give students basic knowledge in the field of vegetable-growing/market gardening. Laboratory sessions provide a blend of skills needed for efficient market gardening.
Course content:
The main topics are: Subject matter and basic concepts. Tomato, pepper, eggplant, cucumber, pumpkin, squash, potato, onion, leeks, garlic, leaf vegetables, beet, runner bean, green peas – flow chart and utilization of machinery in vegetable-growing. Hot houses, heating pipes, shading panels, ventilators, sprinklers, cultivators.
Teaching and assessment:
Teaching is by lecture. Students do some individual work to get ready for the laboratory sessions which aim at providing them with practical skills in vegetable - growing, post- harvest processing, storage and handling of vegetables. Final assessment is based on results from written tests and on students' performance in lab sessions.

3455 Systems of Agricultural Production

ECTS credits: 5 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Georgi Velikov Mitev, PhD, Dept. AM, tel.: 888-610, e-mail: gmitev@ru.acad.bg
2. Assoc. Prof. Petar Todorov Radulov, PhD, Dept. AM, tel.: 888-242, e-mail: pradulov@ru.acad.bg

Abstract:
This subject examines the main problems of production in plant growing and stock breeding. It aims to acquaint students with the stability of agricultural production systems, their basic constituents and the technological processes. Growing and harvesting of crops is also examined. Basic technological processes, design features and control of different types of agricultural machines are studied as well as some ecological aspects of agricultural production. Agriculture, Plant growing, Mechanisation of plant growing, Mechanisation of stock breeding are prerequisites for this module.

Course content:
Stability of agricultural production systems and factors for their efficient usage. Factors influencing growth of plants and their engineering interpretation. Soil – water – plant interrelationship. Erosion and congestion of soil. Nutrition status, pesticide application and mechanisation. Cereal crops, fodder crops, technical plants, vegetables and perennial-plant stands. For each system of agricultural production the types of crops, their biological properties, their soil and climate requirements, the technology of growing and mechanisation are examined.

Teaching and assessment:
Lectures deal with underlying theory. In laboratory classes students collect data related to factors, production technologies, etc. Laboratories start with a quiz and finish with writing a report. The principle ''learning by doing'' is applied. The examination comprises answering two questions in writing and answering further questions orally.

3456 Systems of Agricultural Production - Course Project

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment: defence **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Georgi Velikov Mitev, PhD, Dept. AM, tel.: 888-610, e-mail: gmitev@ru.acad.bg
2. Assoc. Prof. Petar Todorov Radulov, PhD, Dept. AM, tel.: 888-242, e-mail: pradulov@ru.acad.bg

Abstract:
The course project in Systems of agricultural production aims to prepare students to solve problems and make scientifically justified decisions concerning choice of a system for agricultural production for a specific area. Students have to justify their choice of type of crop, assess the need for water and specify the ways of water supply, choose the types of technologies taking into account the kind and the state of the soil, choose and combine agricultural aggregates to the best effect and create and process a database.

Course content:
The course project involves planning a system of agricultural production. Students are asked to choose the type of crop and define its biological characteristics. They have to calculate the water consumption processing data concerning the preceding 5 years. The nutrition status of the soil should also be examined as well as the need for fertilizers. Suitable technologies of management of natural resources should be selected.

Teaching and assessment:
The course project is assigned in week 2 of the semester

3465 Crop Protection and Technologies for Crop Protection

ECTS credits: 4 **Weekly classes:** 3lec+0sem+3labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Dimitrina Ilieva, PhD
Abstract:
In this subject students will be introduced to the basic principles in crop protection. Safe and effective use of pesticides will be examined. Students will learn to calculate doses and use crop protection equipment properly. This subject complements knowledge gained in the following modules: Botany, Plant growing and Stock breeding.
Course content:
Specific problems of crop protection. Defining the factors that influence spread of disease, vermin and pests. Use of IT and expert systems. Legislation. Management of pesticides in various protection technologies. Crop protection equipment. Jets and hydraulic spraying.
Teaching and assessment:
Lectures deal with basic methodological issues. Students have to get ready for the laboratory classes where they carry out tasks and solve practical problems. They have to justify their solutions referring to the methodology. Assessment is based on the results of the control over lectures and laboratory classes. When students defend their results they use diagrams, tables and lists of symbols.

3458 Agromarketing

ECTS credits: 4 **Weekly classes:** 2lec+1sem+0labs+0ps+p
Assessment: exam **Type of exam:** written
Departments involved: Department Economics, Faculty of Business and Management
Lecturers:
Assoc. Prof. Lyubomir Lyubenov, PhD, Dept. Economics, tel.: 888-347, E-mail: llyubenov@ru.acad.bg
Abstract:
This series of lectures in agromarketing is designed to acquaint students with the features of demand and supply of agricultural products, the food chains, the ways and channels of realisation of agricultural products and marketing for farmers.
Course content:
Introduction to marketing and agromarketing. Features of agromarketing. Features of demand and supply of agricultural products. King and Engel's law. Prices of agricultural products. Food chain – channels for realisation. Cooperative markets. Tenders. Producers' markets. Auctions. E-auctions. Brokers. Marketing boards, marketing cooperation, marketing groups of producers. Marketing margins and direct marketing of agricultural products. Contracts. Bourses and bourse trade of agricultural products. Vertical integration. Stages and sequence in marketing decision-making. Farmers making marketing decisions.
Teaching and assessment:
Lectures are delivered in the traditional way and are illustrated with slides where appropriate. In seminars students do tests, deal with case studies, write contracts, etc.

3460 Agricultural Buildings and Storage Technologies

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department TMM and HHMT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Jasen Dochev Georgiev, PhD, Dept. TMM and HHMT, tel.: 888-203, e-mail: jdg@ru.acad.bg
2. Assoc. Prof. Georgi Getsov Kenarov. PhD, Dept. HTHPM, tel.: 888-664, e-mail: gkenarov@ru.acad.bg

Abstract:
This subject familiarises Agricultural Engineering students with the functions and the design of agricultural buildings and equipment, with the possibilities and application of storage technologies according to the type of load and the choice of suitable warehouse equipment. Knowledge gained in the following modules will be used: Mechanisation of plant growing and stock breeding, Processing, storage and quality of agricultural products, Heat engineering. Knowledge gained from this subject will be applied in further studies, in the diploma project and in the future job.

Course content:
Agricultural buildings – building materials, design, practical standards and specifications, constructional materials; microclimate. Storage facilities. Storage features of agricultural loads, ventilation, temperature, etc. Storage requirements, preparation for storage and transportation. Open stores, sheds and warehouses for packed and palletised loads. Silo bins and bunkers, towers and trenches – application, structure. Parameters. Handling and storage equipment – structure, standards, choice. Sample technologies for storage of common agricultural loads.

Teaching and assessment:
Lectures provide the theoretical background. They are illustrated with slides and OHP transparencies. Lectures are delivered in a suitable room according to the teaching schedule. Laboratory classes are held in the laboratory of the department. At the examination students answer two questions in writing.

3466 Cadastre and Land Assessment

ECTS credits: 4 **Weekly classes:** 3lec+0sem+3labs+0ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Chavdar Zlatkov Vezirov, PhD, Dept. AM, tel.: 888-442, email: vezirov@ru.acad.bg

Abstract:
On completion of this module students will have basic knowledge and skills in cadastre, land assessment and land management. Previously gained knowledge of agricultural technology and machinery will be used. This subject prepares the students for their diploma project and future job.

Course content:
Basic concepts of the subject. Geodesy and cartography. Cadastre and land management. Location of plant growing activities and stationary activities. Area equipment, cadastre and land management in crop rotations, perennial-plant stands, pastures and meadows. Land management projects. Soil assessment. Approaches and methods for land assessment: market, by income, by costs, by assets.

Teaching and assessment:
Lectures deal with theoretical issues. Students have to get ready for laboratory classes. In laboratories students learn how to use the relevant equipment properly, they make cadastre assessments of real objects. Assessment is based on the results of the control over lectures and laboratory classes. When students defend their results they use diagrams, tables and lists of symbols.

3461 Repairing Principles

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
2. Assoc. Prof. Mitko Ivanov Nikolov, PhD, tel.: 888-458
1. Assoc. Prof. Todor Nikolov Delikostov, PhD, tel.: 888-441
Abstract:
The aim of this subject is to provide the knowledge necessary for efficient management of the ageing process of machines in relation to reconditioning and maintenance.
Course content:
Essence and causes for malfunctions and breakdowns in machines. Nature and classification of processes of wear–and-tear. Defining the limit state. Structure and organisation methods in the repairing of machines.
Teaching and assessment:
Lectures are delivered in the traditional way. They are illustrated with slides and OHP transparencies. Students work in groups of 3 or 4 in laboratory classes and use laboratory equipment and measuring and recording devices.

3462 Plant Breeding and Seed Production

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Senior Research Associate Genka Patenova
Abstract:
Selection deals with genetic modification of plants and creation of new varieties. This subject will examine selection and a number of methods for genetic reconstruction and improvement of plants. Methods in selection are based on genetic regularities and they are used to change the genetic structure of natural and artificially created populations.
Course content:
Development of selection. Variability of biological systems. Methods of genetic reconstruction and improvement of plants. Reproduction of plants and principles of selection. Enhancing the adaptability of plants. Maintenance and distribution of varieties.
Teaching and assessment:
The topics and the structure of the lectures are designed to give students a preparation comparable with the most advanced models in developed countries. Lectures are illustrated with slides, OHP transparencies, films. etc. Laboratory classes serve as an extension and provide an insight into the principles and criteria for assessment of new varieties employed by the State Commission on New Varieties and various international organisations.
To have the term validated students have to attend laboratory classes regularly. At the examination students answer two questions extensively in writing and some more questions orally.

3464 Agricultural Management

ECTS credits: 4 **Weekly classes:** 4lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department BM, Faculty of Business and Management
Lecturers:
1. Assoc. Prof. Nickolai Naydenov, PhD, Dept. BM, tel.: 888-520, e-mail: nnaydenov@esc.ru.acad.bg
2. Principal Assistant Anton Nedialkov, Dept. BM, tel.: 888-520, e-mail: anedialkov@esc.ru.acad.bg

Abstract:
The course aims at giving the students some knowledge of the methodology and practical issues of agricultural management and the resources it needs in a market orientated business environment. Economics, Finance and Accounting, Association, etc., are some of the prerequisites for this course, and it is a necessary prerequisite for the diploma thesis.

Course content:
Main principles, aims and characteristics of agricultural management. Types of agricultural business organizations and services. Economic principles of production and service management in agriculture. Agricultural production planning. Investment policies. Personnel recruitment, selection and human resources management. Agricultural machinery management. Risk management. Management of information in agriculture and services.

Teaching and assessment:
Teaching is by lecture and lectures provide the necessary knowledge for the seminar sessions. Multimedia and appropriate software products are used to illustrate the material covered. The exam comprises answers to two theoretical questions and one problem from the seminars in writing and an oral discussion with the examiner.

3459 Viticulture

ECTS credits: 6 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Senior Research Associate Ivan Dimitrov Todorov, PhD, tel.: 082/ 456923
2. Senior Research Associate Ivan Lazarov, PhD, SA for Approbation and Seed Control, tel.: 02/ 703493

Abstract:
The course is meant to provide basic knowledge and skills in viticulture, methods of vine-growing and sort varieties. Teaching and learning draw upon previous knowledge of plant-growing, general agriculture, fruit-growing and plant protection.

Course content:
Subject matter and main concepts. Origin and biological characteristics of the vine. Main factors for the growth and development of vines. Distribution. How to choose the best place and till the land for a new vine stand. Engineering equipment of the land. Production of planting material. Technologies of growing vine stands.

Teaching and assessment:
Lectures present the most essential methods of viticulture. Students acquire some practical skills at lab sessions which include both individual and team work. Marks are based on students' performance at lectures and laboratory sessions as well as at the semester exam.

3457 Plant-growing II

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Kolyu Atanassov Vassilev, DSc, tel. 888-442
2. Assoc. Prof. Georgi Velikov Mitev, PhD, Dept. AM, tel.: 888-610, e-mail: gmitev@ru.acad.bg

Abstract:
The course provides fundamental understanding of the agricultural significance, distribution, ecological and biological characteristics, regional characteristics, cultivation of the main economically significant green crop and grain fodder. Botany, Soil Science, Agro-chemistry, Plant Physiology and Biochemistry, Agro-meteorology, Agricultural Mechanization, Plant-growing are a prerequisite for this particular course, which is also connected with all the other crop growing subjects.

Course content:
Subject matter. Fodder production – present state. Annual fodder plants (leguminous, cereal plants and mixed type). Perennial fodder plants. Seed production methodology. Natural meadows and pasture-grounds. Classification. Utilization of meadows and pasture-grounds. Technology and machines in fodder production.

Teaching and assessment:
Lectures present the main methodological issues of forage production and they usually precede the laboratory sessions. Students prepare in advance for the lab sessions, they work on their own on individual tasks and are supposed to justify their results. Marks are based on students' performance at lectures and lab sessions. Students can use diagrams, tables and lists of the main symbols.

3467 Technology of Repair of Agricultural Machinery

ECTS credits: 4 **Weekly classes:** 3lec+0sem+3labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc Prof. Todor Nikolov Delikostov, PhD, Dept. RRCT, tel.: 888-441, e-mail: delikostov@ru.acad.bg
2. Assoc Prof. Daniel Likassa Bekana, PhD, Dept. RRCT, tel.: 888-701, e-mail: dbekana@ru.acad.bg

Abstract:
The course aims at providing engineering graduates with a blend of theoretical knowledge and practical skills in agricultural machinery maintenance. The main principles of machine repair and maintenance are examined as well as the principles of effective repair and maintenance management.

Course content:
Repair technology for agricultural machinery. Technology of disassembling, washing and cleaning processes. Flaw detection and substitution of faulty parts. Technology for assembling of typical joints, units and aggregates. Testing and storage of repaired machinery. Quality and management of machinery repair .

Teaching and assessment:
Teaching is illustrated with diagrams, laboratory models, real machines or separate machine units, modern measuring and diagnostic devices. Visual aids are also used where appropriate. Laboratory sessions are carried out in groups of three to four students.

3468 Diploma Practice

ECTS credits: 4 **Weekly classes:** 0lec+0sem+0labs+30ps+0
Assessment: colloquium **Type of exam: paper**
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors
Abstract:
The aim of the Diloma practice is to familiar students with the basic technologies and to confirm the obtained knowledge, skills and abilities, necessary for their realization into the practice.
Course content:
Understanding and study of the production and technological processes and Agricultural Systems Application.
Teaching and assessment:
Teaching is illustrated with diagrams, text and rteference books, real machines or separate machine units, modern measuring and diagnostic devices.

3469 Diploma Project

ECTS credits: 10 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: diploma defence **Type of exam:** paper and presentation
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors
Abstract:
The aim of the Diloma project is students to solve more complicated problems with scientific or practical direction.
Course content:
The diploma project may be as the product from the course extention or as a new topic. The main objective is to solve problem, to design some new constructions, new technology and etc. Modern computer software should be used.
Teaching and assessment:
Knowledge collected during the study period are used, including reference books, field experiments and observations. Tools and devices for measurements arfe used, too.

UNDERGRADUATE STUDIES IN MANAGEMENT AND SERVICING OF MACHINERY

PROFESSIONAL STANDARDS
OF A BACHELOR IN

MANAGEMENT AND SERVICING OF MACHINERY

DEGREE COURSE: Management and servicing of machinery
Degree: Bachelor
Qualifications: Mechanical Engineer
Duration: 4 years (8 semesters)

Maintenance of machines is one of the ways of managing their life cycle and insuring the corresponding reliability characteristics. For that purpose are required well qualified specialists, who possess skill in the field of diagnostics and reliability for asset management, technology of maintenance, resource utilization and management of maintenance. With the help of modern methods and learning equipment the students will obtain deep preparation combined with two specialized knowledge and skill in:

- Develop and apply technology and equipment for diagnostics, maintenance of asset in transport and agricultural industry. Organization of maintenance and repair firms and service companies for agricultural machinery
- Develop and apply technology and equipment for diagnostics, maintenance of machinery for service industry. Organization of maintenance and repair firms and service companies for agricultural machinery

Those who posses the degree "Engineer - BSc." will have specialized knowledge and skill and can perform engineering and managerial job in:

- Firms, whose activity is related with maintenance of machines and systems in transport, tractors, industrial machine building factories, light and food processing industries.
- Repair firms and repair dealer company and organization and management of trading and maintenance of various machineries.
- Inspectors of technical systems and machineries.
- Diagnostics and maintenance shops for machines and systems.

Engineers from " Management and servicing of machinery" with the suggested qualification will satisfy fully the need inside the country as well as abroad in the European Union as a qualified personnel in the field of Maintenance and reliability of Machinery.

CURRICULUM

of the degree course in

MANAGEMENT AND SERVICING OF MACHINERY

First year

Code	*First semester*	*ECTS*	*Code*	*Second semester*	*ECTS*
0380	Applied Geometry and Engineering Graphics I	5	0002	Informatics II	4
			1610	Training Practice	5
0381	Technological Training Practice	3	2068	Mathematics II	6
0410	Chemistry	4	2069	Physics	6
1024	Mathematics I	5	2070	Applied Geometry and Engineering Graphics II	4
1038	Informatics I	5			
2073	Material Science	4	2071	Mechanics I	5
	Elective courses - students elect a course				
0983	English	4			
0383	German	4			
0843	French	4			
0950	Russian	4			
	Total:	***30***		***Total:***	***30***

Second year

Code	*Third semester*	*ECTS*	*Code*	*Fourth semester*	*ECTS*
2402	Strength of Materials I	5	0067	Repairing of Agricultural Machinery - Training Practice	2
2529	Fluid Mechanics	6			
2530	Electrical and Electronic Engineering	6	0077	Practical Utilization of Agricultural Machinery Units	2
2531	Mechanics II	4			
2532	Technology of Materials	5	2430	Theory of Mechanisms and Machines	3
3268	Mathematics III	4	2443	Theory of Mechanisms and Machines – course project	2
			2543	Machine Elements I	6
			2544	Strength of Materials II	4
			2546	Heat Technology	5
			2555	Technology of Engineering	6
	Total:	***30***		***Total:***	***30***

Third year

Code	*Fifth semester*	*ECTS*	*Code*	*Sixth semester*	*ECTS*
2453	Machine Elements – Course Project	2	0079	Hoisting and hauling and manipulation techniques	4
2454	Metrology and Measuring Equipment	5			
0003	Fundamentals of Management	5	0081	Hydro- and pneumo machines in agriculture	5
0004	Internal Combustion Engines	4			
2561	Machine Elements II	3	0082	Statistical methods for machinery maintenance	5
	Elective groups - students elect a group		0094	Basics of the machines supporting	4
	Group A		0102	Basics of the machines supporting - classes project	2
0020	Agricultural production machines	6		***Elective groups - students elect a group***	
0022	Electronic systems in agricultural machinery	5		***Group A***	
	Group B		0111	Automobiles and Agricultural Tractors	5
0024	Machines for agriculture products processing	6	0110	Machines for guardianship and reclaiming an agrarian product	5
0073	Electronic systems in production equipment	5		***Group B***	
			0113	Power Grid Systems	5
			0114	Transport Technics	5
	Total:	***30***		***Total:***	***30***

Fourth year

Code	*Seventh semester*	*ECTS*	*Code*	*Eighth semester*	*ECTS*
3280	Technical Safety	3	0139	Organization and Management of Maintenance	3
0116	Product Recovery in Asset Maintenance and Remanufacturing	4	0164	Information and communication systems for machine maintenance	2
0117	Product Recovery in Asset Maintenance and Remanufacturing - Couece Project	2	0162	Exploitation materials	3
			0144	Economics of maintenance and repair	3
0118	Diagnostics and Monitoring of Agricultural Machinery	6	0206	Diploma practice	4
0119	Reliability of Agricultural Machinery	4	0208	Diploma project	10
0120	Repair-Technological Processes	5		***Elective groups - students elect a group***	
	Elective groups - students elect a group			***Group A***	
	Group A		0170	Technical servicing of machines	3
0121	Machines for the animal husbandry	3	0173	Resource Insurance at Maintenance of Agricultural Technique	2
0122	Assets for Continuing the Agrarian Proficiency	3		***Group B***	
	Group B		0179	Technical servicing of the engineering fitting	3
0137	A production rig	3			
0138	Meanses for holding a technological fitting	3	0203	Maintenance recourse management	2
	Total:	***30***		***Total:***	***30***

Total for the training course: 240 ECTS credits

1024 Mathematics I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department AG, Faculty of Natural Science and Education
Lecturers:
1. Assoc. Prof. Docho Trifonov Dochev, PhD, Dept. AG, tel.: 888-489
2. Assoc. Prof. Stoycho Dimitrov Dimitrov, PhD, Dept. AG, tel.: 888-453

Abstract:
The course is a basic one in engineering education. It uses the mathematical knowledge from secondary school and extends it on a higher level. It is essential for the next mathematical subjects, Physics, Mechanics, general and special engineering courses.

Course content:
Complex numbers and polynomials. Systems of linear equations and determinants. Matrix calculus. Line in plane. Lines and planes in space - forms of determining and common positions. Linear space and linear operators. Second order curves and surfaces. Functions and sequences. Limits and derivatives. Basic theorems of differential calculus. Applications of derivatives for investigating functions. Indefinite integral – definitions and basic properties; methods for calculation - integration by parts, integration by substitution, integration of rational, irrational and transcendental functions.

Teaching and assessment:
The theoretical basis of the topics presented at lectures is acquired at seminars through solving problems; individual practicing and reinforcing is accomplished by weekly assignments. Three written tests are administered and students with grades above 4.50 are exempt from an exam and their mark is formed on the basis of an interview with the lecturer. Students are given six problems at the exam and they have to solve at least three to pass.
Each student is required a course assignment. Its successful presentation at seminars and a regular class attendance are a necessary prerequisite to have a term validated.

1038 Informatics I

ECTS credits: 5 **Weekly classes:** 1lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** test
Departments involved: Department IIT, Faculty of Natural Science and Education
Lecturers:
1. Assoc. Prof. Margarita Stefanova Teodosieva, PhD, Dept. IIT, tel: 888-464, e-mail: mst@ami.ru.acad.bg
2. Principal Assistant Marko Toshev Markov, Dept. of IIT, tel.: 888-754, e-mail: markov@ami.ru.acad.bg

Abstract:
The subject is aimed at introducing students to the computer and its components as a technical aid and to the most widely spread programme products - operating systems, word processing systems, systems for processing information in spreadsheets, data bases, information systems, artificial intellect systems, computer graphics systems, data base management systems. The aim of the practical classes is to provide students with knowledge on the use of the most widely spread application programme systems – Windows, Word, Excel.

Course content:
History and classification of computers. Hardware. Operating systems. Application software. Word processing systems. Spreadsheets. Data bases: relation data base, data base management systems, data exchange and computer networks.

Teaching and assessment:
Lectures are carried out in blocks of two periods every other week. Practical classes are carried out in computer laboratories and represent practice under the guidance of a lecturer. At the beginning of the class ten minutes are allotted for the control of the students' knowledge: by a test, short written or oral testing. Students' practical knowledge for work with the studied programme product is controlled and assessed at the end of each part of the course. The course assignments require from students to show they are able to work individually with the studied at the laboratory classes programme systems. They are also assessed. At the end of the semester students' theoretical competence is controlled by a test, including 100 questions, covering the whole studied material.
The term mark is formed on the basis of the results from the main test, the grade for the performance at the practical classes and the course assignments average grade.

0410 Chemistry

ECTS credits: 4 **Weekly classes:** 2lec+0sem+1labs+0p+p
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Dimitar Jordanov Pavlov, PhD, Dept. RRCT, tel.: 888-733, e-mail: chimia@ru.acad.bg
Abstract:
The subject helps students obtain particular knowledge on the structure of substances, chemical phenomena and processes, directly connected with engineering. Laboratory exercises simulate these processes and show the way for their use or avoiding in engineering practice. The course achieves leveling of the students' previous knowledge on chemistry and provides necessary knowledge and skills for the next courses of Physics, Materials and Manufacturing Engineering, Strenght of Materials, etc.
Course content:
Structure of substances. Kinetics of chemical processes. Chemical equilibrium. Chemical thermodynamics. Metals and alloys. Electrochemical processes. Dispersions. Surface phenomena. Review and classification of the main groups of organic compounds used in engineering practice. Isomerism of the organic compounds and its influence on their properties.
Teaching and assessment:
Laboratory classes provide students with the opportunity to receive visual notion about important theoretical issues, such as: chemical properties of metals and alloys, the work of electric cells, electrolysis, surface phenomena, etc. There is a test control on basic topics at the beginning of each class, which could be either written or oral, with duration of about 15 minutes.

0380 Applied Geometry and Engineering Graphics I

ECTS credits: 5 **Weekly classes:** 1lec+0sem+0labs+2p+cw
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EG, Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Nikola Stoyanov Nikolov,PhD, Dept. EG, tel.: 888-491
Abstract:
The subject introduces students to the methods and means of presentation of three-dimensional objects by plane images and to the ways of analysis, transformation and optimization of graphic images. A necessary precondition is basic knowledge on geometry and technical drawing. It develops students' steric imagination, as well as skills to cope with graphic and technical information. This subject is a base for further learning of other technical branches of science.
Course content:
Types of projection. Complex drawing. Reciprocal position of principal geometric objects. Transformation of a complex drawing. Methods for projection. Reciprocal crossing of geometric objects. Images in drawings. Axonometric projection.
Teaching and assessment:
The theory, presented at lectures by didactic means, provides the needed base for practical classes and course assignments. During the practical classes problems are solved, instructions are given, examples are considered. Students are required to do a course assignment, which represents a number of plans with different images of steric objects.
The final course mark is formed on the basis of the grades of two tests and the course assignment results. The requirements to have a term validated are regular class attendance and course assignment submission.

2073 Material Science

ECTS credits: 4 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department MME, Faculty of Mechanical and Manufacturing Engineering
Lecturers:
1. Prof. Mitjo Jordanov Kanev, MSc(Eng), PhD, Dept. MME, tel.: 888-688, e-mail: kanev@ru.acad.bg
2. Prof. Rusko Ivanov Shishkov, MSc(Eng), PhD, Dept. MME, tel.: 888-204, e-mail: rish@ru.acad.bg

Abstract:
This subject studies the composition, structure and property connections in materials, which are used both in techniques and daily life, as well as the opportunities, granted to change and redirect these properties in a certain way. Basic knowledge on physics and chemistry is needed. Students acquire useful knowledge and experience, which can be applied in other subjects having in common with material processing or new product construction.

Course content:
Main notions on the structure and properties of metal, dielectrical and semiconductor crystal materials. Structure analyzing methods. One-, two-, and multi-component systems. Balance equilibrium diagrams of conditions. Regularity of crystallization and transformations in hard condition – mechanisms and kinetics. Metastable conditions. Iron, steel and cast iron, copper, titanium, aluminum and their alloys. Other kinds of metal material. Ceramics and metal ceramics. Polymeride materials. Composition materials.

Teaching and assessment:
Theoretical knowledge taught at lectures is assimilated, specified and improved during the laboratory classes. They concern mainly the material structure and the thermal methods of its change. Three tests are appointed during the semester. The test results are reflected in the exam's assessment.

0381 Technological Training Practice

ECTS credits: 3 **Weekly classes:** 1lec+0sem+0labs+3ps+0
Assessment: oral exam **Type of exam: practical and discussion**
Departments involved: Department MME, Faculty of Mechanical and Manufacturing Engineering
Lecturers:
Prof. Georgi Stefanov Popov, MSc(Eng), PhD, Dept. MME, tel.: 888-314, e-mail: gpopov@ru.acad.bg

Abstract:
The subject provides preliminary knowledge and practical skills on the main working processes in the mechanical-engineering manufacture, machine equipment and tool facilities in the manufacture organization. The acquired knowledge and skills serve as basis for learning the general and specific subjects and the active educational forms connected with them.

Course content:
The subject is not concerned with lectures. The seminar classes include the main practically oriented data about the separate technological processes and operations from metal and mechanical engineering technologies (metal casting, welding, plastic deforming, cutting, metal cutting machines and instruments). The practical classes are connected with performing of manual and machine molding operations, manual electric arc welding and cutting, open manual and machine forging, universal lathe work, drilling, crosswise-grating machine work, milling and performing of manual locksmith (fitter) operations.

Teaching and assessment:
The practical exercises are held in the learning work-department, where the working places are prepared in advance. Students are divided in-groups, each of which uses a separate working place. Control is carried out through an oral exam. A certain practical assignment is carried out, as well as short discussion of a theoretical issue.

0383 English, 0843 German, 0950 French, 0983 Russian

ECTS credits: 4 **Weekly classes:** 0lec+0sem+0labs+4ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department FL, Faculty of Law Studies
Lecturers:
English: 1. Sr Lecturer Iliyana Gancheva Benina, Dept. FL, e-mail: Ibenina@ru.acad.bg
2. Sr Lecturer Tsvetelina Andreeva Nedelcheva, Dept. FL, e-mail: tsandreeva@ru.acad.bg
German: 1. Sr Lecturer Tinka Angelova Karaivanova, Dept. FL, e-mail: tkaraivanova@ru.acad.bg
French: 1. Sr Lecturer Roumyana Ivanova Milanova, Dept. FL, e-mail: rmivanova@ru.acad.bg
Russian: 1. Sr Lecturer Iliyana Gancheva Benina, Dept. FL, e-mail: Ibenina@ru.acad.bg
Abstract:
The foreign language module is aimed at achieving communicative competence in the area of the subject specialism and the future job. The teaching objectives comprise the development of reading comprehension skills to handle specialist texts and the acquisition of communication skills to interact successfully in professional settings and everyday situations.
Course content:
Meeting people. Talking about the present and the past. Plans. Describing objects and places. Comparing things. Searching for information in catalogues. Linking facts and ideas. Applying for a job.
Teaching and assessment:
To acquire the necessary language knowledge and to develop skills in using the language as a means of communication a wide range of authentic and specially constructed texts (i. e. articles, diagrams and tables, brochures and catalogues etc.) as well as audio and video materials are used. In class students participate in role plays, pair and group activities and discussions. Continuous assessment involves at least two written tests and oral testing as well.

2071 Mechanics I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineering
Lecturers:
1. Assoc. Prof. Georgi Konstantinov Gabrovski, MSc, PhD, Dept. TM, e-mail: ggabrovski@ru.acad.bg
2. Assoc. Prof. Venko Georgiev Vitliemov, MSc, PhD, Dept TM, tel.: 888-572, e-mail: venvit@ru.acad.bg
Abstract:
The students are acquainted with the methods for investigation of various kinds of rigid body motion, for different force transformations, and for investigation of the mechanical interaction in rigid bodies in equilibrium. The subject provides a basis for modeling of structures, mechanisms, dynamic processes and gives engineering methods for practical problem solution. Preliminary knowledge in Mathematics and Physics is necessary for this course. The discipline is fundamental for the engineering courses about analysis and design of mechanical structures and machines.
Course content:
Particle kinematics. Translational, rotational, and plane rigid body motion. Relative motion of a particle. Equilibrium of a rigid body. Reduction of a system of forces. Equilibrium of a multi-body system. Equilibrium in presence of friction. Gravity center.
Teaching and assessment:
The theoretical basis of the topics is elucidated in lectures and it is illustrated by examples. The students solve problems in practical classes. They apply the learned methods in their course work, which is assigned individually to each student. The course work is controlled and graded by means of a grading system and it is submitted according to a schedule. The students can participate voluntary in two tests to gain higher grade. If a student has higher than 50% of the maximum grade, he or she can get the final grade and can get rid of the exam. The exam consists of 4 questions and 4 problems. The gained grade in the semester is accounted for in the final grade. Regular attendance of classes and course work submission are required for semester passing approval.

2068 Mathematics II

ECTS credits: 6 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department MA, Faculty of Natural Science and Education
Lecturers:
Prof. Stepan Agop Tersian, D Maths, Dept. MA, tel.: 888-226, 888-587
Abstract:
The subject acquaints students with basic notions of mathematical analysis, necessary for further study of Mathematics Part III, Applied Mathematics, theoretical basis of Electrical Engineering, Mechanics, etc.
Course content:
Basic topics: Functions of more than one variable; Differential geometry in plane and space; Ordinary differential equations; Multiple integrals; Field theory; Numerical and functional series.
Teaching and assessment:
At lectures students are introduced to main theoretical issues, logically presented and provided with appropriate examples. The theoretical basis of the topics presented at lectures is acquired at seminars through solving problems, having theoretical and application character. Three written tests are administered during the term. The final control is carried out by a written exam consisting of solving problems and answering theoretical questions. During the term consultations are held - two classes per week. The requirement to have a term validated is regular seminar attendance.

0002 Informatics II

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+1ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department IIT, Faculty of Natural Science and Education
Lecturers:
1. Assoc. Prof. Margarita Stefanova Teodosieva, PhD, Dept. IIT, tel: 888-464, e-mail: mst@ami.ru.acad.bg
2. Principal Assistant Marko Toshev Markov, Dept. IIT, tel.: 888-754, e-mail: markov@ami.ru.acad.bg
Abstract:
Students are introduced to one programming language. They work out elementary algorithms, which are aimed at the development of their logic thinking. The topics of lectures present main algorithm structures – branch, cyclic recurrence, multiple choices. Various types of data are analyzed: scalar data, structured data. The problems solved find application in engineering practice. At practical classes programmes are input and executed.
Course content:
Algorithms: main notions. Branch algorithms. Cycle algorithms. One dimension arrays of algorithms. Two dimension arrays of algorithms. Structure of a Pascal programme. Types of data in Pascal. Data input and output. Branch statement, multiple choice statements. Cycle statements. Types of arrays, work with arrays. Procedures and functions. Strings. Records. Files. Text files.
Teaching and assessment:
Lectures are carried out in blocks of two periods per week.
The classes are practical ones with duration of two periods every other week. At the beginning of the class the assistant-professor first explains the issues which students haven't been able to understand. Then they solve problems on algorithm compiling and write programmes. At the end of the class a short test is carried out.

2069 Physics

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** written and oral
Departments involved: Dept. of Physics, Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
1. Assoc.Prof. Nadezda Marinova Nancheva, PhD, Dept. of Physics, e-mail: nancheva@ru.acad.bg
2. Assoc.Prof. Parvoleta Ivanova Docheva, PhD, Dept. of Physics, e-mail: docheva@ru.acad.bg

Abstract:
The course aims at acquainting the students with the physical character of processes and phenomena in nature and the methods for their investigation, with the general properties of matter and the material objects. The laboratory exercises aim at creating skills for experimental investigation of physical phenomena and solving of physical problems.

Course content:
Measuring physical quantities. Kinematics and dynamics of material point and rigid body. Interaction in nature. Work and energy. Mechanical preservation laws. Special theory of relativity. Molecular physics and thermodynamics. Transformation phenomena. Periodic processes and waves. Electric field and electric current. Magnetic field and electro-magnetic induction. Optical phenomena. Atoms, atom nuclei. Elementary particles.
Contemporary investigation theories and methods in physics and practical applications of the physical effects and phenomena are accented.

Teaching and assessment:
Lectures give the main theoretical material, supported by some demonstrations of physical phenomena and processes. At the laboratory classes the students work independently and investigate particular physical phenomena.
The knowledge of lecture material and laboratory classes is tested regularly. If the results of this assessment are good, the students are allowed to the exam. The final assessment is formed after a discussion with the student.
At the exam the students answer two theoretic questions and do a laboratory exercise.

2070 Applied Geometry and Engineering Graphics II

ECTS credits: 4 **Weekly classes:** 1lec+0sem+0labs+2ps+cw
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EG, Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Nikola Stoyanov Nikolov, PhD, Dept. EG, tel.: 888-491

Abstract:
The subject analyzes the rules for doing and making out plans, schemes and technical text documents; norms and instructions of Bulgarian and international standards considering drawing up technical documents. It develops students' steric imagination and their skills to cope with technical documents. This subject is a base of further learning of other technical branches of science and doing course projects and a diploma paper.

Course content:
Different connections: threaded, key, spline and permanent connections. Drawing of a machinery piece – content, composition, images, dimensions, tolerance of dimensions, method of indicating surface texture, text information. Special documentation of some technical products. Drawings of assembled units. Item list. Text documents. Schemes. Building drawings.

Teaching and assessment:
The theory, presented at lectures by didactic means, provides the needed base for practical classes and course assignments. During practical classes problems are solved, instructions are given, examples are considered. Students are required to do a course assignment, which represents a number of plans with different images of steric objects.
The final course mark is formed on the basis of the grades of two tests and the course assignment results. The requirements to have a term validated are regular lectures and classes attendance and course assignment submission.

1610 Training Practice

ECTS credits: 5 **Weekly classes:** 0lec+0sem+0labs+6ps+0
Assessment: colloquium **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Hristo Ivanov Beloev, PhD, Dept. AM, tel.: 888-553, e-mail hbeloev@ru.acad.bg
2. Senior Assis. Jordan Ivanov Josifov, MEng, Dept. AM, tel.: 888-484, e-mail jjosifov@ru.acad.bg
3. Senior Assis. Kiril Iliev Hadjiev, MEng, Dept. ICE, FTE, tel.: 888-332, e-mail: khadjiev@ru.acad.bg
4. Assis. Georgi Penchev Kadikianov, MEng, Dept. TAFLT, FTE, tel.: 888-526, e-mail: kadikqyanov.abv.bg

Abstract:
The course aims to introduce students to: general structure of: machinery for soil-cultivating and growing crops, machinery for harvesting in livestock and machinery, with the classification, the overall structure of tractors and cars and drive operation and regulation of their mechanisms and systems, operating principles of petrol, diesel and gas engines for tractors and their structure and diversity.

Course content:
Machines for primary and further processing of soil. Machines for sowing and fertilizing. Machines for harvesting cereals. Machines for cleaning livestock and poultry facilities. Milking machines and equipment for primary processing of milk. Introduction to drive the tractor and car. Transmission of tractors and automobiles. Stockyard system of the tractor and car. Management System tractors and automobiles. Braking system on the tractor and car. Additional drives and operating equipment of tractors and automobiles. General structure and working principle of internal combustion engines. Gas distribution mechanism. Cooling system. Lubricating system. Fuel system. Ignition system. Starting systems. Electrical equipment of the vehicle.

Teaching and assessment:
In the classes are used: posters, slides, transparencies and videos, then they consider those machines in laboratories. After each cycle testing is conducted on the basis of which the outcome is based on colloquim.

2530 Electrical and Electronic Engineering

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** oral
Departments involved: Dept. TEEEM, Faculty of Electrical and Electronic Engineering, and Automation
Lecturers:
1. Assoc. Prof. Georgy Rashkov Georgiev, PhD, Dept. TEEEM, e-mail: grashkov@ru.acad.bg
2. Assoc. Prof. Svilena Vasileva Todorova, PhD, Dept. TEEEM, tel.: 888-224, e-mail: svito@ru.acad.bg
3. Assoc. Prof. Venelin Iliev Iakov, PhD, Dept. TEEEM, tel.: 888-269
4. Principal Assistant Docho Rusev Ivanov, Dept. TEEEM, tel.: 888-501

Abstract:
The subject of Electrical and Electronic Engineering is a part of the curriculum for the bachelor degree of non-electrical degree-courses. The aim of the course is to introduce students to main theoretical issues in the fields of Main Laws of the Theoretical Electrical Engineering, Electrical Measurement, of Electrical and Non-electrical Quantities, DC and AC Electrical Machines, Electronic semiconductors and schemes. Preliminary knowledge in Physics and Mathematics is necessary. The knowledge on Electrical and Electronic Engineering is used in the next courses and when preparing the graduation work.

Course content:
Basic elements and magnitudes of electrical circuits: DC and AC, three-phase and magnetic circuits, electrical measurements of electrical and non-electrical quantities, DC machines, transformers, synchronous and induction AC machines. Main electronic devices: diodes, thyristors, transistors and operational amplifiers. Amplifiers. Digital networks.

Teaching and assessment:
The teaching process is organized in lectures and laboratory classes. At laboratory classes students obtain practical knowledge. There is a test control on basic topics at the beginning of each class, which could be either written or oral, having 15 minutes duration. The test control results purpose is to help the exam performance.

2402 Strength of Materials I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+cw
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1. Assoc. Prof. Ivelin Ivanov, PhD, Dept. TM, tel.: 888-472, e-mail: ivivanov@ru.acad.bg
2. Assoc. Prof. Nedka Stancheva, PhD, Dept. TM, tel.: 888-474, e-mail: nedka@ru.acad.bg

Abstract:
The subject provides students with a system of knowledge about the methods to assess by calculations the advisability, reliability, and effectiveness of the shapes and dimensions of structural elements. Preliminary knowledge in basic Mechanics (Statics) and Mathematics are necessary. The subject is a fundamental for the further studies in other subjects of the methods for design and concrete mechanical engineering objects.

Course content:
Introduction. Basic terms and principles, stress, deflections, strain. Internal forces in trusses. Tension and compression. Testing of materials, basic mechanical properties. Shear and crushing. Torsion of circular and noncircular bars. Moments of area of cross sections. Plane bending and 3D bending, deflections in bending, deflected axis of a beam. Non-axial tension and compression. Buckling of struts.

Teaching and assessment:
The theoretical basis of the topics, presented in the lectures, is applied by the students in the exercises by solving problems for training. The students work out an individually assigned complex course assignment, which is graded on two-week schedule. The students participate in three tests, which are graded. The final grade is accumulated from the grade of the tests and from the grade of the course work defence. Regular attendance of classes and course work submission are the requirements for semester passing approval.

2531 Mechanics II

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+1ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
Assoc. Prof. Stoyan Stoyanov, PhD, Dept TM, tel. 888-572, e-mail: sgstoyanov@ru.acad.bg

Abstract:
Systematic knowledge of the methods and the ability to investigate the mechanical interaction and the motion of rigid bodies as well as dynamic processes in mechanical multi-body systems are built up in this subject. The aim of the course is that the students learn how to build up dynamic models of mechanical systems in order to solve practical engineering problems. Preliminary basic knowledge in Mathematics and Mechanics I is necessary. The course gives the basis of knowledge for the following disciplines as Strength of Materials, Applied Mechanics, Machine Elements, Lifting and Transportation Machinery.

Course content:
Newton’s law. Basic problems of the particle dynamics. D’Alembert’s principle. Linear oscillation of a particle. Relative motion dynamics of a particle. Dynamic characteristics of a particle and of a multi-body system. Theorems of the dynamics. Mass inertia moments and centrifugal inertia moments. Kinetostatics. Dynamics of a body in translational, rotational, and plane motion. Impact theory.

Teaching and assessment:
The theoretical basis and the methods of dynamics are explained in the lectures and modelling problems are solved. The students solve problems in the practical classes. There is a complex course work problem individually assigned to each student. The course work is scheduled for assessment, which is based on a specific grading system. The students can participate in up to 2 written tests included in the grading system. If at the end of the semester, the students have higher than the average graded they can get this grade as a final and miss the exam. The exam consists of solving problems and short theoretical questions. The semester grade is accounted for in the final grade. Regular attendance at practical classes and accepted course work are required for semester passing approval.

2529 Fluid Mechanics

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Ivanka Mitkova Jeleva, PhD, Dept. HTHPM, tel.: 888-582
Abstract:
The subject introduces students to the main relationships and physical treatment of the phenomena analyzed in hydrostatics, kinematics and fluid dynamics from the perspective of their application in engineering practice. Basic knowledge on Mathematics, Physics, Theoretical Mechanics is a prerequisite for the acquiring of Fluid Mechanics and it in its turn is a prerequisite for the acquiring of hydraulic and pneumatic machines and drives, agricultural machines, internal combustion engines, etc.
Course content:
Main properties of fluids. Equilibrium of fluids. Kinematics and dynamics of ideal and real fluids. Hydraulic resistances and calculation of pipelines and channels. Resistance of streamlined bodies and wings. Liquid leakage from openings, end-pieces, jets.
Teaching and assessment:
The topics of the lectures provide students with the opportunity to get acquainted with main laws of fluid mechanics preceding laboratory exercises, during which the obtained knowledge is consolidated and its practical application is clarified. For each laboratory class students work out a written statement. The exam starts with a written working out of two questions from the course syllabus and a practical task solving, followed by an oral testing. Students work out a course assignment by stages, consisting of solving particular tasks from the studied material. The requirement to have a term validated is submission of the course assignment and the written statements from the laboratory classes. The exam is in written form, including short answers to theoretical questions and a solution of a certain number of problems.

3268 Mathematics III

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Ljuben Georgiev Valkov, PhD, Dept. NMS, tel.:888 466, e-mail: vulkov@ami.ru.acad.bg
2. Principal Assistant Violetka Atanassova Kostova, Dept. NMS, tel.:888 466, e-mail: leta@nami.ru.acad.bg
Abstract:
The discipline is aimed at providing students with skills for processing data, obtained from experiments in the field of engineering, which requires the use of:

- Relativity theory mathematical apparatus
- Mathematical statistics methods for experimental data processing
- Methods for planning an experiment

Course content:
The course includes elements from: relativity theory, mathematical statistics, regression and correlation analysis, linear algebra numerical methods and mathematical analysis.
Teaching and assessment:
The training process is organized in lectures, seminars and practical classes. At lectures theoretical issues are presented and illustrated with appropriate exemplary problems, connected with students' degree course. At seminars students solve problems, connected with engineering practice and requiring the application of the theory of relativity mathematical apparatus, as well as mathematical statistics.
Each student is required to do an individual course assignment.
The final course mark is formed on the basis of the following formula:
Final course mark= 2/3 the grade of the test + 1/3 the grade of the course assignment.

2532 Technology of Materials

ECTS credits: 5 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department MME, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1. Assoc. Prof. Georgi Ivanov Nikolov,MSc(Eng),PhD,Dept.MME, tel.: 888-311, 888-210
2. Assoc. Prof. Mladen Tzvetanov Trifonov, PhD,Dept. MME, tel.: 888-206, E-mail: mtr@ru.acad.bg

Abstract:
The subject aims at supplying knowledge and skills on the fundamentals of the following technological processes – casting plastic deformation and welding as well as the fields of their application where machine manufacturing and some non-machine manufacturing materials and goods are processed. Some general knowledge on physics, chemistry and strength of materials is a necessary prerequisite for studying this subject. It is basic for studying other subjects in the field of mechanical engineering technologies.

Course content:
Main principles of the casting technology – a process diagram, working out of a casting form, casting of metal materials, special methods for getting mouldings. Main principles of the plastic deformation technology – a process diagram methods of volume and sheet deformation, special deformation methods, plastic deformation of metal materials. Main principles of welding technology – a process diagram methods of welding through melting and pressure special welding methods, thermal cutting, welding of metal materials. Fundamentals of other materials' processing: plastic and metal-ceramic materials.

Teaching and assessment:
Training is carried out through lectures and laboratory classes. Three tests are scheduled during the lectures. The final exam includes three written issues with an oral discussion. Final assessment is worked out on the basis of the tests and exam results.

2543 Machine Elements I

ECTS credits: 6 **Weekly classes:** 2lec+0sem+1labs+1ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department MSME, Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Petar Jivkov Stamatov, PhD, Department MSME, tel.: 888-592, e-mail: stamatov@.ru.acad.bg

Abstract:
The discipline performs the role of a linking unit between a number of general-theoretical subjects / Mechanics, Strength of Materials, Theory of Machines and Mechanisms, Applied Geometry and Engineering Graphics, Materials and Manufacturing Engineering, Metrology and Measuring Equipment, etc./ and some engineering courses, included in the main module. The course introduces students to the theoretical fundamentals of general-purpose machine elements and to the methods for their calculation and construction.

Course content:
Volumetric and surface strength of machine elements. Fatigue limit. Types of joints: threaded, riveted, welded, key, clamp joints. Rotary motion elements: axes, shafts, friction and anti-friction bearings, controlled, uncontrolled and automatic couplings.

Teaching and assessment:
Lectures are presented to all groups of students of the degree course at one and the same time. Students' current work on the lectured material is controlled trough two tests during the semester. Practical classes are carried out in a computer laboratory equipped with 12 modern computers. Students have a wide variety of didactic materials at their disposal: charts, a rich collection of standards and catalogues, samples of machine elements, slide and over-head projectors. Laboratory classes demonstrate visually a number of theoretical issues, already presented at the lectures. There is a test control on basic topics at the beginning of each laboratory class and the results, processed on a computer, are presented in standard report forms. Students are required to do two individual course assignments during the semester: one on a screw-jack design and another one – on a friction clutch design. The course assignments are supervised at weekly consultations, controlling the accomplishment of the graphic and calculation parts. Students defend both course assignments. The total continuous assessment mark on Machine Elements I is formed on the basis of the tests and course assignments results.

2544 Strength of Materials II

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+1ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1. Assoc. Prof. Ivelin Ivanov, MSc(Eng), PhD, Dept. TM, tel.: 888-472, e-mail: ivivanov@ru.acad.bg
2. Assoc. Prof. Nedka Stancheva, MSc(Eng), PhD, Dept. TM, tel.: 888-474, e-mail: nedka@ru.acad.bg

Abstract:
The subject provides students with a system of knowledge about the methods to assess by calculations the advisability, reliability, and effectiveness of the shapes, dimensions, and the material of structural elements. Preliminary knowledge in basic Mechanics and Mathematics are necessary. The discipline is fundamental for other educational courses for design of specific machines.

Course content:
Introduction in theory of stress and strain. Failure criteria. Energy methods (Castegliano's theorem) for deflection calculation in trusses. Statically indeterminate systems. Unit force method. Dynamic loading. Buckling of struts. Thick tubes and high-velocity rotating disks.

Teaching and assessment:
The theoretical basis of the topics, presented in the lectures, is applied by the students in the practical classes by solving problems for training. Some problems are well illustrated in the laboratory exercises. The students work out an individually assigned complex course work, which is graded on two-week schedule. The students can voluntarily participate in three tests and the gained grade, if it is above 50% of the maximum, leads to final grade, so the student is granted the right to miss the exam. The exam consists of two problems and three questions. The semester grade is accounted for in the final grade of the exam. Regular attendance of classes and course work submission are the requirements for semester passing approval.

2430 Theory of Mechanisms and Machines

ECTS credits: 3 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department TMM and HHMT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Atanasov Koev, PhD, Dept. TMM and HHMT, tel.: 888-486, E-mail: pkoev@ru.acad.bg

Abstract:
This subject introduces the students from this department to the methods of investigation (analysis) and projecting (synthesis) of machines and mechanisms according to structural, geometrical and dynamic indications. The subject forms a basis for mechanism and machine studying with concrete application.

Course content:
Structure and classification of mechanisms. Leverage (linkage), cam mechanism and gear transmission kinematics. Theory of gear trains with involute toothed gears. Kinetostatics of mechanisms. Dynamics of the machine unit (aggregate). Balancing of leverage mechanisms and rotors.

Teaching and assessment:
The essence of the methods of mechanism synthesis – analysis is presented at lectures. Specific problems for mechanism investigation are solved during the practical classes. Overhead projectors, computer simulations for motion passing and transformation, mechanism models in motion (metal, polymethilmethacrylate, paxoline for showing through a projector), as well as real constructions are used for presenting the matter in a real way. Learning assimilation is controlled through tests, assignments and an individual complex course project, which is presented and assessed gradually. Continuous assessment is formed on the basis of the test, the assignments and the course project.

2443 Theory of Mechanisms and Machines – course project

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department TMM and HHMT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.prof. Ognyan Lyubenov Alipiev, Dept. of TMMHHET, tel.: 888-593, e-mail: oalipiev@ru.acad.bg
2. Assoc.prof. Tanya Petkova Grozeva, Dept. of TMMHHET, tel.: 888-258, e-mail: tgrozeva@ru.acad.bg
3. Assoc.prof. Petar Atanasov Koev, Dept. of TMMHHET, tel.: 888-486, e-mail: pkoev@ru.acad.bg
4. Assoc.prof. Dimitar Ivanov Zafirov, Dept. of TMMHHET, tel.: 888-428, e-mail: dzafirov@ru.acad.bg

Abstract:
The goal of the course project is to help students acquire and rationalize the general methods of research (analysis) and design (synthesis) of different types of mechanisms and machines. It aids the students in building practical skills to discover the main features of mechanisms and prepares them for independent solving of specific engineering problems. The project in Theory of Mechanisms and Machines (TMM) is the first stage of machine-building design, connecting the knowledge acquired in a number of general science courses with the course design of real technical objects, studied in specialized courses.

Course content:
A machine unit is designed in which the driving and the operating machines are an electric motor and a flat leverage mechanisms respectively, joined through involution gear. The course project includes the following stages: structural and kinematical analysis of leverage mechanism; kinetostatic investigation of leverage mechanism; optimization geometric synthesis of gear mechanism. It consists of a calculation part, structured as explanatory calculation notes and a graphic part with a specified number of blueprints.

Teaching and assessment:
The course project is developed individually, using detailed methodological guidance and calculation and simulation software developed for this purpose by the Department staff. The work on the separate stages is carried out both at home and in the project lab, equipped with modern computers, multimedia, and a number of models in motion and real constructions of mechanisms. The calculation and graphic part of the project solutions are controlled in stages and evaluated based on their reliability and the way they have been explained, as well as on the analysis of the results obtained.

2546 Heat Technology

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Valentin Vassilev Bobilov, PhD, Dept. HTHPM, tel.: 888-844, e-mail: bobilov@ru.acad.bg

Abstract:
The subject consists of three parts: Technical Thermodynamics, Heat Transfer and Applied Heat Technology. The aim of the course is to provide future specialists with the necessary engineering knowledge on the main laws of thermodynamics and heat transfer and to create practical skills for solving real application technical problems from the areas of drying, refrigerating and heating and ventilation equipment.

Course content:
Main notions: thermodynamic system, heat equilibrium, work and heat of processes. Main laws of ideal gas. State equation. Mixtures of indifferent ideal gases. First law of thermodynamics. Main thermodynamic processes – constant-volume, constant-pressure, constant temperature, adiabatic and polytropic processes. Second law of thermodynamics. Karno's cycling process. Serviceability of thermodynamic systems. Real gasses. Van der Vaals' equation. Water steam and water steam processes. Renkin's cycle. Humid air thermodynamic properties. Leakage of gasses and steam trough a nozzle and a diffuser. Throttling. Cycles of working machines and heat motors. Cycle of a compressor refrigerator machine. Heat conduction – Furie's equation. Radiant heat exchange. Laws of radiant heat exchange. Complex heat exchange and heat transfer. Heat exchanging appliances. Fuels and combustion processes. Steam and water heating boilers. Heat balance and efficiency coefficient. Steam and gas turbines. Heat energy consumption for technological processes, heating, ventilation and air-coditioning. Alternative and secondary energy sources.

Teaching and assessment:
Lectures provide students with theoretical knowledge. A part of the laboratory classes are carried out on laboratory installations, another part – on real industrial objects. For each laboratory class students work out a written statement, including processing and analysis of the experimental data. The assessment is done on the basis of students' performance during the laboratory classes and their written statements. The exam is in written form, followed by an oral testing. The final mark is a complex one, based on the results of the exam and the student's performance at the laboratory classes.

2555 Technology of Engineering

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** written
Departments involved: Department TECM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1. Assoc. Prof. Stefan Vesselinov Vichev, PhD, Dept. TECM, tel.: 888-451, e-mail: svichev@ru.acad.bg
2. Assoc. Prof. Mikhail Kolev Karshakov, PhD, Dept. TECM, tel.: 888-508, e-mail: mkarshakov@ru.acad.bg
Abstract:
The subject provides general knowledge and skills on the methods, instruments and machines for mechanical processing of machine details. It analyzes the design stages of technological processes.
Course content:
General information and theoretical base of the process of cutting metals. Metal cutting machines and instruments. Methods and processes for treatment through shavings removal: turning, scraping, shaping, drilling, reaming, pull-broaching, push-broaching, milling, grinding, carving, gear-tooth milling. Design of technological processes for mechanical processing.
Teaching and assessment:
Students are introduced to main theoretical issues at lectures. The use of the recommended literature and the active participation at laboratory classes are prerequisites for the students' individual work, which is of great importance. The questions of the exam syllabus are divided into three groups according to their difficulty, which is aimed at raising the efficiency of their exam preparation. Depending on which group their knowledge corresponds to, they receive a relevant exam mark

0067 Repairing of Agricultural Machinery – Training Practice

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+2ps+0
Assessment: colloquium **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Plamen Ganchev Kangalov, PhD, Dept. RRCT, tel.: 888-441, e-mail: kangalov@ru.acad.bg
2. Assoc. Prof. Todor Nikolov Delikostov, PhD, Dept. RRCT, tel.: 888-441, e-mail: delikostov@ru.acad.bg
Abstract:
The subject provides preliminary knowledge and skills concerning the operating of the technological equipment, used in machine repairing. It also aims at acquiring certain practical habits in the field of agricultural machinery servicing.
Course content:
Topics are viewed connected with the support of type functions, learning of concrete repairing-restoration processes, concerning bringing back the details' and units' serviceability.
Teaching and assessment:
Practical knowledge is acquired during the laboratory classes, at separate working places. Students are divided into groups and are given the opportunity to participate personally in the carrying out of the technological operations.

0077 Practical Utilization of Agricultural Machinery Units

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+2ps+0
Assessment: colloquium **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Dimitar Petrov Dimov, PhD, Dept. AM, tel.: 888-242
2. Assoc. Prof. Petar Todorov Radulov, PhD, Dept. AM, tel.: 888-242
3. Assoc. Prof. Chavdar Zlatkov Vezirov, PhD, Dept. AM, tel.: 888-442

Abstract:
The subject aims at providing knowledge and possibility for acquiring starting, servicing and ruling tractor abilities, as well as giving information on the rules of agricultural aggregate constitution (forming) and the technological basis for farming cultures growing. The acquiring of practical habits is focused in this programme, which is achieved by means of students' personal participation at different levels.

Course content:
Main rules in safety facilities and fire-protection. Agricultural aggregates classification. Necessity of implementing and contents of the operation for conducting of the monthly technical servicing. Introductory class on crawler tractors. Measuring instruments and controls. Control manipulation. Introductory class on wheel tractors. Preparation rules and starting the driving motor and the engine. Driving a wheel tractor in a straight line and in a complicated contour. Shift of power transmission. Main principles (ways) of constituting agricultural aggregates. Specification and positioning (establishment) of the necessary cross base. Attachment systems and special devices for unitization. Natural unit's composition.

Teaching and assessment:
The practical utilisation on unitization topics is held in groups and working places in a way that allows anyone a maximum of personal participation. As for driving and labour – it is held individually under the guidance of the instructor and his staff.
Student already qualified as "tractor-driver" and "machine-operator" do not need to attend classes.
The final assessment is formed on the basis of the lecturer's grading.

2561 Machine Elements II

ECTS credits: 3 **Weekly classes:** 1lec+0sem+1labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department MSME, Faculty of Transport Engineering
Lecturers:
Assoc.Prof. Petar Jivkov Stamatov,MSc(Eng),PhD,Dept. MSME, tel.: 888-592, e-mail: stamatov@ru.acad.bg

Abstract:
This subject is a linking unit among a number of general theoretic subjects as "Mechanics", "Strength of materials", "Theory of mechanisms and machines" etc. and some technical subjects included in the main course module. The educational course is aimed at studying the theory of the machine elements with a general use and their calculation and construction methods.

Course content:
Mechanical gears. Cylindrical involute tooth gears – geometry kinematics, calculation of contact strength and bending. Planet, wave, conical, screw and worm gears. Reduction gears. Chain and belt gears. Rubbing gears and variable-speed drives.

Teaching and assessment:
Lecture material and the way it is taught is similar to the one described in "Machine elements – part I". The practical classes are taught in groups in a computer room. Students use boards, a set of standards and brochures, model samples, overhead projectors. The laboratory classes are based on various topics. There are tests for incoming and continuous control. The practical results are computer-processed and are singled out in reports. The course project is computer-controlled in consultation classes each week. Issues are individually solved through projecting cylindric, conic, worm and other reduction gears. The total assessment of this subject includes students' work on the course assignment of "Machine elements – part II" and is formed on the basis of a written exam which includes two issues for discussion.

2453 Machine Elements – Course Project

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment: project defence **Type of exam:** oral
Departments involved: Department MSME, Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Petar Jivkov Stamatov, PhD, Dept. of MSME, tel.: 888-592, e-mail: stamatov@ru.acad.bg
Abstract:
The course project aims at acquiring skills at scheme reading, chart drawing of constructions and their loading as well as stabilizing the habits in strength calculation of machine elements, which have been acquired during the course assignment carrying out. The subject is a linking unit between the subject "Engineering graphics" and course projects in the specializing subjects.
Course content:
While developing the course project main issues are explained, connected with the projecting, construction and strength inspection of complex machine elements such as shafts, bearing supports, cylinder, conic and worm tooth transmission.
Teaching and assessment:
The course project is carried as weekly consultations in a computer equipped room. The projecting assignments are individual and various as far as construction and initial parameters are concerned. The project consists of two parts – calculating and graphic. The graphic part includes an assembly drawing, a list of the composition parts and non-standard detail drawings. The calculating part is formed as explanatory.
The project is developed at stages and the lecturer approves each stage.
The defence of the finished work is public. It is assessed and both the result and the course assignment assessments form the final subject assessment.

2454 Metrology and Measuring Equipment

ECTS credits: 6 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department MTM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
Assoc.Prof. Branko Dushkov Sotirov, PhD,Dept. of MTM, tel.: 888-493, e-mail: bsotirov@ru.acad.bg
Abstract:
The subject forms the basis of the fundamental technical preparation in the field of "Agricultural machinery and technologies" and "Automotive machinery and technologies". The main purposes of this subject are: to give basic knowledge about the main notions, principles and rules of measuring and examining equipment control, as well as evaluating measuring precision; to introduce the structure and metrological characteristics of measuring appliances; to elucidate the principles, methods and devices of measuring the main physical quantities – length, angle, mass, temperature, time, pressure etc. to create real practical skills for operating certain measuring appliances.
Course content:
Theoretical basis of metrology. Legislative basis of metrology. Measuring and examining equipment control. Main metrological characteristics of SI. Precision classes of SI. Choice of SI. Primary converters used in SI. Length measuring. Measuring appliance for linear dimensions. Angle measuring. Methods and means for control and measuring of form deviations, natural location and roughness of surfaces and axle. Measurement precision. Noise and vibration measurement. Mass measurement. Time and temperature measurement. Mechanic quantity measurement. Measurement of quantities characterizing substances' composition and qualities.
Teaching and assessment:
The lectures introduce different topics fof discussion. They include main principles, methods and devices for measuring different physical quantities. During the laboratory classes students do the following: diagram, method and device choice for measuring a certain technical details; independent work with universal and specific devices for technical measurement, standard and guide work. The laboratory classes are assessed continuously. Each laboratory class is preceded by report preparation. Final assessment is actually the average of the following: the course assignment assessment; measurement practical knowledge and skills assessment and two test papers. The results from the incoming test control are added to the final assessment too.

0003 Fundamentals of Management

ECTS credits: 5 **Weekly classes:** 3lec+1sem+0labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department BM, Faculty of Business and Management
Lecturers:
1. Assoc. Ppof. Nikolaj Najdenov, PhD, Dept. BM, tel.: 888-520, e-mail: nnaydenov@ecs.ru.acad.bg
2. Sr.Assistant Anton Nedjalkov, Dept. BM, tel.: 888-520, e-mail: apetkov@ecs.ru.acad.bg

Abstract:
The course is aimed at providing students with knowledge of business management and the necessary resources for it in small and medium industrial firms in conditions of market economy. The subject of Economics is a necessary prerequisite for the Fundamentals of Management and it in its turn is a prerequisite for the diploma project.

Course content:
Management: nature and tasks. Managerial decisions. Forms of business organization and a company management structure. Business planning. Capital and capital investments analysis. Company staff management. Technical and material resources management. Information resources of industrial firms management.

Teaching and assessment:
The theoretical basis provided at lectures is acquired at seminars with application of appropriate examples. The topics of the lectures are presented with the help of various visual aids: slide and overhead projectors, multimedia, etc. Management application programmes are used at some of the seminars. The final continuous assessment mark is formed on the basis of the results of two written tests administered during the semester.

0004 Internal Combustion Engines

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department ICM, Faculty of Transport Engineering
Lecturers:
Assoc.Prof. PhD Valentin Dimov Ivanov, Dept. ICM, tel.: 888-373, e-mail: vdivanov@ru.acad.bg

Abstract:
Before the discipline engines analyze the theory, the dynamics, the construction and the characteristics of the engines with a intra-burning with intra-burning himself. In the hypothesis of EIB the processes, the main indices and the components that they determine on them are being viewed. The dynamics and the couples construction-a year are important for specifying the forces, burdening the parts, of the engine from which the lastingness and the operating security depend on the parts and the mechanisms to the engine. The operating indicators to the engine depend in the normal state in the fuel system, the incendiary system. The active, ekologi and economic indicators are being priced to the engine at its characteristics that are being determined proficiently.

Course content:
Fuel and chemical reactions on his burn. Old couple-years cycle-processes of refilling Thicken burn widen and drop out. Fuel gauge Our indices of the engine. Effective indices of the engine. Over-barreling couples Year-ecological indices of the engine. Work manners and characteristics of the engine. Controls and a frequency of rotation. Poising the engines. Blocks, crankcases and цилиндрови heads. Бутална As well Belle Team. Belle val. Газоразпределителен Film advance. А смазочна and refrigerating system. Electrical systems in the cars and a tractors.

Teaching and assessment:
The tuition is taken by lections and laboratorial exercises. During the lections will be taken 4 tests, which are necessary for compliting the current rate of education. If the student rate is over 70, the same will miss the exam. The exam is in written form including 2 question points from lections and one question point from laboratorial exercises. The final rate of education is formed by written exam, current rate of education and project prepared during the term.

0020 Agricultural production machines

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Hristo Ivanov Beloev, PhD, tel.: 888-456, e-mail: hbeloev@ru.acad.bg;
2. Assoc. Prof. Daniel Likasa Bekana, PhD, tel.: 888-701, e-mail: dbekana@ru.acad.bg.

Abstract:
The subjacent “Machinery for agricultural product production” intended to educate students in the field of “Machinery Maintenance and reliability” The aim of this subject is to give students certain scientific and practical knowledge about designing of agricultural machinery. In order to achieve this aim, the teaching material is based on current criteria for machinery exploitation of agricultural machinery, different scientific research results of technological processes are used for designing agricultural machines and optimization of their constriction design. Machinery reliability is also regarded in the process of designing

Course content:
The subjacent “Machinery for agricultural product production” intended to educate students in the field of “Machinery Maintenance and reliability” The aim of this subject is to give students certain scientific and practical knowledge about designing of agricultural machinery. In order to achieve this aim, the teaching material is based on current criteria for machinery exploitation of agricultural machinery, different scientific research results of technological processes are used for designing agricultural machines and optimization of their constriction design. Machinery reliability is also regarded in the process of designing.

Teaching and assessment:
The learning involves lections and laboratory exercises. The exam is in a written form that includes 2 question points from lections and one question point from laboratorial exercises.

0022 Electronic systems in agricultural machinery

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Miroslav Dimitrov Mihaylov, PhD, Dept. AM, tel.: 888-324, e-mail: mmihaylov@ru.acad.bg

Abstract:
The operating principles, the structure and applying of electronic systems in carrying out various technological processes in agriculture are viewed and discussed in the subject. Students are acquainted with the internal structure, the characteristics, the advantages and the peculiarities of the existing electronic systems and appliances. The practical orientation of the subject is due to their successful implementation and leads to efficient agricultural machinery.

Course content:
Use of the electronic means for receiving, processing and transferring information about the agricultural technological processes. Main technological processes and machines – object of the agricultural electronization. Main notions and diagrams in electronic appliances. Electronic systems used in soil cultivation and culture growing, in harvesting machines and stock-breading.

Teaching and assessment:
During lecture attendance students are acquainted with the operational principles, different types of electronic components and devices applied in agriculture. Multimedia products, videos and foliograms are used. Laboratory classes are concerned with studying the properties of essential electronic elements and diagrams, with investigation and analysis of the properties, possibilities and parameters of concrete electronic systems for control of agricultural machines and processes.The students are expected to work out a report. In-coming and out-coming control is carried out of classes. Students answer two written questions at the exam and solve a problem. Then follows an oral discussion.

0024 Machines for agriculture products processing

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. PhD Chavdar Zlatkov Vezirov, Dept. AM, tel.: 888-442, e-mail: vezirovv@ru.acad.bg
2. Assoc.Prof. PhD Boris Georgiev Borisov, Dept. AM, tel.: 888-325, e-mail: bborisovv@ru.acad.bg

Abstract:
The discipline targets machines and apparatuses in the production industry to give to the students consents and road senses for holding machines and apparatuses for processing растениевъдна produce and securing their dependability. The issues are being heard in the relevant interconnection with inspection as well Their application in the farming.

Course content:
Theoretical abcs of the rehash of staples and materials. Machines and apparatuses for a primary and secondary plant rehash-production. Machines and apparatuses for a rehash of character and oil - bearing acculturations. Machines and apparatuses for tobacco, a hop and the biotechnological output. Machines and apparatuses in the logging and the rehash of wood. Machines and apparatuses in cleaning entities. Courses in the development of the machines and the apparatuses in the interrapted industry

Teaching and assessment:
The tuition is taken by lections and laboratorial exercises. During the lections will be taken 3 tests, which are necessary for compliting the current rate of education. If the student rate is over 5, the same will miss the exam. The exam is in written form including 2 question points from lections and one question point from laboratorial exercises. The final rate of education is formed by written exam, current rate of education and project prepared during the term.

0073 Electronic systems in production equipment

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+p
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc.Prof. PhD Miroslav Dimitrov Mihailov, tel.: 888-342, e-mail: mmihaylov@ru.acad.bg.

Abstract:
The operating principles, the structure and applying of electronic systems in carrying out various technologies and equipment in preservation and, processing of agricultural production are viewed and discussed in the subject. Students are acquainted with the internal structure, the characteristics, the advantages and the peculiarities of the existing electronic systems and appliances. The practical orientation of the subject is due to their successful implementation and leads to efficient production equipment.

Course content:
Use of the electronic means for receiving, processing and transferring information about different processes and production equipment. Main technological processes and machines – object of the production electronization. Main notions and diagrams in electronic appliances. Electronic systems used in qualification, preservation and, processing of production.

Teaching and assessment:
During lecture attendance students are acquainted with the operational principles, different types of electronic components and devices applied in production equipment. Multimedia products, videos and foliograms are used. Laboratory classes are concerned with studying the properties of essential electronic elements and diagrams, with investigation and analysis of the properties, possibilities and parameters of concrete electronic systems for control of production equipment and processes.The students are expected to work out a report. In-coming and out-coming control is carried out of classes. Students answer two written questions at the exam and solve a problem. Then follows an oral discussion.

0079 Hoisting and hauling and manipulation techniques

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department TMM and HHMT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. Georgi Kenarov, PhD, Dept. TMM and HHMT, tel.: 888-223, e-mail: gkenarov@ru.acad.bg
2. Principal Assistant Toni Uzunov, PhD, Dept. TMM and HHMT, tel.: 888-239, e-mail: tuzunov@ru.acad.bg

Abstract:
This subject introduces the students to the construction, the technical-exploitation parameters, the methods of calculation and appropriate choice of hoisting and hauling and manipulation techniques, that is used in services and companies for maintenance of machines and systems. It is based on the knowledge already received from the following subjects: Mechanics, Mechanisms and Machines Theory, Machine elements. It helps studying the subjects in Machines diagnostics and monitoring, Technologies for sustainable services and repair of machinery, Technical service of technical equipment and in graduation and practice.

Course content:
General information: Loading capacity machines for strait line, plane and space movement of loads. Load holding devices, hoisting manipulators, motor crane manipulators and trancemanipulatiors – arrangement, kinematic structures and stage of mobility, application. Machines for continuous transportation – function and classification, technical operationexploitation characteristics. Necessary power to actuate transporter – choice of engine. General information about systems of for mechanization and automation of hoisting and hauling and manipulation processes.

Teaching and assessment:
The lectures give theoretical knowledge on paramount subject issues. Experimental and functional studies are carried out of real samples of hoisting and hauling and manipulation systems during the laboratory classes. Part of these classes is practical and they are carried out in suitable repairing service company. Continuous assessment is formed on the basis of the laboratory classes grading and two test papers.

0081 Hydro- and pneumo machines in agriculture

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc.Prof. Petar Rusev Petrov, PhD, Dept. HTHPM, tel.: 888-585, e-mail: prusev@ru.acad.bg

Abstract:
The subject aims at giving knowledge on the main issues concerning the theory construction and exploitation of various hydro- and pneumo machines, which are used in agriculture. These are centrifugal, axle pumps, ventilators and compressors, as well as volumetric pumps and hydroengines – piston and rotor-piston, toothed lamination, roller, screw etc. Statics and dynamics of hydro and pneumo cylinders is discussed too. Students are acquainted with the machine characteristics, their operation in a system and regulation. Pump stations are studied – irrigating and dewatering as well as the fittings used.

Course content:
Definition, classification and appliance of hydro and pneumo machines. Main indicators of pumps, ventilators and hydroengines. Structure and operational principle of turbo-machines-pumps, ventilators and compressors. Theory fundamentals of turbo machines – speed triangles and main equation. Turbo machines similarity and classification. Centrifugal and axle pumps – structure, classification, main elements of the pumps, constructions, cavitation and characteristics. Centrifugal and axle ventilators – structure, classification and constructions, calculating a ventilator according to similarity ventilators for agricultural machines. Machine operating in a regulation system. Volumetric pumps and hydro engines – piston and membrane, rotor-toothed, laminated, roller, screw, with rotating pistons, axis and radial rotor piston. Hydro and pneumo cylinders – structure, statics and dynamics. Operation of large pumps in a regulation system. Volumetric vacuum pumps and compressors – structure, thermodynamic processes, multistep compression. System operation and regulation. Pump stations – types, choice and pump aggregates position. Fitting elements used in the pump stations – types, structure and choice. Automatic operation of pump stations.

Teaching and assessment:
The learning process is organized in two main directions – lectures and laboratory classes. Lectures enable students to get a theoretical knowledge of the main above-mentioned issues and they preceed the laboratory classes. In the latter the students are acquainted with the practical appliances diagrams, the methods of carrying out a practical exercise and processing of practical data. A report is worked out for each practical class. The exam includes a written paper on two issues and an oral discussion.

0082 Statistical methods for machinery maintenance

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Faculty of Transport Engineering
Lecturers:
Prof. DHC Atanas Mitkov, tel.: 888 553, e-mail: amitkov@ru.acad.bg
Abstract:
Discipline "Statistical methods for machinery maintenance" has a goal to educate students with the main statistical methods of gathering, processing and analysis of data, which are gathered in the procedure of machinery exploitation and maintenance.
Course content:
Probability models for reliability and maintenance of machinery. Main problems related to mathematical statistics. Pint value of major numeral characteristics of indicators. Main statistical distributed. Interval value of major numerical characteristics. The estimates to main numeral characteristics. The confirmation on the statistical hypothesis's. The components of the correlational analysis. The components of регресионния analysis.
Teaching and assessment:
Multimedia projector for illustrating the teaching material is used during the lectures. At the beginning of each and every one lecture the cardinal times are reminded from the one who inaugurates. Exercises and workshops related are planed to be two hours and correspond to the lectured materials.

0094 Basics of the machines supporting

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. PhD Mitko Ivanov Nikolov, Dept. RRCT, tel.: 888-458, e-mail: mnikolov@ru.acad.bg
2. Assoc.Prof. PhD Vasil Antonov Stojanov, Dept. RRCT, tel.: 888-480, e-mail: vas@ru.acad.bg
Abstract:
This subject is accorded to students from "Technical supporting and reliability". The propose of this subject is studying of the theoretical basics of the supporting and repearing, securing of knowleges for purposeful control of the process of senescent of the agricultural machines to restoring their usefull properties and supporting their technical and economical characteristics in the sphere of repearing and service.
Course content:
General aspects of the repearing and supporting of the machines. Condition and development of the service-repearing base in Bulgaria. Structure of the quality and reliability in the machines repearing and supporting. Properties and indices of the supported and restored machines. Causes and processes leading to change in the machines condition. Blastings of the details after physic-chemical influences. Blastings of the details after physical influences. Blastings of the details after chemical influences. Controling and assorting of the details. Summary wearing of the details. Defecting of the details.
Teaching and assessment:
The tuition is taken by lections and laboratorial exercises. During the lections will be taken 3 tests, which are necessary for compliting the current rate of education. If the student rate is over 5, the same will miss the exam. The exam is in written form including 2 question points from lections and one question point from laboratorial exercises. The final rate of education is formed by written exam, current rate of education and project prepared during the term.

0102 Basics of the machines supporting - classes project

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment: project defence **Type of exam:** oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. PhD Mitko Ivanov Nikolov, Dept. RRCT, tel.: 888-458, e-mail: mnikolov@ru.acad.bg
2. Assoc.Prof. PhD Vasil Antonov Stojanov, Dept. RRCT, tel.: 888-480, e-mail: vas@ru.acad.bg

Abstract:
Classes project has got bases of the urging of the machines upon the discipline for goal for the students to get and apologize the amplification of remedial documentation for detect of detail. On it habits for solving concrete problems and their public representation are being got. Course project is started considering the students Man Belle self-went Body-our decisions on concrete tasks had related to developing a remedial instruction book at performance.

Course content:
Classes project includes the following main problems: a destination, structure and content of the remedial design; Normative prerequisites to the remedial design; Function, structure and a message of the card for detect; Choice of Belle and meanses for detect; Address, description, conditions and directions on work with the appliance

Teaching and assessment:
Classes project is being developed single - handed in plying detailed methodical directions Make by the academic department. In the beginning of the semester the students have individual undertaking. The work in the separate phases on курсовият project is being done in family conditions, the uses and the instructional consultations. The authoritative курсовия judgment-undertaking forms after public defense.

0110 Machines for guardianship and reclaiming an agrarian product

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc.Prof. PhD Bojidar Rusanov Kolev, Dept. AM, tel.: 888-610, e-mail: bkolev@ru.acad.bg

Abstract:
With the received cognitions and road senses the students must dominate in theoretical and applicable aspect the drive and the exploitation of machines and equipments of the technology lines for guardianship and a rehash of vegetative and animal merchandises at treatment of their structure, code of behavior of work, forecloses, sustains as well a dependability at work.

Course content:
Technical grounds to the guardianship and the processing of an agrarian product. Appliances and apparatuses for getting tests and a qualification. Nipple machines and apparatuses of calibration. Courses, flowing at dehydration, of the nipple. Drying agent-installations function, kinds of use, efficiency. Depositories function, sorts, particularities, a masterminding. Machines for civilizing, scalloping, dosing, mixing necessities, code of behavior of work, a dependability at exploitation. Technologies for silage necessities, facilities and facilities, rules for exploitation. Fodder cookhouses function, a rig. A machines and facilities for a sort Facilities and manners of guardianships of field conditions. Facilities for guardianships in an adjustive gas center. A irregular and permanent repository. Facilities for cooling milk and testises. Impermanent guardianship. Facilities for a cooling, arrest and melting fish.

Teaching and assessment:
The instructional process is being exemplified with posters, videos and multimedia meanses. The methods of lecture demonstration, practical work with the technique or her mechanisms and details are being used in the uses. Course work is being developed, transmits and protects in the flanges in the semester. Pricing the sciences is being done by written examination. The authoritative judgment was formed by the results of the written examination and course work.

0111 Automobiles and Agricultural Tractors

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department ATFLT, Faculty of Transport Engineering
Lecturers:
1. Assoc.Prof. Ivan Iliev Evtimov, PhD, Dept. ATFLT, tel.: 888-527, e-mail: ievtimov@ruacad.bg
2. Assoc.Prof. Borislav Georgiev Angelov, PhD, Dept. ATFLT, tel.: 888-457, e-mail: bangelov@ru.acad.bg
Abstract:
The course acquaints the students with the construction end exploitational characteristics of automobiles and tractors in various working conditions. What is needed also is knowledge about the internal combustion engines, theoretical mechanics and mathematics. The discipline is a prerequisite for studing exploitation and maintenance machines.
Course content:
Analysis of the modern constructions automobiles and tractors. Basic exploitational characteristics dragging and dynamic characteristics and energy.
Teaching and assessment:
The subject is taught through lectures and laboratory exercises. Students work out individually course assignments. Lecture material makes use of up-to-date didactic means and audio-visual aids are based on modern constructions. Laboratory exercises take place in a specialized laboratory hall at the department of the course work the student uses the acquired knowledge for analysis of the construction and study of the dynamic characteristics automobiles. The discipline ends up with a continuous assessment. Evaluation takes into account the results of the defense of the course assignment and the submission of the laboratory exercise reports.

0113 Power Grid Systems

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc.Prof. PhD Valentin Vasilev Bobilov, Dept. HTHPM, tel.: 888-844, e-mail: bobilov@ru.acad.bg
Abstract:
The discipline offers cardinal sciences of the discipline on the industrial thermotechnic installations and systems. The goal of the education of the discipline for well the students to receive sciences for the methods and the meanses for choice, engineering and exploitation of the industrial and domestic grid systems. The conditions for achieving high energy efficiency at observing the indices are analyzed on her comfortable technology energy trials. Preliminary lores in the disciplines are necessary Technical thermodynamics, The mechanic of the fluids and pumps, air compressors and fans.
Course content:
Conventional water heatings. Conventional air heatings. Exothermic sets, characteristics and areas of enclosure. Nonconventional heatings. Beaming And thermpumps systems, characteristics and areas of enclosure. Creditworthiness, determines as well energy efficiency on the heatings. Special necessities to the systems, functioning in centers, with increased danger - chemical active, explosive. The productiveness of the facilities and items of the classic air-condition systems determines. Creditworthiness, determines as well energy efficiency in the air-condition systems. Climatic curves in H-d diagrams . International calculation parameters. Center and zonal climatic facilities. Details to the climatic centrals. Icegenerators of direct and vicarious dehydration. Humid matter. Dynamics of the trial freeze - dried. Convectional drying agent with hot air. Industrial facility for natural gas and steam generators, incinerators, heartily air crafts. Liquefied industrial facility-gas warehouse economies, evaporative systems and steam generators. Domestic facilities for natural gases and liquid hydrocarbon of gas-propane butane. Domestic gas appliances steam generators, boilers, cookers.
Teaching and assessment:
The students receive theoretical cognitions from the study material. The lab uses happen for getting much road senses for using the equipments. Clases work is test for concretely deciding used issue. At each use the students process and analyze the received data. The scaling perpetrates itself in the action during the teach and the lab uses, the class project protection-work and the bowling scores from the prosecuted at the end of the education examination. The students receive theoretical cognitions from the study material. The lab uses happen for getting much road senses for using the equipments. The project is test for concretely deciding used issue. At each use the students process and analyze the received data. The evaluation is being perpetrated in the action during the teach and a lab-uses, the class project protection-work and the bowling scores from the prosecuted at the end of the education examination.

0114 Transport Technics

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department ATFLT, Faculty of Transport Engineering
Lecturers:
Prof. PhD Dimitar Stanchev, tel.: 888-545, e-mail: dstanchev@ru.acad.bg
Abstract:
With studing of the discipline "Transport technics" the bases of knowled in the tield of the different kind transport technics are put and conditions for itscorrect using and supporting are created. Depending оп realization, the students studied this discipline will have possibility quichly orient in concrete conditions and extend application knowledge and skills. For reaching this the role of the exercise and course task is considerable.
Course content:
Problems tengecies in production, using and dovelopment. Purpose, requirment and сотпоп classification of the transport technics tractor, railway, ship. Structure and work principle. Prniciple construction decissions and speality in sepparate kind transport technics - energy aggregates, transmissions, movement sistems, load spaces, management systems. Theoretical bases of the transport technics - the bases concept, tractive and resistance forces, power balance, transmissions and transfomation of the engine power stream to driving organs. Bases characteristics in using of transport technics for tractive and transportation actions tractive I driving characteristic, brake characteristics, energy I есопоту characteristics. Bases concepts for optimal using: efficiency coeffcient, energy effectiveness. Systems for optimal using of the transport technics.
Teaching and assessment:
Educational materials have for the discipline. This materials are electronic fonnded. 'П the beginning of the lecture the plan is write and relative literature is suggested. After this content of materials is presented. Depending оп the theme the materiale written on the black board, computer proector, viewer. The possibility of the dialogue with students in used. At the laboratory exercise eyry student has concrete theme for work. The results are presented in written form. During of the exercise the dialogue with students is lead and the assessment for working results is made. Part of the themes are connected with visit of the object with educational purpoase.

3280 Technical Safety

ECTS credits: 3 **Weekly classes:** 2lec+0sem+1labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Vladimir Tomov Vladimirov, DSc, Dept. EEP, tel.: 888-481, e-mail: vtomov@ru.acad.bg
Abstract:
This is a general technical subject. It aims at providing knowledge and certain skills for analysis and synthesis application of technical and organization decisions in labor safety. Main issues: learning the analysis methodology of the safety of the technical and production system-resources, characteristics, motion, standardizing, measuring and evaluation of the dangerous and harmful production factors; mastering the methods of projecting of safe technical systems; technical appliances projecting and explaining organization decisions in labour safety.
The subject has incoming connections with the following subjects: Physics, Chemistry, Heat engineering, Hydromechanics, Machine elements. It has outcoming connections with the subjects from the following direction: Agricultural machinery, Management and technical servicing, Agricultural mechanization, as well as the optional subject lying in the management field.
Course content:
Technical safety – main notions and definitions. Projecting methodical basis of safe technical and production systems. Mechanical safety of technical systems. Electrical safety. Electromagnetic safety. Immission and safety. Noise and vibration safety. Radiation safety. Management and ways of presenting information in technical and production systems. Labour safety control.
Teaching and assessment:
The lectures include the three specializing directions. Visual aids are used. The laboratory classes are experimental and analyzing in their essence. Students have to be prepared, which is ascertained by an incoming test. Two test papers are carried out during the practical classes. They are based on preliminary stated learning issues. Final assessment is achieved on the basis of the laboratory tests, test papers and class participation.

0116 Product Recovery in Asset Maintenance and Remanufacturing

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. PhD Mitko Ivanov Nikolov, Dept. RRCT, tel.: 888-458, e-mail: mnikolov@ru.acad.bg
2. Assoc.Prof. PhD Vasil Antonov Stojanov, Dept. RRCT, tel.: 888-480, e-mail: vas@ru.acad.bg

Abstract:
The propose of this subject is gaving a science-practical knowleges to the students about the standard processes used in repearing of details efficiency in hydraulic and pneumatic machines. The students are meeting with the basic generally accessible methods accorded with removing of the defects of the details. Also, examined are most popular defects in the main classes of details (corpus details, cylindrical centered and hollow details, etc.) and methods for their removing. In conjunction with theoretical aspects of the processes, used machines and equipment, working regimes and their applications, the students will gain knowleges for their control and ad-aptation to different conditions.

Course content:
The propose of this subject is gaving a science-practical knowleges to the students about the standard processes used in repearing of details efficiency in hydraulic and pneumatic machines. The students are meeting with the basic generally accessible methods accorded with removing of the defects of the details. Also, examined are most popular defects in the main classes of details (corpus details, cylindrical centered and hollow details, etc.) and methods for their removing. In conjunction with theoretical aspects of the processes, used machines and equipment, working regimes and their applications, the students will gain knowleges for their control and ad-aptation to different conditions.

Teaching and assessment:
Necessity of details repearing. Classification of the methods and processes for repearing of worn out details. Preparing of the details for repearing. Defects removing by mechanical and locksmith treatment. Defects removing by manual arc welding processes. Defects removing by materials. Repearing of corpus details. Technologies for repearing of cylindrical details. Technologies for repearing of disc-shaped details.

0117 Product Recovery in Asset Maintenance and Remanufacturing - Couece Project

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment: project defence **Type of exam:** written and oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. PhD Mitko Ivanov Nikolov, Dept. RRCT, tel.: 888-458, e-mail: mnikolov@ru.acad.bg
2. Assoc.Prof. PhD Vasil Antonov Stojanov, Dept. RRCT, tel.: 888-480, e-mail: vas@ru.acad.bg

Abstract:
The project work on “Product recovery in asset maintenance and remanufacturing” is intended to offer basic knowledge on resource preservation by remanufacturing and reusing discarded materials. Gives hint for documentation preparation related to remanufacturing of parts. With this project the students will gain practical knowledge for different technological aspects of remanufacturing of parts. The students will learn to take decisions for certain practical problems related to remanufacturing problems and preparing their documentations and resource recovery.

Course content:
The Project Work includes the following main problems: the working condition of part and reasons of failure; purpose, structure and content of the remanufacturing table; options for rational methods and means of parts remanufacturing rescore recovery; designing technology for parts remanufacturing rescore recovery; purpose, description, using instruction for the remanufacturing device.

Teaching and assessment:
Project Work will be assigned individually for each student with a detail instruction from the Department in the beginning of the semester. Every week the student will defend the steps that has to be covered. The Project Work’s separate phases will be done as home work, while certain stapes can be fulfilled as workshop during consultations. Evaluation of the Project Work will be completed after defending the total Project Work.

0118 Diagnostics and Monitoring of Agricultural Machinery

ECTS credits: 6 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. PhD Ivan Asenov Mitev, Dept. RRCT, tel.: 888-223, E-mail: imitev@ru.acad.bq
2. Assis. Prof. PhD Todor Nikolov Delikostov, Dept. RRCT, tel.: 888-441, e-mail: delikostov@ru.acad.bq

Abstract:
The "Diagnostics and monitoring of agricultural machinery" discipline goal is to give to the students coпsents and road senses for guaranteeing as well bettering the creditworthiness and performing the automotive, tractor and agricultural machinery diagnostic and monitoring proficiency. This goal achieves itself with the learning of the conceptual and mathematical bases. The properties and characteristics of the dependability and the methods, the meanings and the technology of the technical diagnostic procedure of the bows and the coтponents of the automotive, tractor and agricultural machinery.

Course content:
General questions of the dependability and the diagnostics and monitoring of the agricultural machinery.
A dependability, the diagnostician and quality of the agricultural technique. Conceptual and mathematical lands of the dependability. Structural tag and book up. It accounts aJld decides the dependability of agricultural тachinery. Methods and means of a technical diagnostic procedure. A diagnostic procedure of tractors and coтbines as well and engines. A diagnostic procedure of electrical equipment in automotive. tractor and the agricultural technique. The diagnostics of hydro systems of the agricultural machinery.

Teaching and assessment:
The discipline adult education happens in a technology, built, with a hand harboring classic methods of training. Methods of trainings are being used a! delivering the teaching. her cybernetic information acted with emphasizing oп troubIe note-exposition of material in subjects. Advanced technical means and didactics materials for videos use themselves for a exemplifying. The lab uses are being held oп real entities in aп agricultural proficiency and real laЬ regulations oп discovering the parameters of the technician state's evidence. the indices and the characteristics oп the properties of dependability as well as the structural and diagnostic parameters of the entities.

0119 Reliability of Agricultural Machinery

ECTS credits: 4 **Weekly classes:** 2lec+0sem+1labs+0ps+p
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. PhD Ivan Asenov Mitev, Dept. RRCT, tel.: 888-223, E-mail: imitev@ru.acad.bq
2. Assis. Prof. PhD Todor Nikolov Delikostov, Dept. RRCT, tel.: 888-441, e-mail: delikostov@ru.acad.bq

Abstract:
The "Reliability of agricultural machinery" discipline goal is to give to the students consents and road senses for guaranteeing as well bettering the creditworthiness and performing the automotive, tractor and agricultural machinery reliability. This goal achieves itself with the learning of the conceptual and mathematical bases. The properties and characteristics of the dependability and the methods, the meanings and the technology of the technical diagnostic procedure of the bows and the components of the automotive, tractor and agricultural machinery.

Course content:
General questionsare of the reliability of the agricultural machinery. Conceptua\ and mathematicallands of the dependability. Structural tag and book up. It accounts and decides the dependability of agricultural тachinery. Methods and means of a reliability. A reliability procedure of tractors and combines as well and engines. A reliability of electrical equipment in automotive, tractor and the agricultural technique.

Teaching and assessment:
The discipline adult education happens in a technology, built, with a hand harboring classic methods of training.
Methods of trainings are being used at delivering the teaching, her cybernetic information acted with emphasizing oп troubIe note-exposition of material in subjects. Advanced technical means and didactics materials for videos use themselves for a exemplifying. The laЬ uses are being held oп real entities in aп agricultural proficiency and real laЬ regulations oп discovering the parameters of the technician state's evidence, the indices and the characteristics oп the properties of dependability as well as the structural and diagnostic parameters of the entities.

0120 Repair – Technological Processes

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Daniel Likasa Bekana, PhD, Dept. RRCT, tel.: 888-701, e-mail: dbekana@ru.acad.bg
2. Assoc. Prof. Ivan Asenov Mitev, PhD, Dept. RRCT, tel.: 888-223, e-mail: imitev@ru.acad.bg
Abstract:
The course aims to give technical and practical knowledge necessary for the realization of specialists in practice in maintaining equipment in working condition. Space is devoted to the issue of quality repair service effects, methods and tools for optimal management.
Course content:
Production and technological process of repair and maintenance of machinery and equipment. Technology disassembly-washing and cleaning processes in repair and maintenance of machinery. Technology for detect in repair and maintenance machines. Technology assembly of standard compounds. Technology assembly of units and units. Assembly, testing and storing machinery..
Teaching and assessment:
The tuition is taken by lections and laboratoral exercises. During the lections there is a 2 tests to completing the final rate of education. In current rate of education over 5 the student miss the exam. The exam is in written form including 2 question points from lections and one question point from laboratoral exercises. The final rate of education is completing by exam, current rate and course task.

0121 Machines for the animal husbandry

ECTS credits: 3 **Weekly classes:** 2lec+0sem+1labs+0ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc.Prof. PhD Boris Georgiev Borisov, Dept. AM, tel.: 888-223, e-mail: bborisov@ru.acad.bg
Abstract:
The goal of the discipline is the students with the technology rig, used, to meet together in mechanizing as well automatizing the processes in different technologies and fashions on keeping the animals of the different types of animal farms and accessory sections for them. The kinds of machines and facilities are being analyzed, as the prime calculations at the option to their parameters are being job. On the got sciences for the machines and the equipments in the animal husbandry, the called for skills for resolved government on the process of their aging, with inspection are being procured The effective resuming of their useful properties and continuing they techniques-economies characteristics of the sphere of remedial- it caters for a output.
Course content:
Wises for breeding the animals and the birds. Watering the farms. Ventilation and heating of the farms. Intra-enterprise conveyance in the farms. Mechanized a dose, jumbles up and deals out on the feeds. Mechanize Demisting the top - dress in the farms. Mechanized milking the animals. Heat treatment of the milk. It tumbles dry to the milk. Mechanizing the trials of cutting of the sheeps. Mechanize Meeting in the eggs in the chickenfarms. Technical resolutions of stowage. It granulates to the feeds. Technological solutions for scalloping feeds. Working the centralized feeds.
Teaching and assessment:
The tuition is taken by lection and laboratorial exercises. The current rate of education is formed by 2 tests during the term. The final rate of education is completing by, current rate and course task. The supplementary examination is in written form including 2 question points from lections.

0122 Assets for Continuing the Agrarian Proficiency

ECTS credits: 3 **Weekly classes:** 2lec+0sem+1labs+0ps+0
Assessment: colloquium **Type of exam:** oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. PhD Plamen Ganchev Kagalov, Dept. RRCT, tel.: 888-441, e-mail: kangalov@ru.acad.bg
2. Assos.Prof. PhD Todor Nikolov Delikostov, Dept. RRCT, tel.: 888-441, e-mail: delikostov@ru.acad.bg

Abstract:
The meanses for taking agrarian technique discipline is intended for learning from the students in"Technical staying and dependability" major. The goal of the discipline is learning to the meanses for seconding the agrarian technique in работоспособно condition, But As well as well the meanses for restoring her order. Discipline The effective resumption of their useful properties ekes the needed consents on resolved rule of the procedure-ripening of the machines for inspection out.

Course content:
General questions for the meanses for taking the agricultural technique. A fitting for a load of the agricultural technique. A rig of diagnostics of the agricultural technique. A rig of disassembly and fabrication. Meanses had foreclosed with detecting. A rig for mechanical processing. Tool up for a welding and cook. Assets for occupation of preventive coatings. Meanses for amplification and having serviced machines and components.

Teaching and assessment:
The education does itself by teach - inen and lab uses. The current control of the lab uses is the sub-kind to viva - voce examen. The examination is written colloquium at two issues from the teach - inen and one of the lab uses. The students derive favorable judgment yea of the colloquium of judgment to the issues of the written colloquium-a no more a little from 4.

0137 A Production Rig

ECTS credits: 3 **Weekly classes:** 2lec+0sem+1labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. PhD Chavdar Zlatkov Vezirov, Dept. AM, tel.: 888-442, e-mail: vezirov@ru.acad.bg
2. Assoc.Prof. PhD Boris Georgiev Borisov, Dept. AM, tel.: 888-325, e-mail: bborisov@ru.acad.bg

Abstract:
With the received cognitions and road senses the students must dominate in abstract and applicable view the drive and using the production rig for a rehash on animal produce notably in the aspect of their goad and creditworthiness as well. The issues are being heard in their interconnection with inspection as well Their application of the farming.

Course content:
Abstract land to the rehash to staples and materials. They project on a production rig for working an animal product. A production rig for a primary and secondary rehash of milk, eggs and a wave. A production rig for an output and a rehash on meat. A production rig for aquaplant. A production rig for a output and a rehash on skin, pinions, the horn and cloven feet. Courses in the development on the production rig.

Teaching and assessment:
The tuition is taken by lections and laboratorial exercises. During the lections will be taken 3 tests, which are necessary for compliting the current rate of education. If the student rate is over 5, the same will miss the exam. The exam is in written form including 2 question points from lections and one question point from laboratorial exercises. The final rate of education is formed by written exam, current rate of education and project prepared during the term.

0138 Meanses for Holding a Technological Fitting

ECTS credits: 3 **Weekly classes:** 2lec+0sem+1labs+0ps+0
Assessment: colloquium **Type of exam:** oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. PhD Plamen Ganchev Kagalov, Dept. RRCT, tel.: 888-441, e-mail: kangalov@ru.acad.bg
2. Assos.Prof. PhD Todor Nikolov Delikostov, Dept. RRCT, tel.: 888-441, e-mail: delikostov@ru.acad.bg

Abstract:
The discipline is intended for learning from the students in "Technical staying and dependability" major. The goal of the discipline is learning to the meanses for supporting the technological appointment in workability condition, But As well the meanses for restoring its order. The discipline effective resumption of their useful properties ekes the needed consents on resolved rule of the procedure-ripening of the machines for inspection out.

Course content:
General questions for the instrumentalities for urging of a technological rig. A rig for stocking the technological rig with butters and technology fluids. Tooling for a diagnostic procedure the technological rig. A rig for disassembly and fabrication. Meanses used at detect. A rig for mechanical processing. Tool up for a welding and cook. Meanses for occupation of preventive coatings.

Teaching and assessment:
The education does itself by teach - inen and lab uses. The current control of the lab uses is the sub-kind to viva - voce examen. The examination is written colloquium at two issues from the teach - inen and one of the lab uses.

0139 Organization and Management of Maintenance

ECTS credits: 3 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Daniel Likasa Bekana, PhD, tel.: 888-701, e-mail: dbekana@ru.acad.bg
Assoc. Prof. Vasil Antonov Stojanov, PhD, tel.: 888-480, e-mail: vas@ru.acad.bg

Abstract:
The experience from the last 30 years and more shows a development in the organization and mainte-nance of the machines and equipments. In the discipline “Organization and Management of the Mainte-nance” there are learning the base activity, structure, strategy and organization of the maintenance of the machines and equipments. For the right organization and management of the maintenance of the machines and equipments it is necessary to make the identification of the key resolutions that determi-nate its structure and organization. The learning of this discipline will give eruditions to the students, con-nected with the analyzing, organization and management with its elements and the connection between the maintenance and the production process.

Course content:
Theoretical foundations of the discipline “Organization and Management of the Maintenance”. Management of the maintenance of the machines and equipments. Activities at maintenance of the machines and equipments and their influence on the organization and the management of the maintenance. System procedures for prognosticating of the activity of an organization and management of the maintenance. Choice of performers (output or own resources) at the maintenance. Requirements of European Community for maintenance of the machines and equipments. Methods for taking of base resolutions. Analysis of the administrating of the maintenance and the function of the administrative structure. Total production maintenance. Rating and control of the maintenance of the machines and equipments.

Teaching and assessment:
Students are offered diagrams, laboratory appliances, real machines and machine units, up-to-date measuring and registration equipment during the lectures. The teaching-learning methods include slides and folio grams. Laboratory classes are held at separate working places in groups of 3 - 4 students.

0144 Economics of Maintenance and Repair

ECTS credits: 3 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department of Economics , Faculty of Business and Management
Lecturers:
Assoc.Prof. Emil Georgiev Trifonov, PhD, Dept. Economics, tel.: 888-557, e-mail: e_trifonov@abv.bg
Abstract:
The subject is concerned with the general problems, laws and categories of the contemporary market economy. Thus it creates a certain basis for the remaining economic objects. It also gives general knowledge, which is expressed in alternative way of economic viewing, formation and creates abilities for an independent and expert choice in economic surroundings. It has incoming connection with mathematics and outcoming ones with concrete branch and functional economic subjects.
Course content:
Introduction – the economic system and the fundamental economic theory. Main economic issues. Market mechanism. Public sector and taxation. Demand and supply of the individual markets. Consumer demand and behavi out. Manufacture, company assets and expenses. Imperfect competition and supplying. Price formation and incomes depending on production factors: Gross domestic product and economic rise. Economy cycle, unemployment and inflation. Microeconomic balance. Budget policy. Monetary policy. Foreign policy in the open-plan economics.
Teaching and assessment:
Material is taught in two ways – lectures and practical classes, which elucidate and develop further some of the issues discussed at lectures. Continuous assessment is carried out. It includes two test assignments and personal activity during the semester. The final assessment is the average of the above-mentioned.

0162 Exploitation Materials

ECTS credits: 3 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc.Prof. Dimitar Jordanov Pavlov, PhD, Dept. RRCT, e-mail: chimia@ru.acad.bg
Abstract:
The subject provides the main knowledge and skills for the essential theoretical and practical issues concerning the properties and application of fuels, greasing materials, hydraulic oils, cooling and breaking fluids. Main information on the classification and interchange ability of greasing materials. The influence of the exploitation materials on the machines and aggregates in tractors and automobiles are studied.
Course content:
Carburettior engine fuels. Diesel engine fuels. Motor greases. Transmission greases. Industrial and hydraulic greases. Plastic lubricants. Cooling fluids. Antifreezing agents.
Teaching and assessment:
The subject is taught in two directions – lectures and practical classes. The lecture course includes eight topics for discussion. Demonstration experiments , photoes, boards and slides are used during the lectures. The practical classes form practical abilities and habits in the students.
Continuous assessment is carried out.

0164 Information and Communication Systems for Machine Maintenance

ECTS credits: 2 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Dept. Computing, Faculty of Electrical and Electronic Engineering and Automation
Lecturers:
1. Assoc.Prof. Angel Smrikarov, PhD, Dept. Computing, tel.: 888-743, e-mail: asmrikarov@ecs.ru.acad.bq
2. Principal Assis. Lachezar Yordanov, Dept. Computing, tel.: 888-859, e-mail: liordanov@ecs.ru.acad.bq

Abstract:
The course is intended for students in specialty "Technical maintenance and reliability". The main purpose is to introduce them to organization of the computer, including оn board systems, their interfaces in agricultural machinery. Knowledge about the organization of the computing processes is given in lectures ans workshops. Serial interfaces for transferring of data are object of investigation in workshops. Capabilities of оn board systems for displaying of technological information, control and selfdiagnostic are discussed.
The course has input from "Informatics I", "Informatics II", Electrical engineering and electronics", "Management bases", "Electronic systems in agricultural machinery", "Electronic systems for production equipment", "Diagnostics and monitoring of machinery" and output for "Organization and control of the maintenance" and diploma project.

Course content:
Presenting and processing of information in the computer. Board information systems in agricultural machinery - architecture, information, control and diagnostic functions. Communication between information system, sensors and actuators. Investigation of serial interfaces. Internet and e-mail.

Teaching and assessment:
The lectures are two hours per week and precede the workshops. The workshops are two hours each and are conducted every week. There are three tests during the semester and they give the end assessment.

0170 Technical Servicing of Machines

ECTS credits: 3 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Dimitar Dimov, PhD, Dept. AM, tel.: 888-242, e-mail: ddimov@ru.acad.bg
2. Assoc. Prof Bozidar Kolev, PhD, Dept. AM, tel.: 888-610

Abstract:
The technical servicing (TS) is a complex of operations, connected with the exploitation development, shift, plan and seasonal TS storage during non-working periods. The subject gives knowledge about the factors influencing the serviceability and work-efficiency, the technology and management of TS and the machine storage. In-coming connection – “Internal combustion engines”, “Automobiles, tractors and fork lifts” and “Agricultural machinery”.

Course content:
Changes in the machine technical conditions in the process of their using, factors concerning the serviceability and work efficiency. Main structure-forming elements of the technical servicing system, agricultural machinery storage – necessity and essence. Technical servicing storage technology of agricultural machinery. Material-technical basis of TS and storage. TS and storage management.

Teaching and assessment:
Lectures are given in a traditional way and aim at providing knowledge about the theoretical basis of TS and machinery storage. During the laboratory practical classes the students learn how to apply the methods and means of experimental conducting and controlling of TS operations. All laboratory classes are held with real working tractors, automobiles and agricultural machines. Students work in groups of 3-5 people, and they participate in the realization and result analyzing. To take part in these exercises students undergo in-coming control and each class finishes with a final record of proceedings (written report) and an out-coming test.

0173 Resource Insurance at Maintenance of Agricultural Technique

ECTS credits: 2 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Daniel Likasa Bekana, PhD, tel.: 888-701, e-mail: dbekana@ru.acad.bg
Abstract:
The aim of this discipline is giving of definite scientific – practical eruditions, which are necessary for real-izing of the specialists in the practice at the maintenance of Agricultural Technique in “hard-working” con-dition and management of their resource in a practice. In correspondence with the conditions of making of this activity, the educational material is built on the foundation of the contemporary requirements about the determination of the necessary resource for maintenance of Agricultural Technique. There is an ex-amination of the scientific foundations like: definition, kinds, classification and management of the re-source for maintenance of Agricultural Technique. There is separated a place of the question for the hu-man factor at the resource insurance and maintenance of Agricultural Technique.
Course content:
Distinctions between manufacturing and maintenance technological processes. Dismantling and cleaning processes technologies. Assembly technologies for type’s of connections, units and aggregates. Testing and storage of the repaired machines. Analytic management in machine repairing. Introduction in the resource insurance of machines and equipment: Systematic approach for determination of the method for resource insurance at maintenance of Agricultural Technique. Technical insurance at maintenance of machines and equipment. Technical documentation: ESKD, BDS, ISO, etc. Methods for introduction of norms in the technical documentation. Human resource and management of the resource at maintenance of machines and equipment. Work orders.
Teaching and assessment:
The tuition is taken by lection and laboratorial exercises. The current rate of education is formed by 2 tests during the term. The supplementary examination is in written form including 2 question points from lections.

0179 Technical Servicing of the Engineering Fitting

ECTS credits: 3 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. PhD Dimitar Petrov Dimov, Dept. AM, tel.: 888-242, e-mail: dpdimov@ru.acad.bg
Abstract:
There is the discipline-technical servicing of the technology rig for a target to form At The student-sciences and road senses for the factors, influencing on the operating capability the technology rig, the technology and the management, of the technical servicing. This achieves itself by analyzing the particularities of the conditions in which it works the technology rig, the wises for guaranteing the operating capability to this appointment, by studying the technology, the organization and the control at the different technical servicings and guardianship, needed for this goal-material- technical root and a rig.
Course content:
Land idiosyncratic particularities of the technology rig on the provisions as well in which it worked. Methods for guaranteing as well controlling the order and the operating capability of the technology rig. Structure of the system for technical servicing. A technology of the technical servicing. Guardianship on the technology rig. Material - A technical base for servicing and guardianship on the technology rig. A organization on the technical servicing and guardianship on the technology rig.
Teaching and assessment:
The education does itself by teach - inen and lab uses. For an accession to example the students put themselves in inward ongoing control. The examination is written due to two questions in the teach - inen and one of the lab uses. The authoritative judgment is cast by the written examination and the judgment from the ongoing control.

0203 Maintenance Recourse Management

ECTS credits: 2 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Daniel Likasa Bekana, PhD, tel.: 888-701, e-mail: dbekana@ru.acad.bg
Abstract:
The aim of this subject is giving of definite scientific – practical eruditions, which are necessary for realizing of the specialists in the practice at the maintenance of Agricultural Technique in "hard-working" condition and management of their resource in a practice. In correspondence with the conditions of making of this activity, the educational material is built on the foundation of the contemporary requirements about the determination of the necessary resource for maintenance of Agricultural Technique. There is an examination of the scientific foundations like: definition, kinds, classification and management of the resource for maintenance of Agricultural Machinery.
Course content:
Distinctions between manufacturing and maintenance technological processes. Dismantling and cleaning processes technologies. Assembly technologies for type's of connections, units and aggregates. Testing and storage of the repaired machines. Analytic management in machine repairing. Introduction in the resource insurance of machines and equipment: Systematic approach for determination of the method for resource insurance at maintenance of Agricultural Technique. Technical insurance at maintenance of machines and equipment. Technical documentation: ESKD, BDS, ISO, etc. Methods for introduction of norms in the technical documentation. Human resource and management of the resource at maintenance of machines and equipment. Work orders.
Teaching and assessment:
The tuition is taken by lection and laboratorial exercises. The current rate of education is formed by 2 tests during the term. The supplementary examination is in written form including 2 question points from lections.

0206 Diploma Practice

ECTS credits: 4 **Weekly classes:** 0lec+0sem+0labs+30ps+0
Assessment: exam **Type of exam:**
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors
Abstract:
The diploma practice aims at giving the students the opportunity to get acquainted with contemporary scientific and technical achievements in the sphere, in which they develop a diploma project and with the existing condition of the problem in the organization, which has suggested the topic for the diploma project.
Course content:
In relation to the topic of the diploma project, the students get acquainted with literature sources, patents, inventions etc., with methods for theoretical and experimental investigations and the results from them; with constructive and technological solutions; with laboratory equipment, measurement devices, tools patterns, machines for mechanical treatment, casting, welding, plastic deformation and thermal treatment; with methodology for constructive and technological calculations; with software packages for solving engineering problems; with quality management systems, etc.
Teaching and assessment:
The diploma practice is carried out in the department laboratories, mechanical and mechanical-mounting workshops, constructive and technological offices or divisions of machine-building companies, libraries, etc. in relation to the topic of the diploma project and the organization, which has suggested it. The tasks of the practice are determined by the tutor of the diploma project and are reported to him. The results from the practice are used in forming the literature reference of the diploma project and the development of its specific sections.

0208 Diploma Project

ECTS credits: 10 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: exam **Type of exam:**
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors
Abstract:
The diploma project aims at giving to the students the opportunity to apply the obtained knowledge and skills in self-independent and entire development of engineering projectsThe students who have excellent achievements are given topics with research character. The Final Year project gives the students practical skills and experience for the future engineering practice or for continuing their study in a Master degree course.
Course content:
Review of the information regarding the diploma project topic. Formulating the aim and the tasks. Analysis of the output and the work conditions. Idea project or methodology of the research. Design of repair technologies. Design of the necessary equipment and devices. Running of tests and processing of the results. Technical and economical analysis of the developed variants. Development of technical documentation and graphical representation of the results from the research.
Teaching and assessment:
The diploma project is developed following a given routine. The students work individually, using paper or electronically based information, the equipment of the department or other departments, and their instructor's help. The diploma project instructor assesses the degree of involvement, the public and moral qualities of the student. The assessor evaluates the diploma project. The student defends the diploma project in front of the State Exam Committee and the open public. The State Exam Committee evaluates both the diploma project and the way it is defended.

UNDERGRADUATE STUDIES IN HYDRAULIC AND PNEUMATIC EQUIPMENT

PROFESSIONAL STANDARDS
OF A BACHELOR IN

HYDRAULIC AND PNEUMATIC EQUIPMENT

DEGREE COURSE: Hydraulic and Pneumatic Equipment
Degree: Bachelor
Qualifications: Mechanical Engineer
Duration: 4 years (8 semesters)

The main aim of the Hydraulic and Pneumatic Equipment degree course is to train qualified specialists in the field of design, assembly and exploitation of hydraulic and pneumatic systems, machines, elements and equipment; in design and exploitation of pumping stations, installations for hydraulic and pneumatic transport and ventilation; in diagnostics and repair of hydraulic and pneumatic machines, mechanisms and systems.

The course of study consists of two modules:

- Basic module, with duration of four and a half semesters /from 1 to 5/. During this module students study the following courses such as: Mathematics, Mechanics of Rigid Bodies and Fluids, Strength of Materials, Heat Technology, Machine Elements, Informatics and Computer Communications, Electrical and Electronic Engineering, Foreign Languages, etc.
- Main module, with duration of three and a half semesters. During this module the students' training in the degree course is extended. They study courses such as: Positive Displacement of Hydraulic and Pneumatic Machines, Turbo-Pumps, Compressors and Ventilators, Hydraulic Drive, Pneumatic Drive, Pneumatic Control, Water Turbines, as well as Pumping Stations and Fittings, Industrial Heat Technology, Industrial Aerodynamics, Diagnostics and Repair of Hydraulic and Pneumatic Equipment, Automatic Control of Hydraulic and Pneumatic Equipment, Heat and Gas Supply, etc.

Apart from the general core courses and the specialized training in the field of engineering, students obtain some basic economic knowledge studying courses such as: Economics, Marketing or Fundamentals of Management and elective courses such as: Finance and Firm Accounting, etc.

During the last semester a pre-graduation practice is carried out and students graduate through a State Exam or a Diploma Paper, of their personal choice.

The future specialist, graduating from this degree course, will be able to work in mechanical engineering enterprises and firms in the system of water-supply and sewers; irrigation systems; in the National Electrical Company and power engineering in general; they will be able to set up their own firms, services and dealer's activities in the field of hydraulic and pneumatic equipment.

CURRICULUM

of the degree course in

HYDRAULIC AND PNEUMATIC EQUIPMENT

First year

Code	*First semester*	*ECTS*	*Code*	*Second semester*	*ECTS*
0380	Applied geometry and engineering graphics I	5	0414	Training practice - HPE	5
0381	Technological Training practice	3	0002	Informatics II	4
0410	Chemistry	4	2068	Mathematics II	6
0412	Mathematics I	5	2069	Physics	6
1038	Informatics I	5	2070	Applied geometry and engineering graphics II	4
2073	Material science	4	2071	Mechanics I	5
	Elective courses - students elect a course				
0383	English	4			
0843	German	4			
0950	French	4			
0983	Russian	4			
	Total:	***30***		***Total:***	***30***

Second year

Code	*Third semester*	*ECTS*	*Code*	*Fourth semester*	*ECTS*
2402	Strength of materials I	5	2430	Theory of mechanisms and machines	5
2529	Fluid mechanics	6			
2530	Electrical and electronic engineering	6	2443	Theory of mechanisms and machines - course project	2
2531	Mechanics II	4			
2532	Technology of materials	5	2543	Machine elements I	6
3268	Mathematics III	4	2544	Strength of materials II	4
			2546	Heat Technology	5
			2555	Technology of engineering	5
			3272	Economics	3
	Total:	***30***		***Total:***	***30***

Third year

Code	*Fifth semester*	*ECTS*	*Code*	*Sixth semester*	*ECTS*
2453	Machine Elements II - Course	2	3397	Special Measuring Appliances	3
2561	Project Machine Elements II	3	3403	Fans Turbo-Compressors and Special Pumps	4
2454	Metrology and Measuring Equipment	5			
3399	Centrifugal and axial pumps	5	3404	Turbo-Pumps Fans and Compressors - Course Project	2
3400	Positive Displacement Hydraulic Machines	5			
			3405	Positive Displacement Pneumatic Machines	6
3401	Water Turbines	5			
3402	Industrial Heat Technology	5	3406	Pump Stations and Fittings	5
			3407	Hydraulic and Pneumatic Components and Equipment	5
			3408	Heat Supplying and Gas Supplying	4
	Total:	***30***		***Total:***	***30***

Fourth year

Code	*Seventh semester*	*ECTS*	*Code*	*Eighth semester*	*ECTS*
3280	Technical Safety	3	3418	Industrial Aerodynamics and Pneumatic Transport	3
3410	Heating, Ventilation and Air-Conditioning	6	3419	Hydromechanical and power-shift transmissions	4
3411	System for Hydraulic and Pneumatic Drives	4	3420	Diagnostics and Repair of Hydraulic and Pneumatic Equipment	4
3412	Hydraulic and Pneumatic Drives - Course Project	2	3421	Lift and Transport Techniques	3
3413	Hydraulic and Pneumatic Automatic Systems	6	3422	Automatic Control of Hydraulic and Pneumatic Macines and Technology	2
	Elective courses - students elect a course		3423	Diploma Practice	4
3414	Irrigate Techniques	5	3424	Diploma Project	10
3415	Technology for Detail's Restore	5			
	Elective courses - students elect a course				
3416	Marketing	4			
3417	Fundamentals of Management	4			
	Total:	***30***		***Total:***	***30***

Total for the training course: 240 ECTS credits

1024 Mathematics I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department AG, Faculty of Natural Science and Education
Lecturers:
1. Assoc. Prof. Docho Trifonov Dochev, PhD, Dept. AG, tel.: 888-489
2. Assoc. Prof. Stoycho Dimitrov Dimitrov, PhD, Dept. AG, tel.: 888-453

Abstract:
The course is a basic one in the engineering training. It uses the mathematical knowledge obtained in the secondary school and extends it on a higher level. It is essential for the study of other mathematical subjects, Physics, Mechanics, general and special engineering courses.

Course content:
Complex numbers and polynomials. Systems of linear equations and determinants. Matrix calculus. Line in plane. Lines and planes in space - forms of determining and common positions. Linear space and linear operators. Second order curves and surfaces. Functions and sequences. Limits and derivatives. Basic theorems of differential calculus. Applications of derivatives for investigating functions. Indefinite integral – definitions and basic properties; methods for calculation - integration by parts, integration by substitution, integration of rational, irrational functions.

Teaching and assessment:
The theoretical basis of the topics presented at lectures is acquired at seminars through solving problems; individual practicing and reinforcing is accomplished by weekly assignments. Three written tests are administered and students with grades above 4.50 are exempt from an exam and their mark is formed on the basis of an interview with the lecturer. Students are given six problems at the exam and they have to solve at least three to pass.
Each student is required a course assignment. Its successful presentation at seminars and a regular class attendance are a necessary prerequisite to have a term validated.

1038 Informatics I

ECTS credits: 5 **Weekly classes:** 1lec+0sem+0labs+3ps+ca
Assessment: continuous assessment **Type of exam:** test
Departments involved: Department IIT, Faculty of Natural Science and Education
Lecturers:
1. Assoc. Prof. Margarita Stefanova Teodosieva, PhD, Dept. IIT, tel: 888-464, e-mail: mst@ami.ru.acad.bg
2. Principal Assistant Marko Toshev Markov, Dept. of IIT, tel.: 888-754, e-mail: markov@ami.ru.acad.bg

Abstract:
The course is aimed at introducing students to the computer and its components as a technical aid and to the most widely spread programme products - operating systems, word processing systems, systems for processing information in spreadsheets, data bases, information systems, artificial intellect systems, computer graphics systems, data base management systems. The aim of the practical classes is to provide students with knowledge on the use of the most widely spread application programme systems – Windows, Word, Excel.

Course content:
History and classification of computers. Hardware. Operating systems. Application software. Word processing systems. Spreadsheets. Data bases: relation data base, data base management systems, data exchange and computer networks.

Teaching and assessment:
Lectures are carried out in blocks of two periods every other week. Practical classes are carried out in computer laboratories and represent practice under the guidance of a lecturer. At the beginning of the class ten minutes are allotted for the control of the students' knowledge: by a test, short written or oral testing. Students' practical knowledge for work with the studied programme product is controlled and assessed at the end of each part of the course. The course assignments require from students to show they are able to work individually with the studied at the laboratory classes programme systems. They are also assessed. At the end of the semester students' theoretical competence is controlled by a test, including 100 questions, covering the whole studied material.
The term mark is formed on the basis of the results from the main test, the grade for the performance at the practical classes and the course assignments average grade.

0410 Chemistry

ECTS credits: 4 **Weekly classes:** 2lec+0sem+1labs+0p+p
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Dimitar Jordanov Pavlov, PhD, Dept. RRCT, tel.: 888-733, e-mail: chimia@ru.acad.bg
Abstract:
The course helps students obtain particular knowledge on the structure of substances, chemical phenomena and processes, directly connected with the field of engineering. Laboratory exercises simulate these processes and provide students with the necessary practical experience. The course achieves leveling of the students' previous knowledge on chemistry and develops useful and skills and abilities for the next courses of Physics, Materials and Manufacturing Engineering, Strenght of Materials, etc.
Course content:
Structure of substances. Kinetics of chemical processes. Chemical equilibrium. Chemical thermodynamics. Metals and alloys. Electrochemical processes. Dispersions. Surface phenomena. Review and classification of the main groups of organic compounds used in engineering practice. Isomerism of the organic compounds and its influence on their properties.
Teaching and assessment:
Laboratory classes provide students with the opportunity to receive visual notion about important theoretical issues, such as: chemical properties of metals and alloys, the work of electric cells, electrolysis, surface phenomena, etc. There is a test control on basic topics at the beginning of each class, which could be either written or oral, with duration of about 15 minutes.

0380 Applied Geometry and Engineering Graphics I

ECTS credits: 5 **Weekly classes:** 1lec+0sem+0labs+2p+cw
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EG, Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Nikola Stoyanov Nikolov,PhD, Dept. EG, tel.: 888-491
Abstract:
The course introduces students to the methods and means of presentation of three-dimensional objects by plane images and to the ways of analysis, transformation and optimization of graphic images. A necessary precondition is basic knowledge on geometry and technical drawing. It develops students' steric imagination, as well as skills to cope with graphic and technical information. This subject is a base for further learning of other technical branches of science.
Course content:
Types of projection. Complex drawing. Reciprocal position of principal geometric objects. Transformation of a complex drawing. Methods for projection. Reciprocal crossing of geometric objects. Images in drawings. Axonometric projection.
Teaching and assessment:
The theory, presented at lectures by didactic means, provides the needed base for practical classes and course assignments. During the practical classes problems are solved, instructions are given, examples are considered. Students are required to do a course assignment, which represents a number of plans with different images of steric objects.
The final course mark is formed on the basis of the grades of two tests and the course assignment results. The requirements to have a term validated are regular class attendance and course assignment submission.

2073 Material Science

ECTS credits: 4 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department MME, Faculty of Mechanical and Manufacturing Engineering
Lecturers:
1. Prof. Mitjo Jordanov Kanev, MSc(Eng), PhD, Dept. MME, tel.: 888-688, e-mail: kanev@ru.acad.bg
2. Prof. Rusko Ivanov Shishkov, MSc(Eng), PhD, Dept. MME, tel.: 888-204, e-mail: rish@ru.acad.bg

Abstract:
This course studies the composition, structure and property connections in materials, which are used both in techniques and daily life, as well as the opportunities, granted to change and redirect these properties in a certain way. Basic knowledge on physics and chemistry is needed. Students acquire useful knowledge and experience, which can be applied in other subjects connected with material processing or new product construction.

Course content:
Main notions on the structure and properties of metal, dielectrical and semiconductor crystal materials. Structure analyzing methods. One-, two-, and multi-component systems. Balance equilibrium diagrams of conditions. Regularity of crystallization and transformations in hard condition – mechanisms and kinetics. Metastable conditions. Iron, steel and cast iron, copper, titanium, aluminum and their alloys. Other kinds of metal material. Ceramics and metal ceramics. Polymeride materials. Composition materials.

Teaching and assessment:
Theoretical knowledge taught at lectures is assimilated, specified and improved during the laboratory classes. They concern mainly the material structure and the thermal methods of its change. Three tests are appointed during the semester. The test results are reflected in the exam's assessment.

0076 Technological Training Practice

ECTS credits: 3 **Weekly classes:** 0lec+0sem+0labs+4ps+0
Assessment: colloquium **Type of exam:** practical
Departments involved: Department MME, Faculty of Mechanical and Manufacturing Engineering
Lecturers:
Prof. Georgi Stefanov Popov, MSc(Eng), PhD, Dept. MME, tel.: 888-314, e-mail: gpopov@ru.acad.bg

Abstract:
The course provides preliminary knowledge and practical skills on the main working processes in the mechanical-engineering manufacture, machine equipment and tool facilities in the manufacturing organization. The acquired knowledge and skills serve as a basis for continuing with the general and specific courses of the degree and the active educational forms connected with them.

Course content:
The course is practically oriented. The seminar classes discuss different technological processes and operations in the field of metal and mechanical engineering technologies (metal casting, welding, plastic deforming, cutting, metal cutting machines and instruments). The practical classes are connected with performing manual and machine molding operations, manual electric arc welding and cutting, open manual and machine forging, universal lathe work, drilling, crosswise-grating machine work, milling and performing of manual locksmith (fitter) operations.

Teaching and assessment:
The practical exercises are held in a teaching laboratory, where the working places are prepared in advance. Students are divided in groups, each of which uses a separate working place. Control is carried out through an oral exam. A certain practical assignment is carried out, as well as a short discussion on a theoretical issue.

0383 English, 0843 German, 0950 French, 0983 Russian

ECTS credits: 4 **Weekly classes:** 0lec+0sem+0labs+4ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department FL, Faculty of Law
Lecturers:
English: 1. Sr Lecturer Iliyana Gancheva Benina, Dept. FL, e-mail: Ibenina@ecs.ru.acad.bg
2. Sr Lecturer Tsvetelina Andreeva Nedelcheva, Dept. FL, e-mail: tsandreeva@ecs.ru.acad.bg
German: 1. Sr Lecturer Tinka Angelova Karaivanova, Dept. FL, e-mail: tkaraivanova@ecs.ru.acad.bg
French: 1. Sr Lecturer Roumyana Ivanova Milanova, Dept. FL, e-mail: rmivanova@ecs.ru.acad.bg
Russian: 1. Sr Lecturer Iliyana Gancheva Benina, Dept. FL, e-mail: Ibenina@ecs.ru.acad.bg
Abstract:
The foreign language module is aimed at achieving communicative competence in the area of the subject specialism and the future job. The teaching objectives comprise the development of reading comprehension skills to handle specialist texts and the acquisition of communication skills to interact successfully in professional settings and everyday situations.
Course content:
Meeting people. Talking about the present and the past. Plans. Describing objects and places. Comparing things. Searching for information in catalogues. Linking facts and ideas. Applying for a job.
Teaching and assessment:
To acquire the necessary language knowledge and to develop skills in using the language as a means of communication a wide range of authentic and specially constructed texts (i. e. articles, diagrams and tables, brochures and catalogues etc.) as well as audio and video materials are used. In class students participate in role plays, pair and group activities and discussions. Continuous assessment involves at least two written tests and oral testing as well.

2071 Mechanics I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineering
Lecturers:
1. Assoc. Prof. Georgi Konstantinov Gabrovski, MSc, PhD, Dept. TM, e-mail: ggabrovski@ru.acad.bg
2. Assoc. Prof. Venko Georgiev Vitliemov, MSc, PhD, Dept TM, tel.: 888-572, e-mail: venvit@ru.acad.bg
Abstract:
The students are acquainted with the methods of studying various kinds of rigid body motions, different force transformations, and mechanical interactions in rigid bodies in equilibrium. The course provides basic knowledge for structure modeling, mechanisms, dynamic processes and gives engineering methods for practical problem solutions. Preliminary knowledge in Mathematics and Physics is necessary for this course. The discipline is fundamental for the engineering degree courses and teaches analysis and design of mechanical structures and machines.
Course content:
Particle kinematics. Translational, rotational, and plane rigid body motion. Relative motion of a particle. Equilibrium of a rigid body. Reduction of a system of forces. Equilibrium of a multi-body system. Equilibrium in presence of friction. Gravity center.
Teaching and assessment:
The theoretical basis of the topics is elucidated in lectures and it is illustrated by examples. The students solve problems in practical classes. They apply the learned methods in their course work, which is assigned individually to each student. The course work is controlled and graded by means of a grading system and it is submitted according to a schedule. The students can participate voluntary in two tests to gain higher grade. If a student has higher than 50% of the maximum grade, he or she can get the final grade and can be exempted from the exam. The exam consists of 4 questions and 4 problems. The gained grade in the semester is accounted for in the final grade. Regular attendance of classes and course work submission are required for semester passing approval.

2068 Mathematics II

ECTS credits: 6 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department MA, Faculty of Natural Science and Education
Lecturers:
Prof. Stepan Agop Tersian, D Maths, Dept. MA, tel.: 888-226, 888-587
Abstract:
The course acquaints students with basic notions of mathematical analysis, necessary for further study of Mathematics Part III, Applied Mathematics, theoretical basis of Electrical Engineering, Mechanics, etc.
Course content:
Basic topics: Functions of more than one variable; Differential geometry in plane and space; Ordinary differential equations; Multiple integrals; Field theory; Numerical and functional series.
Teaching and assessment:
At lectures students are introduced to main theoretical issues, logically presented and provided with appropriate examples. The theoretical basis of the topics presented at lectures is acquired at seminars through solving problems, having theoretical and application character. Three written tests are administered during the term. The final control is carried out by a written exam consisting of solving problems and answering theoretical questions. During the term consultations are held - two classes per week. The requirement to have a term validated is regular seminar attendance.

0002 Informatics II

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+1ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department IIT, Faculty of Natural Science and Education
Lecturers:
1. Assoc. Prof. Margarita Stefanova Teodosieva, PhD, Dept. IIT, tel: 888-464, e-mail: mst@ami.ru.acad.bg
2. Principal Assistant Marko Toshev Markov, Dept. IIT, tel.: 888-754, e-mail: markov@ami.ru.acad.bg
Abstract:
Students are introduced to one programming language. They work out elementary algorithms, which are aimed at the development of their logical thinking. The topics of lectures present main algorithm structures – branch, cyclic recurrence, multiple choices. Various types of data are analyzed: scalar data, structured data. The problems solved find application in engineering practices. At practical classes programmes are input and executed.
Course content:
Algorithms: main notions. Branch algorithms. Cycle algorithms. One dimension arrays of algorithms. Two dimension arrays of algorithms. Structure of a Pascal programme. Types of data in Pascal. Data input and output. Branch statement, multiple choice statements. Cycle statements. Types of arrays, work with arrays. Procedures and functions. Strings. Records. Files. Text files.
Teaching and assessment:
Lectures are carried out in blocks of two periods per week.
The classes are practical ones with duration of two periods every other week. At the beginning of the class the assistant-professor first explains the issues which students haven't been able to understand. Then they solve problems on algorithm compiling and write programmes. At the end of the class a short test is carried out.

2069 Physics

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** written and oral
Departments involved: Dept. of Physics, Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
1. Assoc.Prof. Nadejda Marinova Nancheva, PhD, Dept. of Physics, e-mail: nancheva@ru.acad.bg
2. Assoc.Prof. Parvoleta Ivanova Docheva, PhD, Dept. of Physics, e-mail: docheva@ru.acad.bg

Abstract:
The course aims at acquainting the students with the physical character of processes and phenomena in nature and the methods for their investigation, with the general properties of matter and the material objects. The laboratory exercises aim at creating skills for experimental investigation of physical phenomena and solving physical problems.

Course content:
Measuring physical quantities. Kinematics and dynamics of material point and rigid body. Interaction in nature. Work and energy. Mechanical preservation laws. Special theory of relativity. Molecular physics and thermodynamics. Transformation phenomena. Periodic processes and waves. Electric field and electric current. Magnetic field and electro-magnetic induction. Optical phenomena. Atoms, atom nuclei. Elementary particles.
Contemporary investigation theories and methods in physics and practical applications of the physical effects and phenomena are accented.

Teaching and assessment:
Lectures give the main theoretical material, supported by some demonstrations of physical phenomena and processes. At the laboratory classes the students work independently and investigate particular physical phenomena.
The knowledge of lecture material and laboratory classes is tested regularly. If the results of this assessment are good, the students are allowed to sit for the exam. The final assessment is formed after a discussion with the student.
At the exam the students answer two theoretic questions and do a laboratory exercise.

2070 Applied Geometry and Engineering Graphics II

ECTS credits: 4 **Weekly classes:** 1lec+0sem+0labs+2ps+cw
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EG, Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Violeta Stoyneva Encheva, PhD, Dept. EG, tel.: 888-846

Abstract:
The course analyzes the rules for doing and making out plans, schemes and technical text documents; norms and instructions of Bulgarian and international standards considering drawing up technical documents. It develops students' steric imagination and their skills to cope with technical documents. This course is a base for further study of other technical branches of science and doing course projects and a diploma paper.

Course content:
Different connections: threaded, key, spline and permanent connections. Drawing of a machinery piece – content, composition, images, dimensions, tolerance of dimensions, method of indicating surface texture, text information. Special documentation of some technical products. Drawings of assembled units. Item list. Text documents. Schemes. Building drawings.

Teaching and assessment:
The theory, presented at lectures by didactic means, provides the needed base for practical classes and course assignments. During practical classes problems are solved, instructions are given, examples are considered. Students are required to do a course assignment, which represents a number of plans with different images of steric objects.
The final course mark is formed on the basis of the grades of two tests and the course assignment results. The requirements to have a term validated are regular lectures and classes attendance and course assignment submission.

0414 Training Practice - HPQ

ECTS credits: 4 **Weekly classes:** 0lec+0sem+0labs+6ps+0
Assessment: colloquium **Type of exam:** oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. G. Popov, PhD; 2. Assoc. Prof. V. Bobilov, PhD; 3. Principal Assistan K. Tuzharov, PhD; 4. Ass. I. Nikolaev, Assoc; 5. Assoc. Prof J. Demirev, PhD
Abstract:
The course of Training Practice is aimed at introducing the first year students to the used in practice elemental base of hydraulic and pneumatic equipment, as well as to transport machines and mechanisms, road construction and agricultural equipment, where the above equipment is used.
Course content:
Purpose, mechanism, working principle, advantages and disadvantages, classification of: 1. Turbo pumps, turbo compressors and ventilators. 2. Special pumps. 3. Positive displcement pumps and motors, positive displacement compressors and rotary low-pressure compressors. Hydraulic and pneumatic drives /HPD/ in engineering. Feed sources and executing mechanisms of hydraylic and pneumatic drives. Elements of control and auxilliary appliances. Practical introduction to the applications of HPD in machine. Refrigerating installations. Introduction to an industrial heating installation in an enterprise where such is used. Steam boiler and heating installations. Practical introduction to a particular steam boiler and heating installations. Use of HP equipment in technical processes for which the machines have been constructed.
Teaching and assessment:
At the beginning of the classes students are introduced to the mechanism and working principles of the above mentioned machines using various visual aids /posters, slides, videos, etc./. The classes finish with observation of and demonstrative work on samples of these machines.
There is a test control on basic topics at the beginning of each class, which could be either written or oral and the final mark is formed on the basis of the test results.

2530 Electrical and Electronic Engineering

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** oral
Departments involved: Dept. TEEEM, Faculty of Electrical and Electronic Engineering, and Automation
Lecturers:
1. Assoc. Prof. Georgy Rashkov Georgiev, PhD, Dept. TEEEM, e-mail: grashkov@ru.acad.bg
2. Assoc. Prof. Svilena Vasileva Todorova, PhD, Dept. TEEEM, tel.: 888-224, e-mail: svito@ru.acad.bg
3. Assoc. Prof. Venelin Iliev Iakov, PhD, Dept. TEEEM, tel.: 888-269
4. Principal Assistant Docho Rusev Ivanov, Dept. TEEEM, tel.: 888-501
Abstract:
The course of Electrical and Electronic Engineering is a part of the curriculum for the bachelor degree of non-electrical degree-courses. The aim of the course is to introduce students to main theoretical issues in the fields of Main Laws of the Theoretical Electrical Engineering, Electrical Measurement, of Electrical and Non-electrical Quantities, DC and AC Electrical Machines, Electronic semiconductors and schemes. Preliminary knowledge in Physics and Mathematics is necessary. The knowledge on Electrical and Electronic Engineering is used in the next courses and when preparing the graduation work.
Course content:
Basic elements and magnitudes of electrical circuits: DC and AC, three-phase and magnetic circuits, electrical measurements of electrical and non-electrical quantities, DC machines, transformers, synchronous and induction AC machines. Main electronic devices: diodes, thyristors, transistors and operational amplifiers. Amplifiers. Digital networks.
Teaching and assessment:
The teaching process is organized in lectures and laboratory classes. At laboratory classes students obtain practical knowledge. There is a test control on basic topics at the beginning of each class, which could be either written or oral, having 15 minutes duration. The test control results purpose is to help the exam performance.

2402 Strength of Materials I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+cw
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1.Prof. Hristo Nikolov Kuyumdjiev, PhD, Dept. TM, tel.: 888-489, e-mail: hnk@ru.acad.bg
2.Assoc. Prof. Yordan Asenov Nikolov, PhD, Dept. TM, tel.: 888-489, 447-229, e-mail: jan@ru.acad.bg
3.Assoc. Prof. Dobril Hristov Hristov, PhD, Dept. TM, tel.: 888-474, e-mail: dhristov@ru.acad.bg
Abstract:
The course provides students with a system of knowledge about the methods of assessment by calculating the advisability, reliability, and effectiveness of the shapes and dimensions of structural elements. Preliminary knowledge in basic Mechanics (Statics) and Mathematics are necessary. The course is fundamental for the further studies of other subjects.
Course content:
Introduction. Basic terms and principles, stress, deflections, strain. Internal forces in trusses. Tension and compression. Testing of materials, basic mechanical properties. Shear and crushing. Torsion of circular and noncircular bars. Moments of area of cross sections. Plane bending and 3D bending, deflections in bending, deflected axis of a beam. Non-axial tension and compression. Buckling of struts.
Teaching and assessment:
The theoretical knowledge of the topics, presented in the lectures, is applied by the students in the practical exercises. The students work out an individually assigned complex course assignment, which is graded on a two-week schedule. The students participate in three tests, which are graded. The final grade is formed from the grade of the tests and from the grade of the course work defence. Regular class attendance and course work submission are the requirements for semester passing approval.

2531 Mechanics II

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+1ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1. Assoc. Prof. Georgi Gabrovski, PhD, Dept. TM, tel.: 888-474, e-mail: ggabrovski@ru.acad.bg
2. Assoc. Prof. Venko Vitliemov, PhD, Dept. TM, tel.: 888-572, e-mail: venvit@ru.acad.bg
3. Assoc. Prof. Stojan Stojanov, PhD, Dept TM, tel. 888-572, e-mail: sgstoyanov@ru.acad.bg
Abstract:
Systematic knowledge of the methods and the ability to investigate the mechanical interaction and the motion of rigid bodies as well as dynamic processes in mechanical multi-body systems are built up in this course. The aim of the course is to teach students how to construct dynamic models of mechanical systems in order to solve practical engineering problems. Preliminary basic knowledge in Mathematics and Mechanics I is necessary. The course gives the basis of knowledge for the following disciplines: Strength of Materials, Applied Mechanics, Machine Elements, Lifting and Transportation Machinery.
Course content:
Newton's law. Basic problems of the particle dynamics. D'Alembert's principle. Linear oscillation of a particle. Relative motion dynamics of a particle. Dynamic characteristics of a particle and of a multi-body system. Theorems of the dynamics. Mass inertia moments and centrifugal inertia moments. Kinetostatics. Dynamics of a body in translational, rotational, and plane motion. Impact theory.
Teaching and assessment:
The theoretical basis and the methods of dynamics are explained in the lectures. Problems are solved in the practical classes. There is a complex course work problem individually assigned to each student. The course work is scheduled for assessment, which is based on a specific grading system. The students can participate in up to 2 written tests included in the grading system. If at the end of the semester, the students have higher than the average grade they can get this grade as a final and be exempted from the exam. The exam consists of solving problems and answering short theoretical questions. The semester grade is accounted for in the final grade. Regular attendance at practical classes and accepted course work are required for semester passing approval.

2529 Fluid Mechanics

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Ivanka Mitkova Jeleva, PhD, Dept. HTHPM, tel.: 888-582
Abstract:
The course introduces students to the main relationships and physical treatment of the phenomena analyzed in hydrostatics, kinematics and fluid dynamics from the perspective of their application in engineering practice. Basic knowledge on Mathematics, Physics, Theoretical Mechanics is a prerequisite for the acquiring of Fluid Mechanics and it in its turn is a prerequisite for the acquiring of hydraulic and pneumatic machines and drives, agricultural machines, internal combustion engines, etc.
Course content:
Main properties of fluids. Equilibrium of fluids. Kinematics and dynamics of ideal and real fluids. Hydraulic resistances and calculation of pipelines and channels. Resistance of streamlined bodies and wings. Liquid leakage from openings, end-pieces, jets.
Teaching and assessment:
The topics of the lectures provide students with the opportunity to get acquainted with main laws of fluid mechanics preceding laboratory exercises, during which the obtained knowledge is consolidated and its practical application is clarified. For each laboratory class students work out a written statement. The exam starts with a written working out of two questions from the course syllabus and a practical task solving, followed by an oral testing. Students work out a course assignment by stages, consisting of solving particular tasks from the studied material. The requirement to have a term validated is submission of the course assignment and the written statements from the laboratory classes. The exam is in a written form, including short answers to theoretical questions and a solution of a certain number of problems.

3268 Mathematics III

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Ljuben Georgiev Valkov, PhD, Dept. NMS, tel.:888 466, e-mail: vulkov@ami.ru.acad.bg
2. Principal Assistant Violetka Atanassova Kostova, Dept. NMS, tel.:888 466, e-mail: leta@nami.ru.acad.bg
Abstract:
The discipline is aimed at providing students with skills for processing data, obtained from experiments in the field of engineering, which requires the use of:

- Relativity theory mathematical apparatus
- Mathematical statistics methods for experimental data processing
- Methods for planning an experiment

Course content:
The course includes elements from: relativity theory, mathematical statistics, regression and correlation analysis, linear algebra numerical methods and mathematical analysis.
Teaching and assessment:
The training process is organized in lectures, seminars and practical classes. At lectures theoretical issues are presented and illustrated with appropriate exemplary problems, connected with students' degree course. At seminars students solve problems, connected with engineering practice and requiring the application of the theory of relativity mathematical apparatus, as well as mathematical statistics.
Each student is required to do an individual course assignment.
The final course mark is formed on the basis of the following formula:
Final course mark= 2/3 the grade of the test + 1/3 the grade of the course assignment.

2532 Technology of Materials

ECTS credits: 5 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department MME, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1. Assoc. Prof. Georgi Ivanov Nikolov, MSc(Eng), PhD, Dept.MME, tel.: 888-311, 888-210
2. Assoc. Prof. Mladen Tzvetanov Trifonov, PhD, Dept. MME, tel.: 888-206, E-mail: mtr@ru.acad.bg

Abstract:
The subject aims at supplying knowledge and skills on the fundamentals of the following technological processes – casting plastic deformation and welding as well as the fields of their application where machine manufacturing and some non-machine manufacturing materials and goods are processed. Some general knowledge on physics, chemistry and strength of materials is a necessary prerequisite for studying this subject. It is basic for studying other subjects in the field of mechanical engineering technologies.

Course content:
Main principles of the casting technology – a process diagram, working out of a casting form, casting of metal materials, special methods for getting mouldings. Main principles of the plastic deformation technology – a process diagram methods of volume and sheet deformation, special deformation methods, plastic deformation of metal materials. Main principles of welding technology – a process diagram methods of welding through melting and pressure special welding methods, thermal cutting, welding of metal materials. Fundamentals of other materials' processing: plastic and metal-ceramic materials.

Teaching and assessment:
Training is carried out through lectures and laboratory classes. Three tests are scheduled during the lectures. The final exam includes three written issues with an oral discussion. Final assessment is worked out on the basis of the tests and exam results.

2543 Machine Elements I

ECTS credits: 6 **Weekly classes:** 2lec+0sem+1labs+1ps+cw
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department MSME, Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Petar Jivkov Stamatov, PhD, Department MSME, tel.: 888-592, e-mail: stamatov@.ru.acad.bg

Abstract:
The discipline performs the role of a linking unit between a number of general-theoretical subjects / Mechanics, Strength of Materials, Theory of Machines and Mechanisms, Applied Geometry and Engineering Graphics, Materials and Manufacturing Engineering, Metrology and Measuring Equipment, etc./ and some engineering courses, included in the main module. The course introduces students to the theoretical fundamentals of general-purpose machine elements and to the methods for their calculation and construction.

Course content:
Volumetric and surface strength of machine elements. Fatigue limit. Types of joints: threaded, riveted, welded, key, clamp joints. Rotary motion elements: axes, shafts, friction and anti-friction bearings, controlled, uncontrolled and automatic couplings.

Teaching and assessment:
Lectures are presented to all groups of students of the degree course at one and the same time. Students' current work on the lectured material is controlled trough two tests during the semester. Practical classes are carried out in a computer laboratory equipped with 12 modern computers. Students have a wide variety of didactic materials at their disposal: charts, a rich collection of standards and catalogues, samples of machine elements, slide and over-head projectors. Laboratory classes demonstrate visually a number of theoretical issues, already presented at the lectures. There is a test control on basic topics at the beginning of each laboratory class and the results, processed on a computer, are presented in standard report forms. Students are required to do two individual course assignments during the semester: one on a screw-jack design and another one – on a friction clutch design. The course assignments are supervised at weekly consultations, controlling the accomplishment of the graphic and calculation parts. Students defend both course assignments. The total continuous assessment mark on Machine Elements I is formed on the basis of the tests and course assignments results.

2544 Strength of Materials II

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+1ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1. Assoc. Prof. Yordan Asenov Nikolov, MSc(Eng), PhD, Dept. TM, tel.: 888-489, e-mail: jan@ru.acad.bg
2. Assoc. Prof. Dobril Hristov Hristov, MSc(Eng), PhD, Dept. TM, tel.: 888-474, e-mail: dhristov@ru.acad.bg

Abstract:
The subject provides students with a system of knowledge about the methods to assess by calculations the advisability, reliability, and effectiveness of the shapes, dimensions, and the material of structural elements. Preliminary knowledge in basic Mechanics and Mathematics are necessary. The discipline is fundamental for other educational courses for design of specific machines.

Course content:
Introduction in theory of stress and strain. Failure criteria. Energy methods (Castegliano's theorem) for deflection calculation in trusses. Statically indeterminate systems. Unit force method. Dynamic loading. Buckling of struts. Thick tubes and high-velocity rotating disks.

Teaching and assessment:
The theoretical basis of the topics, presented in the lectures, is applied by the students in the practical classes by solving problems for training. Some problems are well illustrated in the laboratory exercises. The students work out an individually assigned complex course work, which is graded on two-week schedule. The students can voluntarily participate in three tests and the gained grade, if it is above 50% of the maximum, leads to final grade, so the student is granted the right to miss the exam. The exam consists of two problems and three questions. The semester grade is accounted for in the final grade of the exam. Regular attendance of classes and course work submission are the requirements for semester passing approval.

2430 Theory of Mechanisms and Machines

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department TMM and HHMT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Atanasov Koev, PhD, Dept. TMM and HHMT, tel.: 888-486, E-mail: pkoev@ru.acad.bg

Abstract:
This subject introduces the students from this department to the methods of investigation (analysis) and projecting (synthesis) of machines and mechanisms according to structural, geometrical and dynamic indications. The subject forms a basis for mechanism and machine studying with concrete application.

Course content:
Structure and classification of mechanisms. Leverage (linkage), cam mechanism and gear transmission kinematics. Theory of gear trains with involute toothed gears. Kinetostatics of mechanisms. Dynamics of the machine unit (aggregate). Balancing of leverage mechanisms and rotors.

Teaching and assessment:
The essence of the methods of mechanism synthesis – analysis is presented at lectures. Specific problems for mechanism investigation are solved during the practical classes. Overhead projectors, computer simulations for motion passing and transformation, mechanism models in motion (metal, polymethilmethacrylate, paxoline for showing through a projector), as well as real constructions are used for presenting the matter in a real way. Learning assimilation is controlled through tests, assignments and an individual complex course project, which is presented and assessed gradually. Continuous assessment is formed on the basis of the test, the assignments and the course project.

2443 Theory of Mechanisms and Machines - Course Project

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment: exam **Type of exam:** written
Departments involved: Department TMM and HHMT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Ognyan Lyubenov Alipiev, PhD, Dept. TMMHHET; tel.: 888-593, e-mail: oalipiev@ru.acad.bg
2. Assoc. Prof. Tanya Petkova Grozeva, PhD, Dept. TMMHHET; tel.: 888-258, e-mail: tgrozeva@ru.acad.bg
3. Assoc. Prof. Petar Atanasov Koev, PhD, Dept. TMMHHET; tel.: 888-486, e-mail: pkoev@ru.acad.bg
4. Assoc. Prof. Dimitar Ivanov Zafirov, PhD, Dept. TMMHHET; tel.: 888-428, e-mail: dzafirov@ru.acad.bg

Abstract:
The goal of the course project is to help students acquire and rationalize the general methods of research (analysis) and design (synthesis) of different types of mechanisms and machines. It aids the students in building practical skills to discover the main features of mechanisms and prepares them for independent solving of specific engineering problems. The project in Theory of Mechanisms and Machines (TMM) is the first stage of machine-building design, connecting the knowledge acquired in a number of general science courses with the course design of real technical objects, studied in specialized courses.

Course content:
A machine unit is designed in which the driving and the operating machines are an electric motor and a flat leverage mechanisms respectively, joined through involution gear. The course project includes the following stages: structural and kinematical analysis of leverage mechanism; kinetostatic investigation of leverage mechanism; optimization geometric synthesis of gear mechanism. It consists of a calculation part, structured as explanatory calculation notes and a graphic part with a specified number of blueprints.

Teaching and assessment:
The course project is developed individually, using detailed methodological guidance and calculation and simulation software developed for this purpose by the Department staff. The work on the separate stages is carried out both at home and in the project lab, equipped with modern computers, multimedia, and a number of models in motion and real constructions of mechanisms. The calculation and graphic part of the project solutions are controlled in stages and evaluated based on their reliability and the way they have been explained, as well as on the analysis of the results obtained.

2546 Heat Technology

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Valentin Vassilev Bobilov, PhD, Dept. HTHPM, tel.: 888-844, e-mail: bobilov@ru.acad.bg

Abstract:
The subject consists of three parts: Technical Thermodynamics, Heat Transfer and Applied Heat Technology. The aim of the course is to provide future specialists with the necessary engineering knowledge on the main laws of thermodynamics and heat transfer and to create practical skills for solving real application technical problems from the areas of drying, refrigerating and heating and ventilation equipment.
The course syllabus also includes topics from the field of non-conventional energy sources and the systems for utilization of waste heat flows.

Course content:
Main notions: thermodynamic system, heat equilibrium, work and heat of processes. Main laws of ideal gas. State equation. Mixtures of indifferent ideal gases. First law of thermodynamics. Main thermodynamic processes. Second law of thermodynamics. Karno's cycling process. Serviceability of thermodynamic systems. Real gasses. Water steam and water steam processes. Renkin's cycle. Humid air thermodynamic properties. Leakage of gasses and steam trough a nozzle and a diffuser. Throttling. Cycles of working machines and heat motors. Cycle of a compressor refrigerator machine. Heat conduction. Convection heat exchange. Radiant heat exchange. Laws of radiant heat exchange. Complex heat exchange and heat transfer. Heat exchanging appliances. Fuels and combustion processes. Steam and water heating boilers. Heat balance and efficiency coefficient. Steam and gas turbines. Heat energy consumption for technological processes, heating, ventilation and air-coditioning. Alternative and secondary energy sources.

Teaching and assessment:
Lectures provide students with theoretical knowledge. A part of the laboratory classes are carried out on laboratory installations, another part – on real industrial objects. For each laboratory class students work out a written statement, including processing and analysis of the experimental data. The assessment is done on the basis of students' performance during the laboratory classes and their written statements. The exam is in written form, followed by an oral testing. The final mark is a complex one, based on the results of the exam and the student's performance at the laboratory classes.

2555 Technology of Engineering

ECTS credits: 5 **Weekly classes:** 3lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** written
Departments involved: Department TECM, Faculty of Mechanical and Manufacturing Engineering
Lecturers:
1. Assoc. Prof. Stefan Vesselinov Vichev, PhD, Dept. TECM, tel.: 888-451, e-mail: svichev@ru.acad.bg
2. Assoc. Prof. Mikhail Kolev Karshakov, PhD, Dept. TECM, tel.: 888-508, e-mail: mkarshakov@ru.acad.bg
Abstract:
The subject provides general knowledge and skills on the methods, instruments and machines for mechanical processing of machine details. It analyzes the design stages of technological processes.
Course content:
General information and theoretical base of the process of cutting metals. Metal cutting machines and instruments. Methods and processes for treatment through shavings removal: turning, scraping, shaping, drilling, reaming, pull-broaching, push-broaching, milling, grinding, carving, gear-tooth milling. Design of technological processes for mechanical processing.
Teaching and assessment:
Students are introduced to main theoretical issues at lectures. The use of the recommended literature and the active participation at laboratory classes are prerequisites for the students' individual work, which is of great importance. The questions of the exam syllabus are divided into three groups according to their difficulty, which is aimed at raising the efficiency of their exam preparation. Depending on which group their knowledge corresponds to, they receive a relevant exam mark

3272 Economics

ECTS credits: 3 **Weekly classes:** 3lec+1sem+0abs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department Economics, Faculty of Business and Management
Lecturers:
Assoc.Prof. Djanko Hristov Minchev, PhD, Dept. Economics, tel.: 888-557, e-mail: dminchev@ru.acad.bg
Abstract:
The subject is concerned with the general problems, laws and categories of the contemporary market economy. Thus it creates a certain basis for the remaining economic objects. It also gives general knowledge, which is expressed in alternative way of economic viewing, formation and creates abilities for an independent and expert choice in economic surroundings. It has incoming connection with mathematics and outcoming ones with concrete branch and functional economic subjects.
Course content:
Introduction – the economic system and the fundamental economic theory. Main economic issues. Market mechanism. Public sector and taxation. Demand and supply of the individual markets. Consumer demand and behavi out. Manufacture, company assets and expenses. Imperfect competition and supplying. Price formation and incomes depending on production factors: Gross domestic product and economic rise. Economy cycle, unemployment and inflation. Microeconomic balance. Budget policy. Monetary policy. Foreign policy in the open-plan economics.
Teaching and assessment:
Material is taught in two ways – lectures and practical classes, which elucidate and develop further some of the issues discussed at lectures. Continuous assessment is carried out. It includes two test assignments and personal activity during the semester. The final assessment is the average of the above-mentioned.

2561 Machine Elements II

ECTS credits: 3 **Weekly classes:** 1lec+0sem+1labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department MSME, Faculty of Transport Engineering
Lecturers:
Assoc.Prof. Petar Jivkov Stamatov,MSc(Eng),PhD,Dept. MSME, tel.: 888-592, e-mail: stamatov@ru.acad.bg
Abstract:
This subject is a linking unit among a number of general theoretic subjects as “Mechanics”, “Strength of materials”, “Theory of mechanisms and machines” etc. and some technical subjects included in the main course module. The educational course is aimed at studying the theory of the machine elements with a general use and their calculation and construction methods.
Course content:
Mechanical gears. Cylindrical involute tooth gears – geometry kinematics, calculation of contact strength and bending. Planet, wave, conical, screw and worm gears. Reduction gears. Chain and belt gears. Rubbing gears and variable-speed drives.
Teaching and assessment:
Lecture material and the way it is taught is similar to the one described in “Machine elements – part I”. The practical classes are taught in groups in a computer room. Students use boards, a set of standards and brochures, model samples, overhead projectors. The laboratory classes are based on various topics. There are tests for incoming and continuous control. The practical results are computer-processed and are singled out in reports. The course project is computer-controlled in consultation classes each week. Issues are individually solved through projecting cylindric, conic, worm and other reduction gears. The total assessment of this subject includes students’ work on the course assignment of “Machine elements – part II” and is formed on the basis of a written exam which includes two issues for discussion.

2453 Machine Elements II - Course Project

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment: project defence **Type of exam:** oral
Departments involved: Department MSME, Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Petar Jivkov Stamatov, PhD, Dept. of MSME, tel.: 888-592, e-mail: stamatov@ru.acad.bg
Abstract:
The course project aims at acquiring skills at scheme reading, chart drawing of constructions and their loading as well as stabilizing the habits in strength calculation of machine elements, which have been acquired during the course assignment carrying out. The subject is a linking unit between the subject “Engineering graphics” and course projects in the specializing subjects.
Course content:
While developing the course project main issues are explained, connected with the projecting, construction and strength inspection of complex machine elements such as shafts, bearing supports, cylinder, conic and worm tooth transmission.
Teaching and assessment:
The course project is carried as weekly consultations in a computer equipped room. The projecting assignments are individual and various as far as construction and initial parameters are concerned. The project consists of two parts – calculating and graphic. The graphic part includes an assembly drawing, a list of the composition parts and non-standard detail drawings. The calculating part is formed as explanatory.
The project is developed at stages and the lecturer approves each stage.
The defence of the finished work is public. It is assessed and both the result and the course assignment assessments form the final subject assessment.

2454 Metrology and Measuring Equipment

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department MTM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
Assoc.Prof. Branko Dushkov Sotirov, PhD,Dept. of MTM, tel.: 888-493, e-mail: bsotirov@ru.acad.bg
Abstract:
The subject forms the basis of the fundamental technical preparation in the field of "Agricultural machinery and technologies" and "Automotive machinery and technologies". The main purposes of this subject are: to give basic knowledge about the main notions, principles and rules of measuring and examining equipment control, as well as evaluating measuring precision; to introduce the structure and metrological characteristics of measuring appliances; to elucidate the principles, methods and devices of measuring the main physical quantities – length, angle, mass, temperature, time, pressure etc. to create real practical skills for operating certain measuring appliances.
Course content:
Theoretical basis of metrology. Legislative basis of metrology. Measuring and examining equipment control. Main metrological characteristics of SI. Precision classes of SI. Choice of SI. Primary converters used in SI. Length measuring. Measuring appliance for linear dimensions. Angle measuring. Methods and means for control and measuring of form deviations, natural location and roughness of surfaces and axle. Measurement precision. Noise and vibration measurement. Mass measurement. Time and temperature measurement. Mechanic quantity measurement. Measurement of quantities characterizing substances' composition and qualities.
Teaching and assessment:
The lectures introduce different topics fof discussion. They include main principles, methods and devices for measuring different physical quantities. During the laboratory classes students do the following: diagram, method and device choice for measuring a certain technical details; independent work with universal and specific devices for technical measurement, standard and guide work. The laboratory classes are assessed continuously. Each laboratory class is preceded by report preparation. Final assessment is actually the average of the following: the course assignment assessment; measurement practical knowledge and skills assessment and two test papers. The results from the incoming test control are added to the final assessment too.

3399 Centrifugal and axial pumps

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Rusev, PhD
Abstract:
The course is aimed at introducing students to the main theoretical issues, design and exploitation of turbo-pumps. It analyses various types of constructions: centrifugal, mixed-flow and axial pumps. Methods of hydraulic calculation of the working wheels and static elements of these machines. Determination of the hydraulic, volumetric and mechanical losses in them. Characteristics, joint work in a system and their control
Course content:
The course consists of two parts. The first part analyses the theory of turbo-machines: flow kinematics in a working wheel; main equation of turbo-machines; influence of the number of wheel blades on the head; construction of velosity triangles of centrifugal and axial turbo-machine; influence of the blade hinge on the head and degree of reaction; similarity of turbo-machines and specific rotation frequency. Centrifugal pumps – hydraulic calculation of a working wheel with cylindrical and three-dimensional blades; hydraulic calculation of static elements; calculation of various types of losses; axial and radial force on the working wheel and its balancing. Mixed-flow pumps. Axial pumps. Admissible suction head and cavitation of turbo-pumps. Characteristics, joint work and control of turbo-pumps.
Teaching and assessment:
The training process is organized in two forms – lectures and laboratory classes. The topics presented at lectures give students the opportunity to get theoretically familiar with the main studied issues, preceding the laboratory classes. At laboratory classes they are introduced to the schemes of experimental installations, methods of performing experiments and experimental data processing. Laboratory classses analyze various hydraulic machines and elements and students are required to do a written statement for each of them. At the exam, which is in written form, students are given two theoretical questions and one practical problem from the laboratory classes. The mark is formed on the basis of an interview with the lecturer.

3400 Positive Displacement Hydraulic Machines

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Prof. Gancho Gujgulov; Assoc. Prof. Gencho Popov, PhD
Abstract:
The course is a specializing one. Studuing it the students of HPE degree course will obtain knowledge of the types of positive displacement hydraulic machines, of their mechanism, work and theory. They will get theoretically familiar with the design methods of various positive displacement pumps, hydraulic motors and cylinderc.
Course content:
Positive displacement hydraulic machines /PDHM/. Main parameters of PDHM. Charateristics of positive displacement pumps and hydraulic motors, work in a system and control through rotation frequency. Positive displacement non-rotary piston pumps. Piston pumps driven by crank mechanism. Air chambers; indicating diagram, power and efficiency coefficient; control; constructions of piston pumps; design elements. Diaphragm pumps. Hydraulic cylinders. Rotation pumps and hydromotors. Gear type pumps and hydromotors – mechanism, work, classification and application; discharge and discharge pulsation; driving torque of a shaft; choice of parameters and fundamentals of construction; gear pumps with internal gearing. Pumps with rotating pistons. Screw-tupe pumps. Sliding-vane pumps and hydromotors. Double action sliding-vane pumps and hydromotors. Rotary radial-piston pumps and hydromotors. Multistepping hydromotors. Rotary radial-piston pumps and hydromotors; machines with angle-type cylinder block and with angle-type disk. Axial piston pumps with a static cylinder block.
Teaching and assessment:
Lectures are presented in a clssical way with the help of such visual aids as: slides, posters and models. Laboratory classes are carried out on training laboratory installations. For each laboratory class students are required to do a written statement including the experimental data and graphic dependencies.The assessment is based mainly on the students' knowledge of the theoretical issues presented at lectures, taking under consideration their results /in points/ from the course assignment. The exam is in written and oral form and the mark is a complex one.

3401 Water Turbines

ECTS credits: 5 **Weekly classes:** 3lec+0sem+1labs+0ps+p
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Principal Assist. Krasimir Tuzharov , PhD
Abstract:
The course is aimed at providing students with knowledge of main theoretical issues and calculation methods of the flow parts of water turbines, used in modern power engineering. Attention is also focused on the constructions, technological features, characteristics and control of water turbines, as well as on the determination of technical and economic indexes, important for designing of water electrical stations.
Course content:
The course is centered on main issues of water turbines theory - main parameters and water turbines operation modes; similarity and modelling; energy losses; flow kinematics in the reaction turbines flow part; cavitation and frequency limit of rotation; characteristics and control. Reaction turbines flow part and main construction elements – hydraulic and strength calculation methods of turbine chambers, guiding appliances and exhaust pipes, constructive and technological features of these elements. Reaction water turbines - general characteristic and main parameters of Francis, axial-flow and diagonal-flow turbines; working blades profiling methods; reversible turbo-machines. Impulse water turbines: for Pelton’s turbine - hydraulic and strength calculation methods, constructional and technological features; for a double turbine - general characteristic, main parameters and analysis of the working process, head control
Teaching and assessment:
The training process is organized in two forms - lectures and laboratory classes. The topics of the lectures give the students the opportunity to get theoretically familiar with main theoretical issues, preceding the laboratoty classes. At laboratory classes students are introduced to the schemes of experimental installations, methods of performing experiments and experimental data processing. For each laboratory class a written statement is required. The exam starts with a written working-out of two questions, followed by an oral testing.

3402 Industrial Heat Technology

ECTS credits: 5 **Weekly classes:** 3lec+0sem+2labs+0ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Iliya Krastev Iliev, PhD
Abstract:
Industrial Heat Technology is an elective course. It analyzes such issues as: fuels and fuel appliances; energy processing equipment: steam boilers and steam turbines; ways of heat usage for technological, heating, industrial and agricultural ventilation needs; installations for heat energy production and transportation
Course content:
Heat state. Main parameters, state control, thermodynamic processes. First law of Thermodynamics, internal energy, work, heat, analytic expressions, specific thermal capacity, gas mixtures. Second law of Themodynamics, entropy, thermal diagrams, Carnot's cycle, maximum work, exergy – unavailable energy. Thermodynamic processes, ideal gasses, real gasses and steam. Steam state of a working body. Water steam. Gas and steam flow. Nozzels and diffusers. Throttling. Regime types of heat and mass interchange. Complex heat interchang, heat passing. Thermal insulation, heat and mass exchangers. Fuels. Needed air quantity for combustion and combustion products. Steam boilers. Steam turbines. Material and energy balance of a calorific apparatus. Heat consumption for heating and ventilation needs. Water gravitation heating installations, pumping and steam heating installations. Heat consumption for ventilation needs. Thermoelectric power stations. Secondary energy sourses. Non-conventional sources of energy
Teaching and assessment:
At lectures students are introduced to main theoretical issues. Laboratory classes are carried out on laboratory installations, on regular exploitation objects and on computer models, prepared in advance. Students are required to do a written statement for each laboratory class including experimental or testing-simulating data, analysis and processing of the obtained data.
The assessment is based on the students' performance during the laboratory classes and their knowledge of theoretical issues. The mark is formed continuously during the semester.

3397 Special Measuring Appliances

ECTS credits: 3 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
Assoc. Prof. Branko Dushkov Sotirov, PhD
Abstract:
The course is of primary importance for the fundamental technical training of the students of Hydraulic and Pneumatic Equipment degree course. The main aims of the course are: to introduce students to main terms, definitions and units of measuring of thermal, hydrostatic and hydrodynamic quantities; to introduce students to basic direct and indirect methods and principles of measuring and conversion of thermal, hydrostatic and hydrodynamic quantities; to introduce them to the structure, constructions and metrological characteristics of special instruments measuring pressure, vacuum, flow velocity, viscosity, temperature and thermal quantities; to introduce them to the main sources of errors in measuring these quantities and to the methods of increasing measuring precision. to create real practical skills for work with main measuring instruments.
Course content:
Pressure measuring, difference of pressures and vacuum. Liquid-pressure gauges and barometers. Piston and spring pressure gauges. Electric gauges. Vacuum gauges. Flow velocity measuring. Viscosity measuring. Errors in measuring of hydrostatic and hydrodynamic quantities. Temperature and thermal quantities measuring, Celsius scales. Contact thermometers. Thermometers without contact. Measuring of thermal flows. Measuring of pH, dencity, viscosity. Measuring of physical and chemical quantities.
Teaching and assessment:
At lectures such main theoretical issues are presented as: main principles, methods and instruments measuring thermal, hydrostatic and hydrodynamic physical quantities. At laboratory classes each student is given opportunity to do individually the following: to choose a scheme and a method; to obtain practical skills for work with special instruments. There is a test control on basic topics at the end of each laboratory class, aimed at constant stimulating of the individual work during the classes.
At the end of the semester a written test is administered including two theoretical questions and one practical problem, connected with the thematic content of the laboratory classes and with the examples from the lectures. The questions test students' theoretical knowledge and the practical problem – their abilities for creative thinking. The final mark is formed on the basis of an interview with the lecturer.

3403 Fans Turbo-Compressors and Special Pumps

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Rusev, PhD
Abstract:
The course is aimed at introducing students to the special features of theory, design and exploitation of ventilators and turbocompressors. Such main types of constructions are analyzed as: centrifugal or axial ventilators; centrifugal and axial compressors. Hydraulic calculation methods of working wheels and static elements of this type of machines. Determination of: hydraulic, volumetric and mechanical losses in them. Characteristics, joint work in a system and their control.
Course content:
The course is focused on centrifugal, axial and diametrical ventilators – hydraulic dimensioning of the main elements (working wheels and static elements). The course also analyses the composition schemes of axial ventilators and the specific features of their calculation. The discipline also deals with the sourses of noise with ventilator installations and the ways of its decrease. Characteristic types of ventilators, joint work of ventilators, work in a system and control. Turbocompressors – types and classification. Thermodynamic processes. Special features of turbocompressors design. Work in a system, pumping and anti-pumping mechanisms, control. Pumps for hydraulic mixtures
Teaching and assessment:
The topics presented at lectures provide students with the opportunity to get theoretically familiar with the main studied issues, preceding the laboratory classes. At laboratory classes students are introduced to the schemes of experimental installations, methods of performing experiments and experimental data processing. Laboratory classses analyze various machines and elements and students are required to do a written statement for each of them. The exam starts with a written working-out of two questions, followed by an oral testing.

3404 Turbo-Pumps Fans and Compressors - Course Project

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Petar Rusev, PhD
2. Assistant Kliment Klimentov
Abstract:
The course project aims students to be able to read a machine scheme, to know deferent constructions of turbo machines (turbo pumps, fans and compressors) and independently to create a plan for turbo machinery.
Course content:
The course project is described for each student individually. Usually the student has to design a kind of propeller, centrifugal or axis pump as well as to calculate the load in the given particular case.
The project development contains by two parts – calculations and graphical design.
Teaching and assessment:
During the first week of the semester the students are given a project topic. Students can use softwear products, papers and other written and lab materials developed by members of the department. The student continuous assessment is performed during their monthly planned face to face consultations with the supervisor.

3405 Positive Displacement Pneumatic Machines

ECTS credits: 6 **Weekly classes:** 2lec+0sem+2labs+0ps+cw
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Prof. Gancho Gujgulov; Assoc. Prof. Gencho Popov, PhD
Abstract:
The subject will help the students of HPE degree course obtain knowledge of the types of positive displacement pneumatic machines, of their mechanism, work and theory. They will get theoretically familiar with the design methods of various positive displacement compressors and pneumatic motors.
Course content:
Piston compressors – thermodynamics processes in an ideal compressor; multistage compressor, power and efficiency coefficient; main dimensions. Diaphragm compressors. Piston vaccuum pumps - mechanism and classification; indicating diagram; characteristics. Pneumatic cylinders – mechanism, classification and main parameters; statics and dynamics; motion speed of the piston, power and efficiency coeficient; seals; constructions of cylinders. Rotary compressors – sliding-vane type, screw-shaped ones and compressors with rotating pistons, vacuum pumps on a water ring.
Teaching and assessment:
Lectures are presented in a clssical way with the help of such visual aids as: slides, posters and models. Laboratory classes are carried out on training laboratory installations. For each laboratory class students are required to do a written statement including the experimental data and graphic dependencies.The assessment is based mainly on the students' knowledge of the theoretical issues presented at lectures, taking under consideration their results /in points/ from the course assignment. The exam is in written and oral form and the mark is a complex one.

3406 Pump Stations and Fittings

ECTS credits: 5 **Weekly classes:** 2lec+0sem+1labs+1ps+ca
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Rusev, PhD
Abstract:
The course is aimed at introducing students to the main issues of machinary design of various pumping stations – irrigation, drainage and water supply stations. Parameters determination of water sources and water users. Hydraulic and strength calculation of pipelines. Parallel and successive work of pumps and work in a complex system. Constructions, calculation and design of pipeline fittings – valve doors, inlet flaps and check-valves, compensators, etc.
Course content:
The course analyses various types of pumping stations - for irrigation, drainage and water-supply and their principle schemes. Schemes of pumping stations buildings: block type, chamber type with dry and wet chamber, shaft-chamber type, overground, floating, mobile and seasonal. Water-taking equipment of pumping stations - water in-taking mechanisms, delivery pipelines, settling tanks, suction pipelines. Choice of main equipment inside a pumping station - number and type of pumping aggregates, pipelines and fittings. Auxilliary equipment of pumping stations. Equipment at the end of pressure pipelines. Types of fitting elements and requirements for constructing of various types gate equipment: disk, spherical, needle-shaped, cylindrical and valve ones. Strength calculation. Exploitation of pumping stations - reliability and wear parameters of the equipment. Preventive maintenance, current and capital repair of the equipment. Automatic control of pumping stations.
Teaching and assessment:
The training process is organized in three forms - lectures, laboratory and practical classes. The topics of the lectures provide students with the opportunity to get theoretically familiar with the main studied issues, preceding the laboratory classes. At laboratory classes students are introduced to the schemes of experimental installations, the methods of performing experiments and experimental data processing. During the practical classes students are introduced to various pumping stations and fittings and they are required to do a written statement for each laboratory classs. The exam starts with a written working-out of two questions, followed by an oral testing.

3407 Hydraulic and Pneumatic Components and Equipment

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+p
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Prof. Gancho Gujgulov; Principal Assist. Krasimir Tuzharov, PhD
Abstract:
The course is a specializing one. It will help students of the degree course get theoretically acquainted with working fluids (liquids and gas), hydraulic and pneumatic control mechanisms and their calculation, with auxilliary mechanisms, their coupling in hydraulic and pneumatic systems and the design of such systems.
Course content:
The course is focused on the following main issues: general information about hydraulic and pneumatic drive and its application in mechanical engineering. Parameters of hydraulic and pneumatic transmission. Working fluids (liquids, air). Valves: safety valves, overflow safety valves and supporting valves. Mechanism, work, characteristics, dynamics and design. Fixed-pressure reduction valves, valves for constant pressure difference and valves for constant proportion: mechanism, working characteristics, design. Throttles: mechanism, working characteristics, design. Flow-control valves: mechanism, working characteristics, design. Distributors: tap distributors, valve distributors, plunger distributors - mechanism,work characteristics, design. Dividing-collecting valves and relays. Auxilliary mechanisms – seals, tanks, filters, hydraulic accumulators – mechanism and design.
Teaching and assessment:
Lectures are presented in a clssical way with the help of such visual aids as: slides, posters and models. Laboratory classes are carried out on training laboratory installations. For each laboratory class students are required to do a written statement, including experimental data and graphic dependencies.

3408 Heat Supplying and Gas Supplying

ECTS credits: 4 **Weekly classes:** 2lec+0sem+1labs+1ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Valentin Vassilev Bobilov, PhD
Abstract:
he subject is focused on the theoretical issues of heat and gas supply. The aim of the discipline is to introduce students to such topics as: methods and means of transport, control and service of heat and gas transfer systems and installations. Extended knowledge of Chemistry, Physics, Mathematics, Engineering Thermodynamics, Heat transfer and Fluid Mechanics are a necessary prerequisite for the acquiring of this course.
Course content:
Determination of heat consumption. Heat transfer systems. Equipment of thermal power user stations. Heat feed control. Schemes, constructions and equipment for heat processes. Hydraulic calculation of a heat transfer system. Technical and economic efficiency of heat transfer systems. Exploitation of cross-country gas pipelines. Gas distribution and gas regulation stations. Exploitation of city and factory gas pipelines. Protection of gas pipelines against corrosion. Exploitation of gas installations in industrial enterprises. Anti-fire and technical safety.
Teaching and assessment:
The topics presented at lectures introduce students to important theoretical issues. Laboratory classes are carried out on laboratory installations, on objects in regular exploitation, as well as on computer models, prepared in advance. Students are required to do a written statement for each laboratory class, including experimental and testing-simulating data, processing and analysis of the received data. The assessment is based on the students' performance during the laboratory classes and on their knowledge of theoretical topics.

3280 Technical Safety

ECTS credits: 3 **Weekly classes:** 2lec+0sem+1labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Vladimir Tomov Vladimirov, DSc, Dept. EEP, tel.: 888-481, e-mail: vtomov@ru.acad.bg
Abstract:
This is a general technical course. It aims at providing knowledge and certain skills for analysis and synthesis application of technical and organization decisions in labor safety. Main issues: learning the analysis methodology of the safety of the technical and production system-resources, characteristics, motion, standardizing, measuring and evaluation of the dangerous and harmful production factors; mastering the methods of projecting of safe technical systems; technical appliances projecting and explaining organization decisions in labour safety.
Course content:
Technical safety – main notions and definitions. Projecting methodical basis of safe technical and production systems. Mechanical safety of technical systems. Electrical safety. Electromagnetic safety. Immission and safety. Noise and vibration safety. Radiation safety. Management and ways of presenting information in technical and production systems. Labour safety control.
Teaching and assessment:
The lectures include the three specializing directions. Visual aids are used. The laboratory classes are experimental and analyzing in their essence. Students have to be prepared, which is ascertained by an incoming test. Two test papers are carried out during the practical classes. They are based on preliminary stated learning issues. Final assessment is achieved on the basis of the laboratory tests, test papers and class participation.

3410 Heating, Ventilation and Air-Conditioning

ECTS credits: 6 **Weekly classes:** 2lec+0sem+0labs+2ps+cw
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Valentin Vassilev Bobilov, PhD
Abstract:
This subject deals with basic of heating and ventilation systems, with methods of their design, with criteria for estimation of their efficiency and with their choice for concrete cases.
Course content:
Main tasks and selection of heat production systems. Steam heating. Hot air heating. Radiant heating. Electric heating. Heat systems for animal farms. Natural ventilation. Forced ventilation. Aeration. Ejection. Air curtains. Ventilation systems for living, public and industrial area.
Teaching and assessment:
The theoretical basis of the topics presented at lectures is acquired at seminars through solving problems; and individual lab practicing. Each student is required a course assignment. Its successful presentation at seminars and at labs and a regular class attendance are a necessary prerequisite to have a term validated. The final exam is written.

3411 System for Hydraulic and Pneumatic Drives

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Prof. Gancho Gujgulov; Principal Assist. Krasimir Tuzharov, PhD
Abstract:
The course will help the students of HPE degree course get theoretically acquainted with hydraulic and pneumatic machines, pumps, hydraulic motors, compressors, pneumatic motors; hydraulic and pneumatic control mechanisms and their calculation, with auxiliary mechanisms, their connection in drive systems and design of such systems /synthesis and analysis of hydraulic and pneumatic systems.
Course content:
The course is a specializing one. It will help the students of HPE degree course get theoretically acquainted with hydraulic and pneumatic machines, pumps, hydraulic motors, compressors, pneumatic motors; hydraulic and pneumatic control mechanisms and their calculation, with auxiliary mechanisms, their connection in drive systems and design of such systems /synthesis and analysis of hydraulic and pneumatic systems/.
Course content: The course consists of two parts. The second part analyses types of hydraulic and pneumatic drive systems /pump, pump-accumulator, pump-flywheel, multiplication, etc./. Schemes of hydraulic and pneumatic motors connection – of sequence and work synchronism, positioning, connection of rotary movement hydraulic and pneumatic rotors. Control and stabilization / throttle, positive displacement, stage/ of hydraulic and pneumatic motors movement speed. Static working regime of hydraulic and pneumatic systems. Hydraulic follow up systems. Analysis and synthesis of various hydraulic and pneumatic drive schemes and systems. Fundamentals of dynamics of hydraulic and pneumatic drive systems. Heat calculation of a hydraulic system.
Teaching and assessment:
Lectures are presented in a clssical way with the help of such visual aids as: slides, posters and models. Laboratory classes are carried out on training laboratory installations. For each laboratory class students are required to do a written statement including experimental data and graphic dependencies.

3412 Hydraulic and Pneumatic Drives - Course Project

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment: continuous assessment **Type of exam:** oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Gencho Popov, PhD; Principal Assist. Krasimir Tuzharov, PhD
Abstract:
The course project aims students to be able to read hydraulic and pneumatic machine schemes, to know deferent constructions of hydraulic and pneumatic drives and independently to create a plan for such drives.
Course content:
The course project is described for each student individually. Usually the student has to design a kind of hydraulic or pneumatic drive as well as to calculate the load in the given particular case.
The project development contains by two parts – calculations and graphical design of the system.
Teaching and assessment:
During the first week of the semester the students are given a project topic. Students can use softwear products, papers and other written and lab materials developed by members of the department. The student continuous assessment is performed during their monthly planned face to face consultations with the supervisor.

3413 Hydraulic and Pneumatic Automatic Systems

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Veselka Kamburova, PhD; Principal Assist. Krasimir Tuzharov, PhD
Abstract:
The course introduces the students of the speciality Hydraulic and Pneumatic Equipment with hydraulic and pneumatic elements and mechanisms with continuous and digital operation as control and automation means and with some systems for control of pressure, level, flow and c.t. The course gives basic theoretical and practical knowledge for the systems of control and automation of the operation processes.
Course content:
Pneumatic elements and systems with continuous operation: Elements and mechanisms of pneumatic control – requirements and preparation of the air for pneumatic control; pneumatic lines, resistances and chambers. Pneumatic amplifiers – amplifiers type nozzle – harrier, amplifiers with stream pipe and plunger type, stream amplifiers; Pneumatic elements for algebraic operations during time – pneumatic adders, multipliers, integrators, differentiators, inertial elements of diaphragm and stream type; Pneumatic controllers – pneumatic controllers of systems AUS and USEPPA, bellows controllers, casing pneumatic controllers; Pneumatic sensors and converters for pressure, level, temperature, flow and cetera; Pneumatic actuators – actuators and positioners, control organs; Pneumatic systems for automatic control of continuous technological processes. Hydraulic elements and systems with continuous operation; Hydraulic elements for algebraic operations and time operations, operational amplifier, hydraulic chambers, integration and differential elements; Hydraulic sensors for pressure, flow lever and cetera; Hydraulic actuators; Hydraulic controllers; Hydraulic automation systems with continuous action for control of pressure, level, flow and cetera, Proportion hydraulic elements. Pneumatic and hydraulic elements and system with discrete action, Using the elements of mathematical logic for analyses of discrete elements and systems; Pneumatic logic elements – stream logic elements for basic laws and functions, memory elements, logic elements with moving parts; Hydraulic elements and systems with discrete action, relay systems.
Teaching and assessment:
At lectures students are introduced to main theoretical issues. Laboratory classes are carried out on laboratory installations, on regular exploitation objects and on computer models, prepared in advance. Students are required to do a written statement for each laboratory class including experimental or testing-simulating data, analysis and processing of the obtained data. The assessment is based on the students' performance during the laboratory classes and their knowledge of theoretical issues. The final procedure is a written exam.

3414 Irrigate Techniques

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Dimitrov, PhD
Abstract:
Irrigation equipment represents a considerable part of the agriculture equipment in Bulgaria. The process is a time and energy consuming one, and the rather expensive equipment is too comlex and variable. The course is aimed at introducing the students of Hydraulic and Pneumatic Equipment degree-course to various irrigation technologies and devices for their realization, to their advantages and disadvantages, areas of application and development trends.
Course content:
The course topics will focus on mechanized surfice irrigation realized through spray irrigation and aerosol moisturizing. There will be also presented some elements for the realization of various technological schemes and constructions of console, belt, multiple rest and other machines, pipe and impulse spray irrigation installations. The following issues will be analyzed as well: technologies and devices for concentrated and drip irrigation, devices for water cleaning and water processing. Students will be introduced to the analysis and testing methods and devices of irrigation equipment and the factors which influence the efficiency of its work. At laboratory classes students will have the opportunity to be acquainted with constructions, their operation mode and control.
Teaching and assessment:
Lectures are presented in a clssical way, using didactic aids /posters, slides, videos/ as well as various training and technical devices. Laboratory classes are carried out in natural conditions in a laboratory and in the fields.

3415 Technology for Detail's Restore

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Mitko Nikolov, PhD
Abstract:
The subject aims at providing students with specific scientific knowledge and practical skills necessary in practice for specialists to keep hydraulic and practical equipment in operating mode. The course analyzes fundamentals of various technological processes and their control, aiming to obtain maximum effect.
Course content:
Details regeneration as a main element of the general technological process of machinery repair. Methods and devices of wear details regeneration. Classification. Defects removal through electric methods, electric-chemical and chemical coatings, polymer materials, etc.
Teaching and assessment:
Schemes, laboratory installations, real machines, modern measuring and registration appliances are used for the aims of the training process. The topics of the lectures are presented with the help of slides and overhead projectors. Laboratory classes are carried out at separate working places for 3 – 4 students.

3416 Marketing

ECTS credits: 4 **Weekly classes:** 2lec+2sem+0labs+0ps+p
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department of Economics, Faculty of Business and Management
Lecturers:
Assoc. Prof. Georgy Emilov Valchev, PhD, Dept. Economics
Abstract:
The subject aims at introducing students to the basic theoretical and methodological issues of marketing. Basic knowledge of economic theory and the problems of world economics is a precondition for building up knowledge of marketing. The subject serves as a basis for learning the methods and approaches to realization of the marketing concept in managing business in other subjects.
Course content:
Introduction to the subject of Marketing. Marketing definition. Types of marketing. Marketing environment. Consumer behavior. Marketing information system. Market segmentation. Marketing strategic planning and kinds of strategies. Factors, determining the choice of a marketing strategy. Production and innovation policy. The concept of life cycle. Price policy: nature, range and principles. Price surveys in marketing. Company price-strategy realization. Company distribution policy. Marketing logystics in Contemporary marketing business communications. Advertising and advertising policy. Organizing and running advertising campaign.
Teaching and assessment:
Lectures are presented in a classical way using visual aids - slide and overhead projectors, when necessary. The theoretical basis of the topics presented at lectures is acquired at seminars through tests and solving tasks. The final continuous assessment mark is formed on the basis of the grades of two written tests administered during the semester.

3417 Fundamentals of Management

ECTS credits: 4 **Weekly classes:** 2lec+2sem+0labs+0ps+p
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department BM, Faculty of Business and Management
Lecturers:
Assoc. Prof. Nikolaj Stefanov Najdenov, PhD, Dept. BM
Abstract:
The course is aimed at providing students with knowledge of business management and the necessary resources for it in small and medium industrial firms in conditions of market economy. The subject of Economics is a necessary prerequisite for the Fundamentals of Management and it in its turn is a prerequisite for the diploma project.
Course content:
Management: nature and tasks. Managerial decisions. Forms of business organization and a company management structure. Business planning. Capital and capital investments analysis. Company staff management. Technical and material resources management. Information resources of industrial firms management.
Teaching and assessment:
The theoretical basis provided at lectures is acquired at seminars with application of appropriate examples. The topics of the lectures are presented with the help of various visual aids: slide and overhead projectors, multimedia, etc. Management application programmes are used at some of the seminars. The final continuous assessment mark is formed on the basis of the results of two written tests administered during the semester.

3418 Industrial Aerodynamics and Pneumatic Transport

ECTS credits: 3 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Ivanka Zheleva, PhD; Assoc. Prof. Gencho Popov, PhD
Abstract:
The course is aimed at introducing students to the interaction between the moving liquid or gas and various appliances and equipment – scrubbers, air heaters, radiators, gas cleaners, drying installations, etc. The subject also analyzes issues concerning this interaction efficiency.
Course content:
Characteristic and structure of the stream when fluids move in channels and pipelines and local resistances. Movement of flows through appliances and gratings. Air movement through air conditioning and ventilation systems. Interaction of a fluid with: reactors, filter appliances, heat exchangers. Main methods for hydraulic calculations of appliances. Methods for calculation of intaking and outtaking parts of an appliance. Efficiency assessment of the interaction between fluids and appliances. Experimental studies of fluid movement in various industrial appliances. Types of pneumatic systems; main points of calculation of pneumatic transport pipe system. Pneumotransport of materials in aeration state. Pneumatic capsule and container transport. Auxiliary appliances and equipment for pipe pneumatic systems.
Teaching and assessment:
The topics presented at the lectures provide students with the opportunity to get theoretically familiar with main issues, preceding the laboratoty classes. At the laboratory classes students are introduced to the methods, experimental installations and carry out experiments. The continuous assessment mark is formed on the basis of two written tests consisting of a theoretical question. They are followed by an interview with the lecturer.

3419 Hydromechanical and power-shift transmissions

ECTS credits: 4 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department TMM and HHMT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. O. Alipiev, PhD; Assoc. Prof. T. Totev, PhD
Abstract:
The course is a specializing one. It introduces the students to the theory, the calculation and the design of hydromechanical transmissions and hydrodynamic gears in transport, road building, agricultural and industry area. Through the course the necessary knowledge is formed for investigations and designing of hydraulic transformers, hydraulic couplings and hydromechanical transmissions with planetary and differentially gear mechanisms. Practical skills for construction of hydromechanical transmissions are form.
Course content:
Mechanical, hydrodynamic and positive displacement transmissions – general knowledge. Elements of hydrodynamic gears. Hydraulic transformers – structure, working, variety, performance. Joint work of hydraulic transformer and the motor. Hydraulic couplings. Automatic gear boxes. Hydromechanical motor-wheels. Full-flow hydromechanical transmissions. Differential hydro-mechanical gears with continuous regulation. Much-flow planetary hydromechanical transmissions.
Teaching and assessment:
Lectures are presented in a classical way, use a multimedia, kinematic models and posters. Laboratory classes are carried out on training laboratory installations. For each laboratory class students prepare in advance and having finished the experiments, they work out a written statement, including the experimental data and graphic dependencies. The continuous assessment is based on the results of the statements and the written tests administered during the semester. The students with poor continuous assessment go in for an examination

3420 Diagnostics and Repair of Hydraulic and Pneumatic Equipment

ECTS credits: 4 **Weekly classes:** 4lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Plamen Kangalov, PhD
2. Assoc. Prof. Todor Delikostov, PhD
Abstract:
The course is aimed at introducing students to the principles of maintenance and repair of hydraulic and pneumatic equipment, providing them with the relevant theoretical and practical knowledge.
Course content:
Technical and economic expedience of equipment maintenance. Processes leading to machines aging. Types of wear and methods for the decrease of wear intensity. Corrosion damage and fatigue rupture – means of protection. Fundamentals of technical diagnostics – diagnostics means and methods. Diagnostics algorithms. Fundamentals of completing, assembly and testing of repaired units and aggregates. Laboratory classes are connected with the topics presented at lectures, giving practical knowledge in the field of diagnostics, discovering and removal of defects, using various methods for flaw detection and determination of residual resource of hydraulic equipment elements and units.
Teaching and assessment:
The topics presented at lectures will be followed by classes for knowledge consolidation. At lectures test control is administered, checking up students' theoretical knowledge and the practical skills acquired at laboratory classes. The exam starts with a written test, including all the questions from the exam synopsis, followed by an oral testing with implementation of one of the already conducted laboratory tasks.

3421 Lift and Transport Techniques

ECTS credits: 3 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department TMM and HHMT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Georgy Kenarov, PhD
Abstract:
The subject introduces the students of Hydraulic and Pneumatic Equipment degree-course to the construction, design and calculation fundamentals of materials handling equipment, where hydraulic and pneumatic drives and elements, as well as pneumatic and hydraulic transport principles find their application. General engineering courses are a prerequisite for the course of Materials Handling Machines and it in its turn is a prerequisite for the studying of the specializing courses, as well as for the diploma project, supplying with exemplary solutions of application, design, choice of hydraulic and pneumatic drives elements.
Course content:
Materials handling equipment – classification, technical characteristics, constructive elements and mechanisms with prevelance of hydraulic and pneumatic drives, fundamentals of calculation and design. Lifting machines with application of hydraulic and pneumatic equipment: hydraulic and pneumatic jacks and hoisting devices, lifting platforms and boards, platforms on air cushion, pneumatic hoists, truck cranes, lifting manipulators and robots, pallet truck, cars and loaders with hydraulic drive. Conveyers – pneumatic conveyers, belt conveyers on air cushion, aerogravity and aerodynamic conveyers.
Teaching and assessment:
Lectures introduce students to the main theoretical issues of the subject. At laboratory classes they carry out functional and experimental studies of real objects of materials handling equipment and the results are consolidated in written statements. The continuous assessment mark is formed on the basis of the grades of two tests on theoretical questions.

3422 Automatic Control of Hydraulic and Pneumatic Macines and Technology

ECTS credits: 2 **Weekly classes:** 2lec+0sem+1labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department of Automation, Faculty of Electrical and Electronic Engineering a
Lecturers:
Assoc. Prof. Svetla Gancheva Stoyanova, PhD
Abstract:
The course is aimed at introducing the students of Hydraulic and Pneumatic Equipment to the main notions and theoretical principles of automatic control, to the controlled objects in the control systems of technological objects. The discipline is also focused on processes and appliances in automatic control systems of hydraulic and pneumatic equipment. Such courses as: Turbo-Pumps, Compressors and Ventilators, Pneumatic Drive and Pneumatic Automatics, etc. are a prerequisite for this discipline. The obtained knowledge and skills are used in the diploma project and will be of use for the future engineers, working in various fields of engineering.
Course content:
Main notions and definitions of the automatic control systems. General characteristic of automatic systems and their elements. Elementary dynamic units - main types. Technological objects as elements of automatic control systems. Information means in the control systems of technological objects. Automatic controllers as control mechanisms of automatic control systems. Conventional executive mechanisms and controlling units. Automatic control systems of processes and appliances in hydraulic and pneumatic equipment. Dynamics and quality characteristics.
Teaching and assessment:
Lectures are presented in a classical way using a slide projector. Laboratory classes are carried out in blocks of 2 periods per week in the training laboratories of the department of Automation on special laboratory stands. Students use manuals for laboratory exercises in their preparation for the classes. The requirement to have a term validated is the fulfillment of all laboratory tasks and written statements submission. The course mark is based on the results of the written exam.

3423 Diploma Practice

ECTS credits: 4 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: colloquium **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
The tutors of diploma projects
Abstract:
Pre-graduation practice is aimed at providing graduating students with the opportunity to extend their knowledge through an introduction to the latest achievements in the field of their diploma project and to the current state of problems in the organization which has offered them the topic of the project. Besides, the pre-graduation practice provides them with the opportunity to get acquainted with the specific character of the diploma project, to adapt and prepare for its development.
Course content:
Depending on the topic of the diploma project, students get acquainted with: available literature sources, patents, inventions; methods of theoretical research and experimental studies, as well as with their results; constructive and technological solutions; laboratory installations, stands and measuring appliances; available samples of hydraulic and pneumatic machines, mechanisms and driving systems; methods of hydraulic and constructive calculations; programme products for solution of engineering problems; quality control systems, etc.
Teaching and assessment:
If possible, the pre-graduation practice is carried out in a firm, where the topic of the diploma project could be implemented or where the tutor works; in a designing office or department, libraries, etc. The results of the tasks, assigned by the tutor are recorded in a journal and they are used in the formation of the cited literature and in the working out of the particular parts of the diploma project. The pre-graduation practice finishes with a written report, defended before the tutor.

3424 Diploma Project

ECTS credits: 15 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors.
Abstract:
The diploma project aims at giving to the students the opportunity to apply the obtained knowledge and skills in self-independent and entire development of engineering projects. The students who have excellent achievements are given topics with research character. The Final Year project gives the students practical skills and experience for the future engineering practice or for continuing their study in a Master degree course.
Course content:
Review of the information regarding the diploma project topic. Formulating the aim and the tasks. Analysis of the output and the work conditions. Idea project or methodology of the research. Design of the necessary equipment and devices. Running of tests and processing of the results. Technical and economical analysis of the developed variants. Development of technical documentation and graphical representation of the results from the research.
Teaching and assessment:
The diploma project is developed following a given routine. The students work individually, using paper or electronically based information, the equipment of the department or other departments, and their instructor's help. The diploma project instructor assesses the degree of involvement, the public and moral qualities of the student. The assessor evaluates the diploma project. The student defends the diploma project in front of the State Exam Committee and the open public. The State Exam Committee evaluates both the diploma project and the way it is defended.

UNDERGRADUATE STUDIES IN INDUSTRIAL DESIGN

PROFESSIONAL STANDARDS
OF A BACHELOR IN

INDUSTRIAL DESIGN

DEGREE COURSE: Industrial Design
Degree: Bachelor
Qualifications: Engineer-designer
Duration: 4 years (8 semesters)

Teaching goal: preparation of modern qualified specialists in design able to operate within a wide range of areas related to industrial and consumer products.

General and special preparation:
The general preparation is carried out from semester 1 to semester 4 including. The subjects studied ensure building up of knowledge and skills at a professional level thus resulting in wide competence when dealing with ergonomic and artistic tasks in the sphere of shape, colour , graphics , technologies .
The special preparation goes on from semesters 5 to 8. The subjects included in the teaching process ensure the building up of design culture at a professional level thus leading to concrete competence when solving complex composition tasks in the sphere of mass production and art products and the respective decisions.

General and special skills;
The general professional skills are manifest in overall professional realizations when it is necessary to give industrial and artistic solutions.
The special skills are being developed with reference to the individual abilities and preferences of the students and are streamed into several directions: industrial product and form design; interior and space design; graphic design and industrial graphics; visual communications; advertising decisions.

Future employment opportunities;
Graduates who have completed the degree find themselves in a favourable situation since they can easily adapt as a result of their academic preparation. The degree course they have completed covers a wide range of interdisciplinary subjects, which in turn can be applied to various professional spheres.

General description and characteristics of the curriculum:
The curriculum has taken into account contemporary interpretations and requirements concerning the teaching of design. It also complies with General Regulations for Teaching 8.16.03 Engineering Design.

CURRICULUM

of the degree course in

INDUSTRIAL DESIGN

First year

Code	*First semester*	*ECTS*	*Code*	*Second semester*	*ECTS*
0477	Free drawing I	5	0479	Creative methods I	5
0478	Form shaping I	5	0480	Free drawing II	4
0481	History of art and design	4	0844	Colour science	4
0839	English I	2	1011	Machine drawing II	5
0986	Mathematics	5	1032	English II	2
0999	Machine drawing I	5	1044	Form shaping II	5
1036	Physics	4	1532	Material science I	5
	Total:	***30***		***Total:***	***30***

Second year

Code	*Third semester*	*ECTS*	*Code*	*Fourth semester*	*ECTS*
3698	Applied mechanics	5	3705	Methodological fundamentals of mechanical design	4
3699	Material science II	4			
3700	Information fundamentals of the design	4	3706	Lighting technologies	4
			3707	Alleviated constructions	5
3701	Free drawing III	5	3708	Graphical design I	5
3702	Form shaping III	5	3709	Modelling and maquette constructions I	5
3703	Theory of the composition I	5			
3704	English III	2	3710	Theory of the composition II	5
			3711	English IV	2
	Total:	***30***		***Total:***	***30***

Third year

Code	*Fifth semester*	*ECTS*	*Code*	*Sixth semester*	*ECTS*
3713	Mechanical design I	5	3720	Machanical design II	5
3714	Production technologies I	5	3721	Production technologies II	5
3715	Ergodesign I	5	3722	Graphical design III	5
3716	Graphical design II	5	3723	Ergodesign II	6
3717	Modelling and maquette constructions II	5	3724	E-design I	5
			3725	English VI	2
3718	Theory of perception	3	3726	Social psychology	2
3719	English V	2			
	Total:	***30***		***Total:***	***30***

Fourth year

Code	*Seventh semester*	*ECTS*	*Code*	*Eighth semester*	*ECTS*
0459	E-design II	5	0707	E-design III	2
0706	English VII	2	3734	Marketing	3
0331	Production technologies III	5	3735	Management of design	3
3727	Design method	5	3736	Creative methods II	3
3729	Artistic spatial layout	5	3737	Aesthetics	3
3731	Advertising	5	3738	Intellectual property	3
3733	Style and symbolism	3	3740	Diploma practice	3
			3741	Diploma project	10
	Total:	***30***		***Total:***	***30***

Total for the training course: 240 ECTS credits

0999 Machine drawing I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department ED, Faculty of Transport Engineering
Lecturers:
1. Assoc. Prof. Trifon Ivanov Trifonov, Dept. ED, tel.: 888-846
2. Principal Assistant Krassimir Stankov Kamenov, Dept. ED, tel.: 888-352

Abstract:
The subject acquaints students with methods to draw plane images of machine manufacturing products and basic types of engineering documentation. The focus is on orthogonal projections, front, cross-sectional and sectional views and axonometric views with shades.

Course content:
Introduction. Projection methods. Orthogonal projection of points, lines and planes. Axonometric views. Shades. Types of images. Layout. Engineering documentation. Thread – drawing and dimensioning. Marking quality and quantity parameters. Automation of engineering.

Teaching and assessment:
Theoretical knowledge gained from lectures is applied in solving problems in class. Students work on their own on their course assignment and report the completion of each stage on a weekly basis. To have the term validated students are required to attend classes regularly and complete their course assignments. The final grade is based on two written tests and the marks from the course assignments.

1036 Physics

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department Physics, Faculty of Electrical and Electronic Engineering and automation
Lecturers:
1. Assoc. Prof. Dimitar Nedelchev Popov, PhD, Dept. Physics, tel.: 888-538
2. Principal Assistant Petko Christov Mashkov, Dept. Physics, tel.: 888-215, e-mail: pmashkov@ru.acad.bg

Abstract:
The subject aims at familiarizing students with the physics essence of processes and phenomena underlying contemporary technical and technological applications related to engineering design.
This subject serves as a basis for future specialized preparation.

Course content:
Electrostatics. Electrostatic methods for surface treatment. Electricity. Electrotechnologies for form shaping, surface modification etc. Magnetic field. Magnetic methods of treatment. Heat radiation. Optics. Colour – colorimetry. Semiconductors. Lasers – application in contemporary engineering.

Teaching and assessment:
Lectures are accompanied by demonstrations to clarify the theoretical basis of the examined phenomena. Laboratory classes serve as a continuation and extension to lectures as the students work on their own solving problems. Each class starts with a quiz to check students' knowledge and finishes with a report and evaluation of students' work. The final exam is oral and the final grade comprises the marks received at laboratory classes and the mark from the exam itself.
Contexts. In all of the above they can function as leading professionals able to provide individual or team decisions related to various artistic ergonomic and technical tasks, regardless of their type and sphere.

0986 Mathematics

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department AG, Faculty of Natural Science and Education
Lecturers:
Assoc. Prof. Svetoslav Yordanov Bilchev, PhD, tel.: 888-453, e-mail slavy@ami.ru.acad.bg
Abstract:
The syllabus of the subject “Mathematics” for the “Engineering design” degree course is fundamental for gaining the minimum of mathematical knowledge and skills needed by the modern designer. Special attention has been paid on forming professional geometrical thinking and imagination in the plane and in the 3D space. This is accomplished on base of a thorough and detailed classification of curves, surfaces and polyhedrons; many examples of problems are shown where there is free transition from Algebra to Geometry and vice versa. Also, the subject “Mathematics” grants the minimum but necessary knowledge about Topology, fractals, Statistics, etc. The link History-Philosophy-Mathematics-Arts, in both directions, is constantly traced during the teaching process.
Course content:
Mathematics as the basis of knowledge. Numbers and numeric rows. Combinatory Mathematics. Equations and imaginary numbers. Analytic geometry. Geometric figures, polyhedrons, Geometric transformations. Fractal Geometry. Functions. Introduction to differentiation. Introduction to Calculus of probability and Mathematical Statistics. Philosophical foundations of Mathematics.
Teaching and assessment:
The teaching content is presented by means of lectures and is illustrated with examples and problems at the seminars. Students are given weekly assignments which are assessed with a “Yes” or “No”, and if assessed with a “No”, are given back to the student to correct/finish.
In the beginning of the semester a course assignment is given. It is defended at the end of the semester and the defence is assessed with a grade CA.

0477 Free Drawing I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Antoniy Sofev, Dept. ID, tel.: 888-845
2. Milen Minkov, MA in Arts, Dept. ID, tel.: 888-845, e-mail mminchev@ecs.ru.acad.bg
Abstract:
Perceptive drawing:
1. Introducing a complex of notions
2. Drawing techniques with black & white drawing materials
3. Introduction to perspective – linear and air
4. Work with main categories – line, shape, volume, space, composition

Course content:
Drawing of simple geometric figures in corresponding compositions.
Structural build-up of the figurative field.
Function of the volume line.
Shape and space. Structure of different surfaces.
Symmetry, asymmetry, rhythm. Types of compositions. Free drawing.
Teaching and assessment:
Introduction to the space structure of the shape. Expounding cubistic reception. Setting up structural groups. Changes in perspective, close-ups. Preparation, rationalization, assessment of the given setting. Drawing from memory, drawing according to an assignment – practical tasks. Requirement of intuitive and conscious modeling and organization of space skills. Home assignments – designing and drawing new, unknown forms. Term is validated if all practice tasks are submitted. Assessment is continuous and is based mainly on the end-of-semester assignment; practice tasks carried out during the semester are supporting to the grade.

0478 Form Shaping I

ECTS credits: 5 **Weekly classes:** 0lec+0sem+0labs+4ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Jordan Ivanov Doichinov, PhD, Dept. ID, tel.: 888-845, e-mail: jdoichinov@yahoo.co.uk
Abstract:
The aim of the subject is to familiarize students with the main modeling materials, their characteristics and properties and the corresponding processing and manipulation technologies used when presenting design projects in different stages of their development. The practice classes aim at gaining knowledge, and, mostly, practice skills for working with these materials, and help students perform well at course assignments and projects in subjects such as Form shaping, Theory of the composition, Modeling of industrial forms, etc.
The subject is essential for training in Maquette constructions.
Course content:
Practical execution of objects with: paper, wood, gesso, plasticine, sheet plastic, foam plastic, fiber glass, polyester putty, paint.
Teaching and assessment:
In the beginning of a series of classes the characteristics and properties of different materials and the corresponding modeling techniques and technologies are presented to the students. They are given the opportunity to practice and experiment with new ideas based on what has been shown to them. Afterwards they work on assigned tasks. Students also execute two constructive tasks; those tasks require creative and thoughtful approach, and are not restricted in terms of materials and technology.

0481 History of Art and Design

ECTS credits: 4 **Weekly classes:** 4lec+0sem+0labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Antoniy Sofev, Dept. ID, tel.: 888-845
Abstract:
The aim of the subject is to familiarize students with the historical roots and features of art in epochs which mark human civilization. The knowledge gained is used as a basis for forming aesthetic awareness and knowledge and skills applicable in the designer's profession in particular. The subject will deepen students' understanding of the place, aims and tasks of design as a new socio-cultural phenomenon. The course in History of Art and Design gives helps the specialist form an aesthetic values system and gives knowledge which is fundamental for understanding the problems which are to be solved by Design and Art and their methods and means.
Course content:
Historical approach to History of Art and Design. Historical review of the development of space and composition. Characterization of the process of artistic perception.
Periods of development of Art: Primeval, Ancient east, Antiquity, Middle Ages, Renaissance.
The art of the New Ages. Modern Art and design. The place of design in the history of Art.
Teaching and assessment:
The course in History of Art and Design features various types of classes, methods and methodological approaches. Students are assessed by means of tests; audiovisual resources are used in the presentation of the teaching contents. Teaching is based on the integration of the subjects in the curriculum and the unity of theory and practice and rational and emotional bases.

0839 English I

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department FL, Faculty of Law
Lecturers:
Sr. Lecturer Elga Kirilova Naoumova, Dept. FL ; tel.: 888-803, e-mail: enaoumova@ecs.ru.acad.bg
Sr. Lecturer Roumyana Josifova Koleva**,** Dept. FL; tel.: 888-803, e-mail: rkoleva@ecs.ru.acad.bg
Abstract:
The overall aim of the seven modules in English is achieving communicative competence in the area of the subject specialism and the future job. The teaching objectives comprise the development of reading comprehension skills to handle specialist texts and the acquisition of communication skills to interact successfully in professional settings and everyday situations.
Course content:
Meeting people. Shapes. People and places.Work environment. Jobs.
Teaching and assessment:
To acquire the necessary language knowledge and to develop skills in using the language as a means of communication a wide range of authentic and specially constructed texts (i. e. articles, diagrams and tables, brochures and catalogues etc.) as well as audio and video materials are used. In class students participate in role plays, pair and group activities and discussions. Continuous assessment is carried out by means of homework tasks, small assignments and two written tests.

1011 Machine drawing II

ECTS credits: 5 **Weekly classes:** 0lec+0sem+0labs+4ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department ED, Faculty of Transport Engineering
Lecturers:
1. Assoc. Prof. Trifon Ivanov Trifonov, Dept. ED, tel.: 888-846
2. Principal Assistant Krassimir Stankov Kamenov, Dept. ED, tel.: 888-352
Abstract:
The subject improves knowledge gained in the Machine drawing I course and builds practical skills for making and reading drawings of elements, assembly drawings, general view drawings and specification drawings. The knowledge gained is applicable in all construction subjects.
Course content:
Representation and marking of collapsible and uncollapsible joints, limits of the shape and mutual disposition of surfaces, limits of lineal dimensions, roughness of surfaces, coverages, heat treatment. Technical requirements. Drawing of elements from view. Assembly drawings. Specification drawings. Reading of general view drawings. Detailed drawing.
Teaching and assessment:
The knowledge gained in the Machine drawing I course is applied in the practice classes. Each student creates design documentation of an article from view and reads a general view drawing under the supervision of the lecturer. The course assignment improves students' knowledge of making drawings of elements and enhances their skills for axonometric projecting with shades. The final course grade is formed by the course assignment and two written tests. Term is validated if the student has executed the course assignment and attended classes regularly.

1532 Material science I

ECTS credits: 5 **Weekly classes:** 4lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department MSMT, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
Assoc. Prof. Diana Tzaneva, PhD, Dept. MSMT, tel.: 888-307, e-mail dvc@sting.ait.ru.acad.bg
Abstract:
The goal of the subject is to familiarize students with a variety of metal and non-metal materials used in engineering. The syllabus is based on the relationship between the composition, structure and properties of materials and gives applicable knowledge of material properties and helps students choose the correct material for a particular task. Physics and chemistry are prerequisite to the subject, and it is prerequisite to all technical subjects.
Course content:
The Material science course exploits the structure of materials, the methods for its examination and modification and the properties resulting from the structure and composition. New highly efficient materials (light alloys, technical ceramics, composite materials based on metal, ceramics, polymers) are introduced to students along with conventional materials – steel, cast iron, non- ferrous alloys, silicate ceramics and polymers.
Teaching and assessment:
Lectures are illustrated with folios of graphical relationships, charts, structures, equipment and tables. During lab exercises students carry out experimental tasks and formulate conclusions based on application of basic theoretical dependencies.
The continuous assessment is carried out by means of dialogue between the lecturer and the students and written tests covering the most important parts of the matter taught. No course assignments/projects are given. The requirements for validation of a term are equal with the ones given in the general regulations of the university. A student is exempt from exam if their average grade from continuous assessment is at least 5.00 and their attendance of lectures is at least 90%. The exam consists of writing on two questions and brief discussion with the lecturer over the mistakes made. The marks from the continuous assessment are also taken into account when the final grade is formed.

0479 Creative methods I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Prof. Nikola Orloev, PhD, tel. 888-554, e-mail norloev@ecs.ru.acad.bg
Abstract:
The subject familiarizes students with a large arsenal of methods, techniques, algorithms, rules and principles for rational and intuitive thinking when analyzing and synthesizing new creative ideas and solutions, and the particular ways in which they can be applied. The subject aims at developing the constructive skills of the designer; this is achieved by using a centered hexagonal pattern of the creativity process. This pattern is the basis on which the future designer builds a personal algorithm for developing their intellectual and creative potential.
Course content:
Mental process- cerebrum; logic ant intuition; psycho-physiological bases of the creativity process.
Elements of the hexagonal pattern: Types of problems. Methods, techniques, algorithms, rules for synthesis of ideas and solutions. Strategy and tactics for finding solutions. Logical, intuitive and heuristic operations. Main qualities of the creative personality. Algorithm for self-programming.
Survey, appliance and practice of modern intuitive methodologies and methods.
Teaching and assessment:
The lectures are presented in an analytical/discussion form, by means of many didactic materials. The practice classes are also in the form of discussions, and are aimed at mastering creative methods and means and applying them in practice.
A set of practical tasks is assigned at the first seminar for the students to carry out on their own. The completion of the tasks indicates the knowledge and skills acquired and term is validated on basis of it.
The grade is formed by all components of the education in the subject.

0480 Free drawing II

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Antoniy Sofev, Dept. ID, tel.: 888-845
2. Milen Minkov, MA in Arts, Dept. ID. tel.: 888-845, e-mail: mminchev@ecs.ru.acad.bg

Abstract:
Acquiring professional knowledge and skills in anthropo-technical drawing:
1. Acquiring knowledge about plastics
2. Forming a 3D perception of space and representing 3D space in the plane by means of lines, patches, strokes
3. Building skills for situating the drawn object within the composition
4. Building skills for working with shape and volume; acquiring knowledge of anatomy and most frequently used perspectives

Course content:
Human head and skeleton:
1. Sketch, anatomy, topography. Structural and constructive drawings.
2. Skeleton, torso – anatomy, topography. Structural and constructive drawings. Portrait characterization. Sitting, standing and nude figure. Biomechanics of different kinds of pressures. Free drawing.

Teaching and assessment:
Analyzing and synthesizing drawing objects. Construction, shape, volume, space. Organization of the composition.
Students use the knowledge acquired during the seminars under direct supervision and throughout the practicals where set parameters and tasks are given. Students are given home assignments on Anatomy, Perspective and Psychophysiology.
Term is validated if all practical assignments are handed in.
Assessment is continuous and is made mainly on basis of the final course assignment; the oral examination on theoretical questions is also taken into account. The home assignments are supporting to the grade.

1044 Form Shaping II

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Dancho Ivanov Gunev, Dept. ID, tel.: 888-426, e-mail: dgunev@ru.acad.bg

Abstract:
The subject is a foundation course about “The Grammar” of the visual language with its two main parts “Morphology” and “Syntax”. “Morphology” in sense of: Basic form-formation elements, Structures; Volume-space structures etc. “Syntax” – relates to the principles of organizing elements and structures; Principles of interrelations between form elements expressed in a complex way.

Course content:
Basic elements of the form. Basic features of the form. Interrelations between form elements. Hierarchy element levels. Principles of organization. Generalized model for 2-D and 3-D form-formation.

Teaching and assessment:
During the lectures problems of structuring of the material form as a number of elements and relations between them, considered like a “grammar” system which is expressing and interpreting a determinate idea are presented. A set of practical tasks is designed on the principle of free improvisation with preliminary defined contrivances on the theme in conformity with modern tendencies in the art and design followed by full analysis. Course assignment is an extension of the practical tasks, but its successful fulfillment needs a lot of knowledge, imagination and representative skills.

0844 Colour Science

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Antoniy Sofev, Dept. ID, tel.: 888-845
2. Milen Minkov, MA in Arts, Dept. ID. tel.: 888-845, e-mail: mminchev@ecs.ru.acad.bg
Abstract:
Aimed at creating the necessary professional culture of perceiving and dealing with colour. A fundamental subject for a designer. Fully compliant with the drawing basics and drawing techniques training.
Course content:
History of colour science. Colour harmonies. Colour contrast. Colorimetric systems. Colour psychology. Colour symbolism. Psychological influence of colour. Colour-emotion relationships. Colour dynamics. Colour usage in design. Contrasts. Mixing of colours. Colour materials and colour solutions.
Teaching and assessment:
Thumbnail development, preliminary design development, work project phase and final realization (course assignment).
Parallel execution of various practical tasks - monochrome and colour.
Term validation: upon submission of all practical tasks.
Grading: basing on the course assignment, supported by a general assessment of performance on the course tasks and a theoretical knowledge check.

1032 English II

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Sr. Lecturer Elga Kirilova Naoumova, Dept. FL; tel.: 888-803, e-mail: enaoumova@ecs.ru.acad.bg
Sr. Lecturer Roumyana Josifova Koleva**,** Dept. FL; tel.: 888-803, e-mail: rkoleva@ecs.ru.acad.bg
Abstract:
Module 2 is the second module of stage 1 – the level is mostly False Beginners.
Main objective is developing of speaking and listening skills and alongside – writing and reading skills. Grammar is taught as communicative functions. Teaching content covers vocabulary and grammar included in the Longman's course "Matters – Elementary" as well as additional materials related to the specialty.
Course content:
Fashion and films. Clothes. Colours. Capital cities. Spare time activities. British design 1 and 2. A tourist brochure.
Teaching and assessment:
To acquire the necessary language knowledge and to develop skills in using the language as a means of communication a wide range of authentic and specially constructed texts (i. e. articles, diagrams and tables, brochures and catalogues etc.) as well as audio and video materials are used. In class students participate in role plays, pair and group activities and discussions. The exam is based on the topics discussed during the semester.

3698 Appled Mechanics

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
Assoc. Prof. Venko Vitliemov, PhD, Dept. TM, tel.: 888-572, e-mail: venvit@ru.acad.bg
Abstract:
Mechanics is a general subject including both theoretical and applied aspects. The course comprises selected topics from the subjects of Mechanics and Strength of Materials, which are fundamental for mechanical engineers. It is aimed at mastering the basic laws and methods of mechanics for the purpose of analyzing, assessing and forecasting phenomena in mechanical systems, thus developing the engineering foundation of design skills.
Course content:
Kinematical and dynamical characteristics of basic mechanical objects (point, body and system of bodies). Forces and torques. Supports and support reactions. Inetrial characteristics of bodies. Work, power, energy. Static and dynamic friction. Law of conservation of mechanical energy. D'Alembert's principle. Kinetostatics. Shearing force. Stress, displacement, deformation. Hooke's law. Simple and complex stressed state of objects. Safety factor and admissible stress. Strength theory. Strength dimensioning. Stability of structural elements. Vibrations in mechanical systems.
Teaching and assessment:
Teaching is performed through lectures and practicals. Theoretical material is presented in lectures, suitably visualized by slides and transparencies. During lectures, students get acquainted with the basic theoretical relationships, exemplified by relevant problems. During practicals, oral examination is carried out on the basic topics. Students examine models of mechanical system elements and solve practical application problems. Practicals also include laboratory work on mechanical vibration and materials testing. Students develop course tasks. Term validation: upon regular attendance at practicals and lectures, and submission of completed course assignment.

3699 Materials Science II

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department MME, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1. Assoc. Prof. Diana Vassileva Tsaneva, PhD, tel.: 888-307
2. Assoc. Prof. Docho Danev Dochev, PhD, tel.: 888-358
Abstract:
The subject is aimed at acquainting students with common industrial methods and means for application of coatings, as well as with the structure and properties of coatings.
Course content:
Includes discussion of various coating application methods: dipping in molten metal (hot method), chemical depositing of metal coatings, electrochemical coating method (layering), painting/varnishing technologies. A substantial part of the course is dedicated to vacuum coating methods in view of their increasing application, versatility and precision.
Students are acquainted in detail with the technologies of coating in vacuum (magnetron sputtering and electric-arc evaporation), as well as with the methods for determining a coating's chemical composition, structure and properties.
Teaching and assessment:
Lectures are illustrated by means of appropriate transparencies and slides. Most of the laboratory work is carried out in two laboratories having the necessary coating equipment and apparata for determining the properties of coatings.
Term validation: as per the General Tuition Guidelines of the University of Ruse.
The exam consists of developing a written exposition, followed by oral discussion, on three questions from the synopsis.

3700 Information Fundamentals of The Design

ECTS credits: 4 **Weekly classes:** 0lec+0sem+0labs+4ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department IIT, Faculty of Natural Science and Education
Lecturers:
Assoc. Prof. Margarita Teodossieva, PhD, tel.: 888-464, e-mail: mst@ami.ru.acad.bg
Abstract:
The subject introduces the industrial designer into the theoretical and practical aspects of information technologies in view of solving design-relevant programming problems, as well as synthesizing graphic solutions for newly created software products.
Course content:
Review and analysis of modern programming languages. Methods and algorithms for software product synthesis. Specialized hardware configurations and peripherals. Using specialized hardware in the solving of programming problems.
Principles in graphic development of new software products and systems. Standard problems in the transfer of computerized knowledge related to graphic design.
Teaching and assessment:
Carried out according to individual syllabi for master's degree in industrial design. Comprises an individual teaching course in programming followed by practical work on various case studies and problems. Finally students are assigned individual research and development tasks which serve as a basis for the continuous assessment grade.

3701 Free Drawing III

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Antoniy Sofev, Dept. ID, tel.: 888-845
2. Milen Minkov, MA in Arts, Dept. ID. tel.: 888-845, e-mail: mminchev@ecs.ru.acad.bg
Abstract:
Technology of drawing and painting materials. Canvases, canvas preparation, paints. Introduction into the physical and chemical properties of painting materials. Other working materials in design. Technological and technical sequence in working with drawing and painting materials.
Course content:
Painting techniques: pastels, watercolour, oil paints, acrylic paints. Functions of colour. Auxiliary means. Airbrush techniques. Felt-tip pen and marker techniques. Auxiliary means and materials. Plastic and shaping techniques. Mixed techniques. Collage. Letterpress and intaglio. Metal techniques. Lithography. Embossing.
Teaching and assessment:
Fundamentals of drawing and painting materials and techniques, colour generation and perception, and colour properties. Practical exercises in most techniques and verbal description of the rest in lectures. Home assignments in mixed techniques on a freely chosen theme.
Term validation: upon submission of all practical tasks.
Continuous assessment grade: based on one of the course assignments in airbrush techniques.

3702 Form Shaping III

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Dancho Ivanov Gunev, Dept. ID, tel.: 888-426, e-mail: dgunev@ru.acad.bg
Abstract:
The subject is a part of the Form Shaping cycle and is aimed at acquiring knowledge, practical skills and experience in creating envelope shapes, while focusing on their industrial and aesthetic aspects. The course provides knowledge in various project development methods, namely for geometric description of arbitrary surfaces, using kinematical models. It also serves to review and apply previously studied material referring to composition categories, properties and means.
Course content:
Definition and practical application of an envelope shape. Kinematical models for describing arbitrary surfaces. Surface types and their use in form shaping. Projection methods: Monge's projection, orthographic projection, axonometric view, perspective and other specific projections. Application. Mechanical design and flow functions as a fundamental factor in generating envelope shapes. Introduction to the basics of computer-based 3D modeling.
Teaching and assessment:
The theoretical foundations presented in the lectures are reviewed and assimilated during the practicals by applying them in solving real-life simulation practical tasks. Practicals focus on individual coaching, as well as on the use of personal computers. The continuous assessment grade is based on the completed course assignment including development of graphic solutions.

3703 Theory of Composition I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Prof. Nikola Atanassov Orloev, PhD, tel.: 888-554, e-mail: norloev@ecs.ru.acad.bg
Abstract:
Introduction to fundamental aesthetic knowledge and skills in shape composition, for synthesizing both industrial and artistic (applied art) products. A major contribution to the industrial designer's specific professional competence in the synthesis of artistic solutions.
Course content:
Basic categories of composition. Tectonic properties and spatial structure of shapes and compositions. Basic composition properties (a set of 20 properties). Basic composition tools (a set of 10 tools). Algorithm for shape composition. Composition quality assessment. Creative problems and methods in composition.
Teaching and assessment:
As a rule, lectures are presented in the form of an analytical discussion, using a wide range of dedicated didactic tools. Practicals are devoted to discussing problems chosen by the students, clarification of practical tasks and course assignments, as well as to individual practical work.
On the first lecture the students are assigned a set of practical creative tasks for individual work, to be completed according to a set time schedule. Their execution is the basis for estimating and controlling acquired knowledge and skills, as well as a prerequisite for term validation.
Also on the first lecture, a course assignment is announced, consisting of an individual research/creative task and two 3D compositions. Specific attention is being given to creativity and execution quality.
The final grade is formed on the basis of the student's performance in all components of the tuition process.

3704 English III

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department FL, Faculty of Law
Lecturers:
Sr. Lecturer Elga Kirilova Naoumova, Dept. FL ; tel.: 888-803, e-mail: enaoumova@ecs.ru.acad.bg
Sr. Lecturer Roumyana Josifova Koleva**,** Dept. FL; tel.: 888-803, e-mail: rkoleva@ecs.ru.acad.bg
Abstract:
Module 3 is the first in Stage 2 – the level is Post Elementary. The main objective is further development of speaking skills as well as reading and writing skills. Teaching content covers vocabulary and grammar from "Matters – Pre-Intermediate" as well as supplementary materials such as catalogues, leaflets and models. The main focus is on building skills for describing a product, stating an opinion, making one's point and summarizing.
Course content:
Young people's life. Plans and arrangements. Preferences and personal taste. The objects in the room. Furniture. Describing everyday objects. Stages in new product development.
Teaching and assessment:
As in previous modules students participate in role plays, pair and group activities and discussions. Methodology is closely related to aims and objectives and relies on the implications of modern ELT methods as regards general English and ESP. Motivation, learners' different learning styles as well as their future communicative needs are all taken into account. Grammar is taught by means of the task-based approach – the reversed pyramid – production, practice, presentation. Focus is on appropriacy and fluency rather than accuracy. Continuous assessment is carried out by means of homework tasks, small assignments, written tests.

3705 Methodological Fundamentals of Mechanical Design

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department MSME, Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Borislav Anghelov, PhD, tel.: 888-457, e-mail:bangelov@ru.acad.bg
Abstract:
The course is aimed at acquainting the students with the mechanical essence of machines as technical objects, and provide an understanding of their designation, classification, main characteristics, specific requirements, structure and operation; it also presents the fundamentals of mechanical design and reviews basic information sources (reference books, catalogues and standards) of common machine elements – mechanisms and standard parts. The knowledge provided by the course is intended to ensure flawless communication between industrial designers and machine engineers, as well as allow the designer to take decisions on their own in the field of mechanical design.
Course content:
Basic notions of machine science. Mechanisms: degrees of freedom. Mechanisms: structural classification. Fundamentals of calculation and design of machine elements. Joints. Elements of rotary motion. Mechanical transmissions.
Teaching and assessment:
Performed through lectures, practicals and weekly consultations. Theoretical material is presented in lectures and visualized by slides, transparencies, wall charts and kinematical models. Practicals serve to extend and assimilate the main topics provided in the lectures, using also a wide range of visualization means and example literature. Students may choose to take 2 written tests. Those who receive an average grade higher than 4, do not need to sit for the final exam.

3706 Lighting Technology

ECTS credits: 4 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Radoslav Ivanov Kyuchukov, PhD, tel.: 888-301, e-mail: rkjutchoukov@ru.acad.bg
Abstract:
The subject is aimed at acquainting the students with the theoretical foundations of visual communication. It discusses the structure and essence of the visual communication process, the visualization factors, the basic visual communication means, as well as the overall efficiency of the visual communication process.
Course content:
Diagram of the visual communication process. Structure and essence of visual communication. Visual information and visual communication. Visual factors. Visual communication model. Types of visual communication. Visual identification.
Visual communications in the public, industrial, advertising and business environment. Efficiency of visual communication. Visual culture. Management of visual communications.
Teaching and assessment:
Lectures are presented according to a pre-announced schedule. The lecture material is visualized through didactic and commercial visual aids. Laboratory work is focused on the execution of practical tasks, but also include demonstrations, real contact and studying of visual communication means. The course assignment is individual, with a free theme choice.
The continuous assessment grade is based on estimating the students' theoretical knowledge and the results of its application in practical work throughout the semester.

3707 Alleviated Constructions

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
Assoc. Prof. Ivelin Ivanov, tel.: 888-224
Abstract:
The subject provides, in a popular form, basic knowledge on modern analytical methods and tools for strength and rigidity dimensioning of thin-wall and lightweight structures of partly decorative nature. Students learn to perform (unaided) calculation of such structures, as well as competently discuss their properties. The subject is based on the knowledge obtained in subjects such as Applied Mechanics, Strength of Materials, and Structural Elements. The knowledge obtained in Lightweight Constructions is used further in the course of study, namely in the development of real-application design projects, as well as in the student's practice after graduation.
Course content:
Introduction. Bar systems: mechanical designs, determining internal forces at various loads, methods for strength and rigidity calculation of frameworks. Thin-wall structures: specifics of plates and shells, membrane stress in symmetrical shells, bending of round and rectangular plates, methods of strengthening plates and shells. Welded structures. Finite elements method: basic notions, practical applications, advantages and limitations, VIMKE program system. Selected special topics: dynamic loads in lightweight structures, stability of complex structures. Thermal stress.
Teaching and assessment:
The theoretical foundations of the discussed topics, as presented in the lectures, are assimilated in seminars through solving problems; their individual application is exercised through an individual all-inclusive course assignment. The exam is carried out on control questions and problems. During the exam, students can use books and references without limitation. Term validation is dependent on regular and active participation in the tuition process.

3708 Graphical Design I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Dancho Ivanov Gunev, tel.: 888-426, e-mail: dgunev@ru.acad.bg
2. Principal Assistant Venelin Yozhef Molnar, e-mail: molnar@elits.rousse.bg

Abstract:
The subject introduces the students to the main trends in contemporary graphic design, while providing extensive knowledge in the field of typography and functional graphics. It reviews in detail modern typesetting and artistic fonts and typefaces, systematically distinguishing different styles and families basing on their formal parametres. Students get acquainted also with the current legal environment and requirements related to trade mark design and usage.

Course content:
Introduction to graphic design. Types of graphics. Application of graphic design in modern social communication processes. Typography. Basic notions in creating and analyzing type. Historical review of the development of type varieties; milestones on the road to today's variety of type. Structural shaping of type. Type classification. Functional graphics: designation, specific characteristics. Trade marks: legal background and aesthetic requirements.

Teaching and assessment:
The theoretical foundations presented in the lectures are reviewed and assimilated during the practicals by applying them in solving real-life simulation practical tasks. Practicals focus on individual coaching, as well as on the use of personal computers. The continuous assessment grade is based on the completed course assignment including development of graphic solutions.

3709 Modeling and Maquette Constructions I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Tsvetomir Donev Konov, tel.: 888-558, e-mail: ckonov@abv.bg

Abstract:
Obtaining knowledge and skills necessary for producing models/mockups of industrial products, through the following stages: design development, model/mockup production, project presentation and defence including creative concept reasoning as well as aesthetics and technology analysis of design solutions.

Course content:
Functions of models and mockups. Model types – classification. Types of modeling work; specific operations. Model scale and scale relevance. Imiation in model construction. Model presentation techniques.
Organization of modeling workflow. Equipment and tools. Basic modeling materials. Types of material processing in view of technological suitability, model-building techniques and finishing operations.

Teaching and assessment:
The lecture course includes 10 topics. On the first practical, students are assigned a course assignment, to be completed in two stages, with an intermediate test in semester week 7-9.
The final grade is formed by taking into account the acquired theoretical knowledge in the lecture topics, but before all basing on the results of the practical work on the course assignment which represent two models – a high-precision model of a large-size product and a demonstration model of a general-use item.
Modeling tasks are performed by hand, without computer modeling aids; this is aimed at obtaining hands-on individual experience and skills for practical realization of real-life projects.
The ready project is accompanied by a brief written presentation.

3710 Theory of Composition II

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Prof. Nikola Atanassov Orloev, PhD, tel.: 888-554, e-mail: norloev@ecs.ru.acad.bg
Abstract:
This is a subject of complex nature. It is focused on the development of concepts for compositional form shaping in the frame of an individual creativity project, applying composition knowledge, form shaping skills, colour science knowledge and drawing/painting techniques, as well as application of various presentation techniques.
Course content:
The specifics of the subject suggest linking of multiple topics from the theory of composition, form shaping, colour science etc., while accenting on their thorough practical application in the work on real-life or research objects, assignments and projects.
Simultaneously, new theoretical and practical topics and problems of the composition theory are being introduced, related primarily to shape tectonics. Applied form shaping problems: shape vs. material vs. technology; shape vs. colour vs. light/shadow. Special drawing techniques. Special materials and means for design presentation, incl. verbal, written, and graphical ones, in addition to colour solutions, mockups and models.
Teaching and assessment:
A basic vehicle of the teaching process, in view of its appropriateness for achieving the goals and objectives of the subject, is the practical realization of creativity projects. It is aimed at inspiring creative freedom and confidence, while practicing the student's knowledge and skills in using all graphic, colour, modeling and other techniques existing in professional design.
The goal is to achieve a high level of presentation knowledge and skills, which are indispensable when preparing design solutions and projects for exhibitions or competitions.

3711 English IV

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department FL, Faculty of Law
Lecturers:
Sr. Lecturer Elga Kirilova Naoumova, Dept. FL ; tel.: 888-803, e-mail: enaoumova@ecs.ru.acad.bg
Sr. Lecturer Roumyana Josifova Koleva**,** Dept. FL; tel.: 888-803, e-mail: rkoleva@ecs.ru.acad.bg
Abstract:
Module 4 is the second module in Stage 2 – the level is Post Elementary. As in module 3 the main objective is further development of speaking skills as well as reading and writing skills. Teaching content covers vocabulary and grammar from "Matters – Pre-Intermediate" as well as supplementary materials such as catalogues, leaflets and models. The main focus is on building skills for describing a product, stating an opinion, making one's point and summarizing.
Course content:
Advanced technologies in British industry. Clothes design. Personal characteristics. Taking part in conferences – listening and speaking. Packaging and the consumer – a discussion.
Teaching and assessment:
As in previous modules students participate in role plays, pair and group activities and discussions. Methodology is closely related to aims and objectives and relies on the implications of modern ELT methods as regards general English and ESP. Motivation, learners' different learning styles as well as their future communicative needs are all taken into account. Grammar is taught by means of the task-based approach – the reversed pyramid – production, practice, presentation. Focus is on appropriacy and fluency rather than accuracy. The exam is based on the topics discussed during the semester.

3713 Mechanical Design I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department ATFLT, Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Borislav Anghelov, PhD, tel.: 888-457, e-mail:bangelov@ru.acad.bg
Abstract:
The subject is aimed at acquainting the students with the structure, designation and types of general-use machine elements and assemblies (structural elements) which can be found in all machines and mechanisms and always perform the same functions. The course clarifies, in a possibly minimal volume, the main topics related to the mechanical design of the abovementioned structural elements, as well as to the methods for determining stress and performing the necessary calculations.
Course content:
Introduction. General information on requirements, mechanical design, strength calculation, wear resistance and reliability of structural elements. Joints: wedge, key, pin, profile, screwed, riveted, welded, friction and elastic joints. Structural elements of rotary motion: axes, shafts, bearings and couplings. Transmissions: gear, chain and belt drives. Variable-speed drives.
Teaching and assessment:
Teaching is performed through lectures and practicals. Also included is an individual course assignment. A special accent is put on the student's individual work in designing a structural element of a real technical object. The level of assimilation of the course material is assessed basing on the student's performance during the practicals and in the development of the course assignment. Elements of the theoretical material are included in Mechanical Design II, to be studied during the next (6^{th}) semester.

3714 Production Technologies I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department MTM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
Assoc. Prof. Parashkev Tonev Enchev, PhD, Dept. MTM, tel.: 888-237
Abstract:
The subject is aimed at providing knowledge of the basic methods for primary shaping through casting and plastic deformation, as well as the influence of the specific technological methods on structural properties. The content is related to Production Technologies II and Manufacturability, all of these forming a group of subjects ensuring the technology knowledge of students in Industrial Design. These subjects also aid all other subjects related to mechanical design.
Course content:
Casting methods, technological characteristics., applications. Influence of casting technologies on the product's design; recommendations. Plastic deformation methods, technological characteristics, applications. Methods for manufacturing plastic products, technological characteristics, applications.
Teaching and assessment:
Lectures present the technological characteristics of the basic methods for primary product shaping through casting and plastic deformation. Laboratory classes focus on the influence of the specific technological methods on the mechanical design of a product, as well as on the methods' applications. The exam is written, whereas the final grades depends also on the grade received at the defence of a practical assignment developed during the semester. Instructions on the teaching process are given at the beginning of the semester.

3715 Ergodesign I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written and oral
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Vladimir Tomov Vladimirov, DSc, Dept. EEP, tel.: 888-481, e-mail: vvladimirov@ecs.ru.acad.bg
Abstract:
On completion of this module students will have basic knowledge of the man-machine-environment system. They will get acquainted with methods and ways to analyse the man-machine systems. They will be familiarised with the synthesis of decisions using means and systems of getting information and control.
Course content:
Man-machine systems. Control devices. Means of representing information. Work places. Work environment. Safety of machines. Examination of the man-operator features. Parameters of work places and work operations. Efficiency of protective equipment.
Teaching and assessment:
Teaching is done through a combination of lectures and workshops. In workshops students get acquainted with the methodology of the basic research, carry out experiments, write reports and make analyses and draw conclusions. In the first workshop a course assignment is set. Students are given a schedule to follow and a reading list. They are expected to submit the assignment at the end of the semester and defend it in their last workshop. Two tests are administered in weeks 7 and 13 and they are taken into account when the final grade is written.

3718 Theory of Perception

ECTS credits: 3 **Weekly classes:** 2lec+0sem+0labs+0ps+ca
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Ivanov Ivanov, PhD, Dept. ID, tel.: 888-811
Abstract:
This subject will introduce students to contemporary ideas and opinions about the processes of different perceptions and their application in engineering design. Emphasis is on cognitive psychology from the designer's point of view.
Course content:
Essence and basic properties of perception; mechanisms and peculiarities of the different perception acts; characteristics of the perception of size, volume, complex shapes, movement and events.
Teaching and assessment:
This module is taught using a combination of lectures and seminars in which tests, case studies, tasks, observation and experiments are used. The course assignments are designed to develop the students' creativity.

3716 Graphic Design II

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Tsvetomir Donev Konov, tel.: 888-558, e-mail: ckonov@abv.bg
2. Principal Assistant Venelin Jozhef Molnar, e-mail: vmolnar@ecs.ru.acad.bg
Abstract:
This subject aims at familiarizing students with the modern characteristics of graphic design, its trends, tools, technologies, materials and communication. Focus is on contemporary graphic design in advertising. The module builds on students' knowledge about the font art and shows how computer modelling and using the Internet as a vision can be applied in solving graphic design problems. Electronic fonts are also being developed.
Course content:
The application of computer technologies in graphic design. Relationship with printing arts processes – requirements and trends. Colour models of synthesis. Work with colours. Interpretations and application. Advertising graphic design – creativity in communication processes. Graphic advertising products – vector and raster graphics – basic characteristics and terms, application and usage. Font editors.
Teaching and assessment:
Knowledge gained from lectures is extended and reinforced in class through various tasks using a personal computer. The final grade is based on the marks received from the course assignments.

3717 Modelling and Maquette Constructions II

ECTS credits: 5 **Weekly classes:** 0lec+0sem+0labs+4ps+ca
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Tsvetomir Donev Konov, tel.: 888-558, e-mail: ckonov@abv.bg
Abstract:
This module builds on knowledge and skills acquired in Modelling and maquette construction – part 1. It aims at enhancing practical skills therefore no theoretical lectures are included. Emphasis is on improving the technology of maquette construction, widening the range of maquette materials and presentation of the course assignment.
Course content:
The course assignment is the core of this module. Tasks include development of industrial products or space design using studied materials and technologies. Tasks are formulated by the lecturer in collaboration with the student. This course assignment may serve as a basis for future projects.
Teaching and assessment:
In class students discuss methodology, choice of materials and ways of processing in relation to the task of their assignment. They report the completion of each stage of the assignment according to a pre-determined schedule. At the end of the semester they receive a grade for their course assignment.

3719 English V

ECTS credits: 3 **Weekly classes:** 0lec+0sem+0labs+3ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department FL, Faculty of Law
Lecturers:
Sr. Lecturer Elga Kirilova Naoumova, Dept. FL ; tel.: 888-803, e-mail: enaoumova@ecs.ru.acad.bg
Sr. Lecturer Roumyana Josifova Koleva**,** Dept. FL; tel.: 888-803, e-mail: rkoleva@ecs.ru.acad.bg
Abstract:
Module 5 is the first module in Stage 3 – The level is Early Intermediate, The main objective is building up of the four linguistic skills, as well as sensitivity towards the register differences in the following domains: general English, academic writing, the language of advertising, the language of business correspondence. Teaching content covers vocabulary and grammar from “Matters Intermediate” as well as supplementary materials. This is the stage when negotiation skills are built as well as note-taking and making a presentation.
Course content:
Young people’s life. Plans and arrangements. Preferences and personal taste. The objects in the room. Furniture. Describing everyday objects. Stages in new product development.
Teaching and assessment:
To acquire the necessary language knowledge and to develop skills in using the language as a means of communication a wide range of authentic and specially constructed texts (i. e. articles, diagrams and tables, brochures and catalogues etc.) as well as audio and video materials are used. In class students participate in role plays, pair and group activities and discussions. Two tests are administered during the semester.

3720 Machanical Design II

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department ATFLT, Faculty of Transport Engineering
Lecturers:
Assoc. Prof Borislav Georgiev Angelov,PhD, Dept. ATFLT, tel.: 888-457, e-mail:bangelov@ru.acad.bg
Abstract:
On completion of this subject students will have a basic knowledge of the methodological basis and the main stages of the process of engineering of technical products and systems. Approaches and illustrative examples from leading experts and schools are examined.
Course content:
Introduction. Subject, aim and tasks of engineering. Engineering and the development of new products and systems. Stages in engineering. Formulation of the engineering task, building of decision concepts, synthesis of decision, functional structure, choice of optimum decision and implementation. Engineering and the use of design principles and operations. Algorithms in engineering.
Teaching and assessment:
This subject is taught using a combination of lectures and seminars. Lectures are illustrated with relevant examples. In class students apply the knowledge they have acquired in designing a real technical object. In addition students are given a course assignment as well.

3721 Production Technologies II

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department MTM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
Assoc. Prof. Parashkev Tonev Enchev, PhD, Dept. MTM, tel.: 888-237
Abstract:
The aim of this subject is to acquaint students with basic methods of (primary) shape forming through casting and plastic deformation and the impact of technological methods on structure. This subject is linked to Production technologies I and Technologies of structure. These three subject provide technological preparation for students and facilitate further studies related to engineering preparation.
Course content:
Methods of casting, technological possibilities, applications. Impact of casting technologies on the structure of the product, recommendations. Methods of producing blanks by plastic deformation, technological possibilities, applications. Impact of plastic deformation technologies on the structure of the product, recommendations. Methods of plastic products production, technological possibilities, recommendations.
Teaching and assessment:
Lectures examine the technological possibilities of the processes of shape forming by casting and plastic deformation. In laboratory classes the impact of technological methods on the structure of the product and the applications are investigated. The final grade comprises the mark from the written exam and the mark from the course assignment.

3723 Ergodesign II

ECTS credits: 6 **Weekly classes:** 0lec+0sem+0labs+4ps+ca
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Tsvetomir Donev Konov, Dept. ID, tel.: 888-558, e-mail: ckonov@abv.bg
Abstract:
In this module students will gain basic knowledge and skills in ergonomics of design i.e. optimization of the relationship and interaction of the Man – machine system, design of working environment components and means of obtaining information and their relation to the aesthetic side of products. Students will also be acquainted with methods and ways for synthesis of decisions about the Man – machine system and its optimization.
Course content:
Essence and structure of ergodesign, anthropological and ergonomic parameters, prerequisites for visibility, organization of the work place, controls, indicators, symbols, colour schemes.
Teaching and assessment:
Lectures provide the theoretical basis for the practice classes in which students produce a model of a design solution to an ergonomic problem set in their course assignment. They also get acquainted with Bulgarian and foreign standards in ergonomics. A written test is administered in week 7 – 9. The final grade is based on the mark from the test, the course assignment and the evaluation of the student's performance in class.

3726 Social Psychology

ECTS credits: 2 **Weekly classes:** 2lec+0sem+0labs+0ps+p
Assessment: exam **Type of exam:** written and oral
Departments involved: Department PSS, Faculty of Natural Science and Education
Lecturers:
Assoc. Prof. Sinto Moic Ylzari, Dept. PSS, tel.: 888-497
Abstract:
This module investigates the major concerns in social psychology. It studies various methods for investigation of the functions and the development of social communities.
Course content:
Relationship between the person and the social environment, essence of social groups, types of social groups, functions and development of social communities, interpersonal communication and social roles, social experience, social mind and social will, public opinion, etc.; methods of research.
Teaching and assessment:
This subject is taught in a series of lectures. The students' performance in class is evaluated. Some practical tasks are included in the oral exam.

3722 Graphical Design III

ECTS credits: 5 **Weekly classes:** 0lec+0sem+0labs+4ps+ca
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Tsvetomir Donev Konov, Dept. ID, tel.: 888-558, e-mail: ckonov@abv.bg
2. Principal Assistant Venelin Jozhef Molnar, Dept. ID, e-mail: vmolnar@ecs.ru.acad.bg

Abstract:
In this subject students will be acquainted with advertising, publishing and printing. They will gain knowledge about the proper preparation of illustrations and texts, the technologies for reproduction and printing and quality control in this area.

Course content:
Basic concepts in printing. Shape forming in book publishing. Preparation of the copy. Energy sources and materials in reproduction. Quantity and quality description of the photoreproduction process. Types of illustrations and their usage. Synthesis of colours. Colorimetry.

Teaching and assessment:
Lectures provide facts and information about modern reproduction processes and students are expected to apply the knowledge they have gained to their work on the course assignment.

3724 E-design I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Angel Smrikarov, PhD, Dept. Computing, tel.: 888-743, e-mail: asmrikarov@ ecs.ru.acad.bg
2. Principal Assistant Kamen Aldinov Uzunov, Dept. ID, tel.: 888-845

Abstract:
This subject examines the underlying methodology of synthesis of technical solutions in the context of the synthesis of industrial products viewed as a unity of TECHNICAL+ERGONOMIC+AESTHETIC solutions. It also provides knowledge and skills about: characteristics of the development of industrial products; main points of systems methodological engineering; methods and ways of synthesis of technical solutions at the WIDE COMPETENCE level of the designer and basic rules and principles of engineering.

Course content:
Characteristics of complex products and systems. Function and structure of technical solutions. A complex method of synthesis of design engineering solutions for 10 classes of problems. Types of problems and competence levels in solving them. Synthesis of functional structures. Morphological analysis and synthesis. Algorithms and methodology for solving basic types of problems. Quality of design engineering solutions. Knowledge and data banks. Mathematical and software support.

Teaching and assessment:
Lectures are built on a large number of model solutions and workshops contribute to detail treatment of modern methods and technologies of synthesis of solutions thus involving the students in analysis and discussion. Special emphasis is laid on the course assignment. It comprises three tasks based on the three main activities at the wide competence level – synthesis of functional structures; morphological analysis and synthesis; innovation product. Students are given freedom in the interpretation of the solution. The course assignment is given in the first class. Students work on it throughout the semester. To have the term validated students are required to submit the assignment. The mark they get for it determines their final grade.

3725 English VI

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+2ps+0
Assessment: Exam **Type of exam:** written and oral
Departments involved: Department FL, Agrarian and Industrial Faculty
Lecturers:
Sr. Lecturer Elga Kirilova Naoumova, Dept. FL ; tel.: 888-803, e-mail: enaoumova@ecs.ru.acad.bg
Sr. Lecturer Roumyana Josifova Koleva**,** Dept. FL; tel.: 888-803, e-mail: rkoleva@ecs.ru.acad.bg
Abstract:
Module 6 is the second module in Stage 3 – The level is Early Intermediate, The main objective is building up of the four linguistic skills, as well as sensitivity towards the register differences in the following domains: general English, academic writing, the language of advertising, the language of business correspondence. Teaching content covers vocabulary and grammar from "Matters Intermediate" as well as supplementary materials. This is the stage when negotiation skills are built as well as note-taking and making a presentation.
Course content:
Fashion and films. Clothes. Colours. Capital cities. Spare time activities. British design 1 and 2. A tourist brochure –recycling and extension.
Teaching and assessment:
To acquire the necessary language knowledge and to develop skills in using the language as a means of communication a wide range of authentic and specially constructed texts (i. e. articles, diagrams and tables, brochures and catalogues etc.) as well as audio and video materials are used. In class students participate in role plays, pair and group activities and discussions. The exam is based on the topics discussed during the semester.

3727 Design Method

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Prof. Nicola Atanasov Orloev, PhD, Dept. ID, tel.: 888-554; e-mail: norloev@ ecs.ru.acad.bg
Assoc. Prof. Dancho Ivanov Gunev, Dept. ID, tel.: 888-426, e-mail: dgunev@ru.acad.bg
Abstract:
Creation of industrial products is presented as a complex activity of synthesis comprising technical, ergonomic and aesthetic solutions. Engineering, aesthetic, technological and economic elements of design are examined. Scientific and experimental methods are investigated. The concept of total synthesis of making decisions, i.e. TOTAL DESIGN is introduced.
Course content:
Structure of complex industrial products – planning and technological schemes; principles of action – physical and technical. Choice or synthesis of technological, kinematics or logic schemes of action, driving and automation. Basic technical, ergonomic and aesthetic problems. Methodology of design for complex solutions. Engineer – designer interaction. Technical and economic analysis. Functional cost analysis.
Presentation of complex projects.
Teaching and assessment:
This subject is taught using a combination of lectures and workshops. Focus is on the course project, which is completed in two stages. The first stage is a synthesis of a known solution – a prototype taken from samples of world design practice. Most of the students will get the same task, for example: A fruit-squeezer. Motivated students who want to choose a complex system are allowed to choose their own task, for example: An engine-powered fork lift truck. Students are given instructions and a schedule in the first workshop. The course project gives students a chance to show their creativity.

0331 Production Technologies III

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department MTM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
Assoc. Prof. Parashkev Tonev Enchev, Dept. MTM, tel.: 888-237
Abstract:
The aim of this subject is to acquaint students with basic methods of (primary) shape forming through casting and plastic deformation and the impact of technological methods on structure. This subject is linked to Production technologies – part 1and 2 and Technologies of structure. These three subjects provide technological preparation for students and facilitate further studies related to engineering preparation.
Course content:
Methods of casting, technological possibilities, applications. Impact of casting technologies on the structure of the product, recommendations. Methods of producing blanks by plastic deformation, technological possibilities, applications. Impact of plastic deformation technologies on the structure of the product, recommendations. Methods of plastic products production, technological possibilities, recommendations.
Teaching and assessment:
Lectures examine the technological possibilities of the processes of shape forming by casting and plastic deformation. In laboratory classes the impact of technological methods on the structure of the product and the applications are investigated. The final grade comprises the mark from the written exam and the mark from the course assignment.

3729 Artistic Spatial Layout

ECTS credits: 5 **Weekly classes:** 0lec+0sem+0labs+4ps+ca
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Prof. Nicola Atanasov Orloev, PhD, Dept. ID, tel.: 888-554, e-mail: norloev@ ecs.ru.acad.bg
Abstract:
The aim of this subject is to develop in students the ability to relate the knowledge and skills gained in different modules and use them effectively in the following areas: public space design (interior and exterior), exhibitions and urban environment design, in-plant environment design.
Course content:
Space (interior and exterior) and man's activity. Colour and lighting. Objects in the interior. Furniture. Style in space design. Intermediate space. Visual communication in the interior and the exterior. Exhibitions. Urban environment. Industrial interior – factors of in-plant environment. Principles. Techniques in artistic design.
Teaching and assessment:
Teaching is done through a combination of lectures and workshops. Workshops involve analysis of existing solutions in architectural design and practice. The course assignment comprises 3 tasks: small-scale interior design (My room), exhibition design and urban design. Students are given a wide choice of topics. Two tests are administered during the semester. The final grade is based primarily on the results of the course assignment. A board of three people evaluates the presentation and the defence of the course assignment.

3731 Advertising

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+3ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Tsvetomir Donev Konov, Dept. ID, tel.: 888-558, e-mail: ckonov@abv.bg
2. Principal Assistant Venelin Jozhef Molnar, Dept. ID, e-mail: vmolnar@ecs.ru.acad.bg

Abstract:
The aim of this subject is to acquaint students with the basic principles in advertising. It also provides knowledge how to run an advertising campaign, how to design packaging, etc.

Course content:
General principles of organization and function of advertising. Underlying theory. The creative process in advertising – design and realization. Management of advertising. History of advertising. Types of advertisements. Advertising channels, means, media. Language of advertising. Music in advertising. Advertising agencies. Surveys. Advertising budget. Characteristics and tools of the packaging. Relationship between advertising, packaging and marketing. The packaging solution and communication. Materials and technologies in the packaging industry. Sanitary, hygienic and ecological regulations. Methods of quality control.

Teaching and assessment:
There are two types of workshops: case studies and projects. In workshops students get acquainted with the Loyalty in Advertising Code, develop company advertising policies, plan advertising campaigns, write a scenario for a commercial, watch and analyze advertising campaigns of real companies, design advertising accessories and equipment.
The final grade is based on a written examination, but the students' performance in workshops and the results of the course assignment are also taken into account. Students can substitute the examination for a project choosing one out of five topics at the beginning of the semester.

0459 E-design II

ECTS credits: 5 **Weekly classes:** 1lec+0sem+0labs+3ps+ca
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Angel Smrikarov, PhD, Dept. Computing, tel.: 888-743, e-mail: asmrikarov@ ecs.ru.acad.bg
2. Principal Assistant Kamen Aldinov Uzunov, Dept. ID, tel.: 888-845

Abstract:
This subject aims at providing a systems methodological approach and a complex model for solving designer problems using personal computers. Students develop and refine their skills in 2D drawing and 3D modelling and visualizing by means of computer animation.

Course content:
Introduction. Computer components and programmes necessary for 3D modelling. Auto CAD. Graphic input/output filters. Mathematical apparatus of computer graphics. 3D modelling. 3D representation by colour and light. 3D studio. Animation of objects as a finishing touch in the design process.

Teaching and assessment:
Each topic is presented as a block of information illustrated with examples. Small-scale practical problems are solved to ensure the acquisition of the programming techniques. Problems related to the course assignment are solved. Students work on their own to solve the problems but they can seek the tutor's help and guidance as well. The final grade is based on the practical tasks carried out during the semester and the course assignment, which involves computer graphics solutions.

3733 Style and Symbolism

ECTS credits: 2 **Weekly classes:** 2lec+0sem+0labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Jordan Ivanov Doichinov, PhD, Dept. ID, tel.: 888-845, e-mail jdoichinov@yahoo.co.
Abstract:
This subject is related both to stylistics and symbolism. It lies in the interdisciplinary field of semiotics, the study of art, psycholinguistics and the theory of perception. It contributes to the development of skills necessary for creation of design products with the desired stylistic characteristics and it helps students to use efficiently the mechanism of symbolism.
Course content:
History of style studies. Artistic style. Basic concepts of style. Structure of style. Classification of styles. The theory of symbolism. Types of symbolical systems. Interrelation between style and symbol. Style and symbols in design, etc.
Teaching and assessment:
Teaching is done through a series of lectures, comprising three modules: stylistics, symbolism and the system style – symbol in design.

0706 English VII

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department FL, Faculty of Law
Lecturers:
1. Sr. Lecturer Elga Kirilova Naoumova, Dept. FL ; tel.: 888-803, e-mail: enaoumova@ecs.ru.acad.bg
2. Sr. Lecturer Roumyana Josifova Koleva**,** Dept. FL; tel.: 888-803, e-mail: rkoleva@ecs.ru.acad.bg
Abstract:
Module 7 forms Stage 4 – The level is Mid- or Upper-Intermediate. Teaching content covers vocabulary and grammar from Matters Upper –Intermediate as well as relevant materials such as articles etc. The main objective is building up of reading and writing skills necessary to understand and prepare documents – briefs, specifications, etc.
Course content:
Clothes and appearances. Adventures abroad. Life in Britain. The environment. People and relationships. Home.
Teaching and assessment:
To acquire the necessary language knowledge and to develop skills in using the language as a means of communication a wide range of authentic and specially constructed texts (i. e. articles, diagrams and tables, brochures and catalogues etc.) as well as audio and video materials are used. In class students participate in role plays, pair and group activities and discussions. The exam is based on the topics discussed during the semester.

3734 Marketing

ECTS credits: 2 **Weekly classes:** 3lec+2sem+0labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department Economics, Faculty of Business and Management
Lecturers:
Assoc. Prof. Georgi Emilov Vulchev, PhD, tel.: 888-347
Abstract:
This subject familiarizes students with basic market laws, the theory of demand, the marketing orientation of business, the development and implementation of marketing strategies and marketing plans, with running successful advertising campaigns and efficient public relations.
Course content:
Market and market laws. Essence and functions of marketing. Types of marketing. Basic marketing concepts. Marketing mix. Marketing goods policy. Development of marketing strategy and marketing plan. The process of marketing price policy development. Distribution policy. Advertising policy of a company.
Teaching and assessment:
Practical training is carried out. The examination has two parts: written and oral.

3736 Creative Methods II

ECTS credits: 3 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Prof. Nicola Atanasov Orloev, PhD, Dept. ID, tel.: 888-554, e-mail: norloev@ ecs.ru.acad.bg
Abstract:
This subject aims to acquaint students with methods, means and rules of formation and management of teams. Students will learn to apply them in an atmosphere of creative confrontation and intellectual competition to solve large-scale problems in projects. Students will be taught how to carry out complex design programmes where the role of the industrial designer is to lead the team or to be an efficient member of the team.
Course content:
Work conditions and performance in a team. Formation of a creative team taking into consideration the genesis of the Bulgarian intelligence. Rules and behaviour principles of the leaders and the members of the creative teams. Communication characteristics of the creative personality. The ability to ask questions. Planning your actions. Presentation skills and writing reports and articles. Discussion skills. Behaviour rules in meetings, discussion of creative ideas and justifying plans and intentions. The creative personality and leadership. Presentation of results and achievements.
Teaching and assessment:
Lectures involve analysis and discussions and offer useful methodology, strategies and algorithms for work. In workshops case studies contribute to the development of the students' skills. In their first workshop students are given a set of tasks, case studies and problems to solve, as well as a schedule to follow. To have the term validated they have to complete these tasks. The course assignment comprises eight tasks and the students are expected to carry them out showing ingenuity. Most of the problems involve creativity and research. The results are presented and defended in front of the whole class. The final grade is based on all the above mentioned components.

2233 Aesthetics

ECTS credits: 3 **Weekly classes:** 3lec+2sem+0labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Antoni Sofev, Dept. ID, tel.: 888-840
Abstract:
On completion of this module students will have in depth knowledge of basic concepts, categories and relationships in the sphere of aesthetics. Such knowledge is vital in training designers as people of fine artistic taste.
Course content:
History of aesthetics. System of aesthetics. Aesthetic properties. Aesthetic relations. Aesthetics as an anthology of art. Morphological aspects of aesthetics. Contemporary aesthetically problems, etc.
Teaching and assessment:
Teaching involves a combination of lectures and seminars. To have the term validated students are required to participate actively in class.

3735 Management of Design

ECTS credits: 3 **Weekly classes:** 2lec+1sem+0labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department Economics, Faculty of Business and Management
Lecturers:
1. Assoc. prof. Georgi Emilov Vulchev, PhD, tel.: 888-347
2. Senior Assistant Milena Todorova Koseva, tel.: 888-347

Abstract:
This subject aims at introducing design students to the underlying theory of management and the characteristics of management in a market economy. Students will acquire knowledge and develop their skills in making management decisions and applying contemporary management approaches and techniques.

Course content:
Introduction to management theory and practice – definition, tasks. Management – a science and an art. Management approaches. Planning – essence, types of plans – hierarchy. Stages in planning. Making management decisions – essence, cost-efficiency. Alternative cost. Choice. Risk evaluation. Statistical planning – strategy, policy, tactics. Contemporary approaches. Organizing – aims and tasks, formal and informal organisations. Organization levels and range of management. Types of organizational structures. Management of human resources – recruitment, training, career development, assessment.

Teaching and assessment:
Lecture notes are distributed in advance and students discuss them with the lecturer in class. Seminars involve case studies and solving practical problems.

0707 E-design III

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+3ps+0
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Angel Smrikarov, PhD, Dept. Computing, tel.: 888-743, e-mail: asmrikarov@ ecs.ru.acad.bg
2. Principal Assistant Kamen Aldinov Uzunov, Dept. ID, tel.: 888-845

Abstract:
This subject aims at providing a systems methodological approach and a complex model for solving designer problems using personal computers. Students develop and refine their skills in 2D drawing and 3D modelling and visualizing by means of computer animation.

Course content:
Introduction. Computer technolgies necessary for web design.Programming in web. Flash animation of objects as a part of the design process.

Teaching and assessment:
Each topic is presented as a block of information illustrated with examples. Small-scale practical problems are solved to ensure the acquisition of the programming techniques. Problems related to the course assignment are solved. Students work on their own to solve the problems but they can seek the tutor's help and guidance as well. The final grade is based on the practical tasks carried out during the semester and the course assignment, which involves computer graphics solutions and web design.

3738 Intellectual Property

ECTS credits: 3 **Weekly classes:** 2lec+0sem+0labs+4ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Veselin Grigorov, PhD

Abstract:
The course objective is to teach the forms of existence of intangible assets (Patents, models, know-how, brand names, designs, copyrights, etc.). And is also the procedures for their formation, and acquisition opportunities for their use in manufacturing and trading companies.

Course content:
Intellectual, procedures for establishing intellectual property rights and possibilities for its economic importance and use.

Teaching and assessment:
In the lectures the necessary theoretical knowledge is presented, and in the seminars cases and sample applications of the Patent Office are studied. The examination assessment is based on a testing task.

3740 Diploma Practice

ECTS credits: 4 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: exam **Type of exam:**
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors
Abstract:
The diploma practice aims at giving the students the opportunity to get acquainted with contemporary scientific and technical achievements in the sphere, in which they develop a diploma project and with the existing condition of the problem in the organization, which has suggested the topic for the diploma project.
Course content:
In relation to the topic of the diploma project, the students get acquainted with literature sources, patents, inventions etc., with methods for theoretical and experimental investigations and the results from them; with constructive and technological solutions; with laboratory equipment, measurement devices, tools patterns, machines for mechanical treatment, casting, welding, plastic deformation and thermal treatment; with methodology for constructive and technological calculations; with software packages for solving engineering problems; with quality management systems, etc.
Teaching and assessment:
The diploma practice is carried out in the department laboratories, mechanical and mechanical-mounting workshops, constructive and technological offices or divisions of machine-building companies, libraries, etc. in relation to the topic of the diploma project and the organization, which has suggested it. The tasks of the practice are determined by the tutor of the diploma project and are reported to him. The results from the practice are used in forming the literature reference of the diploma project and the development of its specific sections.

3741 Diploma Project

ECTS credits: 10 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: exam **Type of exam:**
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors
Abstract:
The diploma project aims at giving students the opportunity to apply the obtained knowledge and skills in self-independent and entire development of engineering projects.The students who have excellent achievements are given topics with research character. The Final Year project gives the students practical skills and experience for the future engineering practice or for continuing their study in a Master degree course.
Course content:
Review of the information regarding the diploma project topic. Formulating the aim and the tasks. Analysis of the output and the work conditions. Idea project or methodology of the research. Design of repair technologies. Design of the necessary equipment and devices. Running of tests and processing of the results. Technical and economical analysis of the developed variants. Development of technical documentation and graphical representation of the results from the research.
Teaching and assessment:
The diploma project is developed following a given routine. The students work individually, using paper or electronically based information, the equipment of the department or other departments, and their instructor's help. The diploma project instructor assesses the degree of involvement, the public and moral qualities of the student. The assessor evaluates the diploma project. The student defends the diploma project in front of the State Exam Committee and the open public. The State Exam Committee evaluates both the diploma project and the way it is defended.

UNDERGRADUATE STUDIES IN ECOLOGY AND TECHNIQUES FOR ENVIRONMENTAL PROTECTION

PROFESSIONAL STANDARDS
OF A BACHELOR IN

ECOLOGY AND TECHNIQUES FOR ENVIRONMENTAL PROTECTION

DEGREE COURSE: Ecology and Techniques for Environmental Protection
Degree: Bachelor
Qualifications: Engineer of Environmental Protection
Duration: 4 years (8 semesters)

The main purpose of the specialty is to prepare qualified professionals with wide practical training in the techniques and technology of environmental protection based on relevant theoretical basis.

The training occurs in two phases. The first phase of the training is fundamental. It is built on the study of natural sciences and mathematics.

The second phase of training of the students majoring in Ecology and Equipment for Environmentall Protection aims at the absorption of knowledge and skills to be applied in two directions:

- Analysis of the environment. The main objective is to be placed on training ground actions and the consequences of pollution on environmental media. This study follows the logical chain "phenomena - sources - factors – emissions - distribution - sites of impact - effects.
- Synthesis of solutions for managing environmental protection. The main goal of training in this area is learning the methods of prevention and finding adequate solutions for environmental protection.

In the eighth semesters students defend a project of their choice.

The graduates who has acquired a Bachelor's degree in major Ecology and equipment for environmental protection may find realization as:

1) Technologists and managers of facilities and systems for recovery and waste treatment
2) Designers of technologies for environmental protection in economic and scientific organizations
3) Experts monitoring the pollution of air, water, soil, food, agricultural and industrial production
4) Leaders of various hierarchical levels of environmental management in public administrations, local governments, enterprises and companies
5) Researchers of the environment and test systems
6) Experts on analysis and assessment of environmental and industrial risk insurance companies, banks, National Insurance Institutes
7) Professionals in production risk management in labor inspectorates, businesses, public and private organizations.

CURRICULUM

of the degree course in

ECOLOGY AND TECHNIQUES FOR ENVIRONMENTAL PROTECTION

First year

Code	*First semester*	*ECTS*	*Code*	*Second semester*	*ECTS*
1990	Higher Mathematics	5	1438	Material Science	5
1991	Botany	8	1439	Ecological Politics	6
1993	Physics	3	1492	Analytic Chemistry with Instrumental Methods	3
2075	General and Inorganic Chemistry	3			
2079	Zoology	7	2078	Ecology	8
	Elective courses - students elect a course		1436	Organic Chemistry	3
			1437	Ecologicaly Danger Production I	5
2235	English I	4			
2236	German I	4			
2237	French I	4			
2238	Russian I	4			
	Total:	***30***		***Total:***	***30***

Second year

Code	*Third semester*	*ECTS*	*Code*	*Fourth semester*	*ECTS*
2252	Applied Mechanics	6	2385	Heat Engineering	3
2306	Informatics	4	2386	Technical Drawing and Machine Design	6
2309	Biochemistry	4			
2315	Microbiology	4	2393	Water Pollution and Impact on the Ecosystems	7
2360	Air Pollution and Influence on the Environment	6	2394	Physical Chemistry	3
2383	Ecologically Dangerous Production II	6	2395	Soil Pollution and Impact on the Ecosystems	5
			2396	Environmental Protection	6
	Total:	***30***		***Total:***	***30***

Third year

Code	*Fifth semester*	*ECTS*	*Code*	*Sixth semester*	*ECTS*
2728	Economics	3	2987	Waste Water Purificatipn II	6
2787	Ecological Legislation and Standards	5	2988	Waste Water Purification II - Course Project	2
2934	The Risk Theory				
2980	Waste Water Contamination I	7	2989	Waste gases purification I	7
2985	Ecological Monitoring	7	2990	Noise and Vibration Protection	4
2986	Hydraulic and Pneumatic Equipment	5	2991	Radiation Protection	3
		3	2992	Safety Technology	5
			2993	Enrichment processes and technologies	3
	Total:	***30***		***Total:***	***30***

Fourth year

Code	*Seventh semester*	*ECTS*	*Code*	*Eighth semester*	*ECTS*
2995	Soil Protection	6	3002	Purification Technique's Testing	4
2996	Waste Gases Purification II	5	3003	Logistics Technologies	4
2997	Waste Gases Purification II – Course Project	2	3004	Ecological Management	2
			3005	Ecological Investigation	4
2998	Treatment technologies	5	3006	Diploma practice	4
2999	Treatment of Dangerous Waste	5	3011	Diploma Project	10
3000	Technical Safety	3		***Elective courses - students elect a course***	
3001	Solid Waste Treatment Technologies	4	3007	Ecological Projects Management	2
			3008	Modelling of Treatment Processes	2
			3009	Rehabilitation Technologies	2
			3010	Veterinary and Hygienic - Sanitary Investigation	2
	Total:	***30***		***Total:***	***30***

Total for the training course: 240 ECTS credits

1990 Higher Mathematics

ECTS credits: 5 **Weekly classes:** 3lec+2sem+0labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AG, Faculty of Natural Science and Education
Lecturers:
Prof. Stephen Agop Terzian, PhD, Dept. AG, tel: 082/888-226; e-mail: tersian@ami.ru.acad.bg
Abstract:
The higher mathematics is a general education discipline. It has been developed on the base of the material acquired before in the middle level course in mathematics. The discipline has links to the base of the Physics, Chemistry, Biology and etc.
The main goal of the education in the discipline is to create skills in the students for mathematical computations making and development of their logical thinking, necessary in the other disciplines. The discipline consists: Introduction to the functional analysis of one variable, linear algebra elements and analytical Geometry. The section of the Mathematical analysis gives knowledge about the main elementary functions, borders and functions investigations, continuity and function's derivation, derivation's application, determinate and indeterminate integral. The section of Linear Algebra consists of concepts about matrixes and linear systems. In the Analytical Geometry the vectors, coordinate systems, equations of planes and lines, equations of curves and planes, are studied. The skills and knowledge, acquired in the discipline of Higher Mathematics are bases to create some disciplines in the other departments.
Course content:
Determinants and Matrixes; Vectors and Analytical Geometry; Differential computation and Solution of one function variable; Undefined integral.
Teaching and assessment:
The teaching in the discipline is made using lectures and seminar exercises. The students are introduced to the main theoretical bases of the material, attended with appropriate chosen tasks. During the lessons, the material is introduced theoretical and the content Is demonstrated with examples. For visualization a multimedia is used. Four tables with main formulas for derivation and integrals, lines, planes and curves, necessary for the task solutions are demonstrated. These tables are available for the students during their test paper. The students have to prepare themselves for the seminary lessons, teaching the material from the lectures. On the exercises the process of acquiring of the material from the students is controlled. The students are trained to solute some problems in practice.

1993 Physics

ECTS credits: 3 **Weekly classes:** 3lec+0sem+1labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department Physics, Agrarian and Industrial Faculty
Lecturers:
Associated Prof. Tamara Pencheva PhD, Dept. Physics, tel: 888-218, e-mail: tgp@ru.acad.bg
Abstract:
The discipline of Physics ensures the base to solve any complex problems in the other technical disciplines. The aim of the discipline is to help student understand the theoretical, methodological problems and the contemporary state of Physics of atmosphere and Earth and to give the whole picture of the processes and phenomenon when machines and complex technical objects are working. The main topics are arranged in logical consequence, although they are shortened due to the limited number of hours. In conjunction with the Theory laboratory practice in physics is lead. The Physics has incoming links with: Mathematics and Chemistry. The outgoing links are with all specialized disciplines.
Course content:
Metrology; Kinematics and Dynamics; Work and Power; Gravity interactions; Vibrations and mechanical waves; Earth's structure; Molecular-kinetics Theory of the substance's structure; The consistency and details of the Earth's atmosphere; Electrical filed; Electricity; Atmosphere's electricity; Magnetic field; Light; Thermal emission;
Teaching and assessment:
The teaching consists of lectures, laboratory exercises, essays and test paper. The students are introduced with the main features of the material. A multimedia is used for visualization of the exercises. The students have to prepare themselves, learning the material they have acquired during the exercises. Universal and specialized measurement devices, computers and appropriate software are used in the exercises. A test control upon the topics is given. During the semester 2 test controls are carried out.
The overall evaluation on the discipline is formed upon the 2 test works, certification of the laboratory exercise and given report.

2075 General and Inorganic Chemistry

ECTS credits: 3 **Weekly classes:** 2lec+0sem+1labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assos. Prof. Dimitar Pavlov, PhD, Dept. RRCT, tel.: 888-733, e-mail: chimia@ru.acad.bg
2. Senior Lecturer Jasmina Pencheva, PhD, Dept. RRCT, tel.: 888-459, e-mail: jasmina@ru.acad.bg

Abstract:
The discipline General and inorganic chemistry for the specialty Ecology and Environmental Protection consists some topics about the substance's construction, chemical compounds, chemical kinetics, Chemical equilibrium and etc, necessary for the cause and characteristics for some important processes in the environment to pass. All the problems are the base to acquire the material in Organic chemistry, Physical chemistry, Analytic chemistry with instrumental methods, Air pollution and influence upon the ecosystems; Water pollution and influence upon the ecosystems and etc. The part of the discipline called Inorganic chemistry has an applied character-introduce to the characteristics of the most important inorganic components of the Air, Water and Soil.
The course has incoming links with course in Chemistry learned in the secondary education and external links with the courses in Organic chemistry, Physical chemistry, Analytic chemistry with instrumental methods, Air pollution and influence upon the ecosystems; Water pollution and influence upon the ecosystems and etc.

Course content:
Substance's construction; Chemical compounds; Chemical kinetics; Chemical equilibrium, Sorption; Adsorption; The base of the electrochemical processes; Corrosion; Chemical and electrochemical corrosion; Metal's characteristics; The main gases in the atmosphere characteristics; The most important gases in the atmosphere characteristics; Chemistry and ozone balance; Salt content and hardness of the water.

Teaching and assessment:
The teaching on the course is using multimedia, posters and tables for material's visualization. The laboratory exercises are organized in the laboratory in Chemistry using the appropriate stands. The students have to prepare themselves in advance. The exercises begin with a test that lasts 15 minutes.
During the semester a course work is implemented, that include chemistry equation solution. If the valuation is different than poor, the student are not saluting any tasks on the exam. The final valuation is made in addition after a written and oral exam.

1991 Botany

ECTS credits: 8 **Weekly classes:** 2lec+0sem+4labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assos. Prof. Siika Pavlova PhD, tel: 888-573

Abstract:
The lectures introduced to the student the anatomical structure, physiology and the systematic of the different systematical plant's group. There are 3 sections of the course. Laboratory exercises are provided for self-dependent development of a problem.
The discipline "Botany" has linked with some biological disciplines, learned during the secondary education, and initial links with the disciplines of Ecology, Biochemistry, Microbiology and etc.

Course content:
Plant cell. Plant tissue. Vegetative organism. Root. Stalk. Leaf. Reproduction and multiplication. Plant's water balance. Photosynthesis. Mineral nutrition of the plants. Plant's breathing. Growth and movement of the plants. Evolution of the plants in the water. Evolution of the plants on the land. Vascular plants (horse tails and ferns). Origins, main directions and stages in the evolution of the seed-plants. Dispermous plants. Monospermous plants. Vegetable kingdom. Mushrooms.

Teaching and assessment:
The teaching on the discipline is held by lectures and laboratory exercises. The maximum number of points that the student is able to acquire getting part in the activities, is 45 points. The laboratory exercises are assessed on the base of the defended report from the student (for each 2 points). For a defended graduation work 10 points are accounted. For student's certification on the discipline are necessary minimum 45 points. The final valuation on the discipline is formed after a written examination, including 2 theoretical problems (assessed to 60 points). A supplementary examination is carried out on the same conditions.

2079 Zoology

ECTS credits: 7 **Weekly classes:** 2lec+0sem+3labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Prof. Stefan Venev PhD, Dept. AM, tel.: 888-556
Abstract:
The discipline is fundamental-consists lectures and laboratory exercises. The lectures aim to introduce studen with the anatomy, physiology and taxonomy of the different groups of animals. The students prepare course wo for individual, profound development of a concrete problem. The laboratory exercises allow good combinatic between the theory and practice.
The discipline of zoology has internal links with all the biological disciplines, learned in the secondary educatic and outgoing links with-Ecology, Microbiology, Biochemistry and etc.
Course content:
The object of study in zoology; Types of mushrooms and types of Cnidarians; Groups of worms, Platyhelminthe Arthropoda, Mollusca and Chordata; Taxonomy of the Vertebrata; Fauna resources; Methods and ways for pe control; Zoonose's diseases by mals and peoples.
Teaching and assessment:
The teaching is held on by lectures and laboratory exercises. The maximum number of points from presents 45. The laboratory exercises are evaluated on the base of defended report from the student (for each up to points). For defended course work are given 10 points. For certification on the discipline the student nee minimum 45 points. The overall valuation is formed after a written exam, including 2 theoretical problem (evaluating up to 60 points). The correctional exam is the same as the written one and is held on the sam conditions.

2235 English I, 2236 German I, 2237 French I, 2238 Russian I

ECTS credits: 4 **Weekly classes:** 0lec+0sem+0labs+0ps+p
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department FL, Faculty of Business and Management
Lecturers:
1. Sr Lecturer Elga Naoumova, Dept. FL, tel.: 888-803; e-mail: enaoumova@ecs.ru.acad.bg
2. Sr Lecturer Tinka Angelova Karaivanova, Dept. FL, tel.: 888-824, e-mail: tkaraivanova@ecs.ru.acad.bg
3. Sr Lecturer Roumyana Ivanova Milanova, Dept. FL, e-mail: rmivanova@ecs.ru.acad.bg
4. Sr Lecturer Iliyana Gancheva Benina, Dept. FL, e-mail: Ibenina@ecs.ru.acad.bg

Abstract:
The foreign language module 1 is aimed at achieving communicative competence in the area of the subject specialism and the future job. The teaching objectives comprise the development of reading comprehension skills to handle specialist texts and the acquisition of communication skills to interact successfully in professional settings and everyday situations.
Course content:
Meeting people. Talking about the present and the past. Plans. Describing objects and places. Comparing things.Searching for information in catalogues. Linking facts and ideas. Applying for a job.
Teaching and assessment:
To acquire the necessary language knowledge and to develop skills in using the language as a means of communication a wide range of authentic and specially constructed texts (i.e. articles, diagrams and tables, brochures and catalogues etc.) as well as audio and video materials are used. In class students participate in role plays, pair and group activities and discussions. Continuous assessment involves at least two written tests and oral testing as well.

2078 Ecology

ECTS credits: 8 **Weekly classes:** 3lec+2sem+0labs+2ps+2cw
Assessment: exam **Type of exam:** written and oral
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Gergina Baeva, tel.: 888-573
Abstract:
This is a fundamental discipline. It aims to equip students with knowledge and expertise in analysing and classifying the specific characteristics of organisms (populations, communities, the biosphere) which are studied and examined in close relationship with environments. The aimed themes throughout the course are: methods of analysis – examination and investigation of established parametres (abiotic ecological factors) of ecotypes (biotypes); structure and composition of populations, communities and the biosphere; productivity and other characteristics of ecosystems; theoretical knowledge of different environments and interrelations between them and organisms; composition and structure of populations; structure and functioning of biocenosis(plant associations) ecosystems and the biosphere.
The studied discipline is very closely related to Biology and Pedology, Soil contamination and Impact on the ecosystems etc.
Course content:
The programme includes global topics like: modern ecology as an interrelated science; the lithosphere and organisms; sun radiation and organisms; ecology of populations; ecology of communities; ecosystems; global ecology etc.
Teaching and assessment:
The studies are performed in the combination of lectures, seminars and practice sessions. The practice sessions are carried out both in laboratories and in the open. They aim to provide students with practical experience and ability of analysing particular organisms. The course assignment is on investigating and presenting the current state of natural ecosystems on the territory of Bulgaria.
The final assessment is based on reports, course assignment defence and exam.

1436 Organic Chemistry

ECTS credits: 3 **Weekly classes:** 2lec+0sem+1labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Dimitar Jordanov Pavlov, PhD, Dept. RRCT, tel.: 888-733, e-mail: chimia@ru.acad.bg
Assistant Prof. Nina Nikolaeva Gospodinova, PhD, Dept. RRCT, tel.: 888-733, chimia@ru.acad.bg
Abstract:
Students receive knowledges about classification, nomenclature and properties of organic compounds. Lecture course treats the main groups of organic compounds, the stress is on their physiological effect on people and their effect on animate nature. Information is given for the emissions of some important organic compounds. The properties of examined organic compounds are studied experimentally at the laboratory exercises. These exercises include methods for qualitative analysis and methods for quantitative analysis; and task for identification of organic compounds.
Course content:
Characteristics of organic compounds and classification; Functional groups and their I.U.P.A.C. nomenclature; Hydrocarbons; Classification; Nomenclature, physical and chemical properties; Spreading, physiological effect, use. Halogenohydrocarbons; Classification, nomenclature, physical and chemical properties; Spreading, physiological effect and use. Freons - nomenclature and properties; Alcohols and phenols; Aldehydes and ketones; Carboxylic acids; Sulphur- and nitrogencontaining organic compounds; Heterocyclic compounds; Alkaloids; Polymers; Surface-active compounds.
Teaching and assessment:
Lecture course treats properties, nomenclature, spreading, use and physiological effect of the main groups of organic compounds. Laboratory exercises include experimental study of what has been treated at the lectures.

1437 Ecologicaly Danger Production I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Nedialko Panchev PhD
2. Assistant Liubomir Vladimiriv, Dept. EEP, tel.: 888-418, e-mail: lvladimirov@ru.acad.bg

Abstract:
he aim of the course is to give knowledge to the students in: main terms and definition of the ecology; complex relationships between abiotic components with the live otganisms; main relationships between of the structural-functional organization of the populations and ecosystems; energetic and homeostasis of the technical, agricultural, marine and forest ecosystems.
The incoming links of the discipline are with Zoology, Botany, Mathematics, Physics, Chemistry. Dangerous wastes, technologies and materials. Ecology. The outgoing are with Ecological monitoring. Environmental protection. Water pollution and impact upon the ecosystems.

Course content:
Fuel heat process. General organic synthesis. Mineral elements production. Electrochemical production. Building. Metallurgy and machine building.

Teaching and assessment:
The teaching is held on lectures and practical exercises.
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice is connected with lectures. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control (oral or written with duration of 15 minutes with maximum number of points 2) is carried out. The students received their issue and work themselves under the observation of the teacher. During the semester 2 test controls are carried out, including the theory and practice and problems from the exercises. The tests are valuated using point system with the maximum number of points, equal to 60 points.
The overall valuation on the discipline is formed after written exam with duration of 120 minutes. The tickets include 2 theoretical questions from the lectures. During the exam table using is permitted.
The maximum number of points from the written exam is 60.

1438 Material Science

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department MME, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
Assoc. Prof. Diana Vassileva Tzaneva, PhD, Dept. MME, tel.: 888-307, e-mail: dvc@ru.acad.bg
Assistant Mariana Dimitrova Ilieva, Mag. Eng., Dept. MME, tel.: 888-307, e-mail; mdilieva@ru.acad.bg

Abstract:
The discipline is devoted to the metal and non-metal engeneering materials used in decontamination systems of water and air, and in the waste remaking systems, as well as, sourses of contamination of the nature during production, corrosion or agening of materials. The discipline is based on Physics and Chemistry knowledges and it is a grounding in “Ecologically dangerous manufactures”, Hydraulic – pneumatic equipment”, “Dressing technique and technologies”, “Dangerous waste treatment”.

Course content:
Classification of the materials. Structure and methods for its investigation. Ferrous and non-ferrous metals and alloys – irons; steels; Cu-, Al-, Ti-, Ni -based alloys. Environmental stability of metals. Ceramics – cement, mortar, concrete, engeneering ceramics and refractories. Technical polymers and elastomers . Ageing of thermoplastics. Composites.

Teaching and assessment:
The lectures are illustrated by schemes, diagrams, graphics etc.. The practical exercises are devoted to the metallographical, X-ray and electron microscopy analysis; analysis of the composition; mechanical properties; corrosion behaviour. The continuous assessment is formed basing on the students’ reports and on two tests on the lecture material.

1439 Ecological Politics

ECTS credits: 6 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Stefka Naumova, tel: 888 434
2. Prof. Vladimir Tomov, Dept. EEP, tel.: 888-481, e-mail: vtomov@ru.acad.bg

Abstract:
The aim of this course is to provide students of the Department of Ecoligy and Environmental Protection with acceptable and easy to understand knowledge in relation to their future professional career as far as national environmental legislation is concerned. They should be acquainted with international acts with regard to the problem. The attention is focused on the intrinsic law regulations of the environmental protection. With reference to that we have included a number of significant international agreements in the course, which Bulgaria has signed, and the consequent rights and obligations for the country. It has incoming links with: Ecological legislation, Environmental protection, Water, Air na soil pollution and etc.

Course content:
Ecological politics, Levels in ecological politics, Sustainable development, Economy development and its models, relationships between economics and environment, Environment during a crisis, Ecological politics forming, ecological foundations, Evaluation of the influence upon the environment, National fond for environmental protection, European politics in environmental protection, Synchronization of the legislation in republic of Bulgaria with European unity.

Teaching and assessment:
The teaching is held on lectures and practical exercises.
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice is connected with lectures. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching. During the practical exercises an incoming control. During the semester 2 test controls are carried out. The overall valuation on the discipline is formed after written exam.

1492 Analytic Chemistry with Instrumental Methods

ECTS credits: 3 **Weekly classes:** 2lec+0sem+0labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assos Prof. Petar Kopchev, PhD, Dept. RRCT
2. Senior Lecturer Jasmina Pencheva, PhD; Dept. RRCT, tel.: 888-459, e-mail: jasmina@ru.acad.bg

Abstract:
Analytic chemistry with instrumental methods aims to give knowledge about the methods, used in the classical analytic chemistry, its applications and possibilities. The information about the modern instruments is given. This is done with the goal realizing the advantages and disadvantages of each method.
The discipline has incoming links with General an inorganic chemistry, Physics and outgoing with other specialized disciplines.

Course content:
Definitions and role of the analytic chemistry in science and practice. Taxonomy of the methods in the analytic chemistry by physical and chemical character of the process of the base. Taxonomy by the volume of the analyzed probe and technique of its execution. Acid and bases. Complex creation in analytic chemistry. Weight analyses. Different methods essentials.

Teaching and assessment:
The discipline of Analityc chemistry with analytic methods is taken under lectures and laboratory exercises.
The laboratory exercises are organized as cycles. Each cycle is developed by 2-3 students. Methods are developed in advance for each exercise, including a short theory and instructions for practical work. In some of the exercises any type of tasks are solved. They are used for experimental data processing. After the experiments, the data are introduced on the shown manner. They finished with talking with the teacher and making a report with the results.
The teaching on the course is using multimedia, posters and tables for material's visualization. The students have to prepare themselves in advance. The exercise finishes with a report.
During the semester a course work is implemented, that include chemistry equation solution.

2252 Applied Mechanics

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+1ps+cw
Assessment: exam **Type of exam:** written
Departments involved: Department EM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1. Assoc. prof. PhD Stoyan Stoyanov, Dept. EM, tel.: 888-572, e-mail: sgstoyanov@ru.acad.bg
2. Assoc. prof. PhD Tanja Grozeva, Dept. TMM&MMHT, tel.: 888-486, tgrozeva@ru.acad.bg
Abstract:
The students get acquainted with the methods for investigation of deferent kinds of rigid body motion, for different force transformations, and for investigation of the mechanical interaction in rigid bodies in eguilibrium. The subject provides a basis for modeling of structures, mechanisms, dynamic processes and the applications of computer methods needed for their investigation. Preliminary knowledge in Mathematics, Physics, and Informatics are necessary for this course. The discipline is a fundamental for the engineering courses about analysis and design of mechanical structures and machines.
Course content:
Particle kinematics. Translational, rotational, and plane rigid body motion. Relative motion of a particle. Equilibrium of a rigid body. Reduction of a system of forces. Equilibrium of a multi-body system. Equilibrium in presence of friction. Gravity center.
Teaching and assessment:
The theoretical basis of the topics is elucidated in lectures and it is illustrated by examples. The students solve problems in exercise classes by utilizing the software environment of MATLAB. They applied the learned methods in their course work, which is assigned individually to each student. The course work is controlled and graded. The total score of any student is formulated by a system of tests, including two midterm and a final term tests with a reexamination test. The gained grade in the semester is accounted for in the final grade.

2306 Informatics

ECTS credits: 4 **Weekly classes:** 1lec+0sem+0labs+2ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department IIT, Faculty of Natural Science and Education
Lecturers:
assoc.prof. Margarita Stefanova Teodosieva, PhD, Dept. IIT, tel.: 888-464, e-mail: mst@ami.ru.acad.bg
Abstract:
The course objective is students to gain knowledge about computers and its components as hardware and about software products like operation systems, text processing systems, presentation systems, worksheet systems, data bases, information systems, computer graphics systems, automated systems for constructive and technological designing. The workshops' goal is students to practice running the widespread software systems like Windows, Word, PowerPoint and Excel on PCs.
Course content:
Computer's history and classification. Hardware. Operation systems. Applied software. Text processing systems. Worksheets. Databases – relational database. Database Management System (DBMS). Widespread DBs. Data communications and computer networks.
Teaching and assessment:
The course is conducted through 2-hour lectures fortnightly and 2-hour workshops weekly. The workshops are held under the supervision of the instructor in computer labs. In the beginning of the workshop session students do a 5-minute brief test, test paper or oral questioning. Students are tested after each course unit for a feedback of their progress on relevant software product in practice. Students fulfil a course assignment to show their ability to use software systems. The course assignments are evaluated as well. Semester validation is given for students' attendance not less than 50% of the total course workload in accordance with the University's Rules. At the end of the semester students are assessed by a test covering the complete course themes. The final grade is formed on the basis of the final test, the workshop activities and the course assignment mark.

2309 Biochemistry

ECTS credits: 4 **Weekly classes:** 2lec+0sem+1labs+0ps+0
Assessment: exam **Type of exam:** oral
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Assoc. prof. Stanka Damianova, PhD
Abstract:
It is a fundamental discipline and presents the chemical structure of the organisms, characteristics and essential pf the substances in its structure. The main biochemical processes are introduced-amino acids, enzymes, proteins and etc.
It is a base for lots of disciplines.
Course content:
Carbohydrates, Proteins, Enzymes, Metabolism, Biochemical energetic, fats, exchange of the fats, carbohydrates, and proteins; relationships between fats, carbohydrates, and proteins; Nuclear amino acids and etc.
Teaching and assessment:
The laboratory exercises are organized as cycles. Each cycle is developed by 2-3 students. Methods are developed in advance for each exercise, including a short theory and instructions for practical work. In some of the exercises any type of tasks are solved. They are used for experimental data processing. After the experiments, the data are introduced on the shown manner. They finished with talking with the teacher and making a report with the results.
The teaching on the course is using multimedia, posters and tables for material's visualization. The laboratory exercises are organized in the laboratory in Chemistry using the appropriate stands. The students have to prepare themselves in advance. The exercises begin with a test that lasts 15 minutes. The exercise finishes with a report.
During the semester a course work is implemented, that include chemistry equation solution. If the valuation is different than poor, the student are not saluting any tasks on the exam.

2315 Microbiology

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Stojan Vlahov PhD, tel.: 888-418
Abstract:
The general aim of the course in Microbiology is to introduce students with the morphology, anatomy, physiology and taxonomy of the different types of microorganisms.
Modern scientific information on the influence of the environmental factors upon the growth of the microorganisms is introduced. Some light is turn on the metabolic processes of some types of microorganisms to synthesize useful for the human biological products.
The role of the microorganisms in the substances circle, connected with the environment and resources renew is considered.
The discipline has incoming links with the courses in Botany, Zoology, Ecology and outgoing links with Biochemistry, environmental protection and etc.
Course content:
The problem and topics of Microbiology. Microorganism's Morphology. Bacteria's Anatomy. Bacteria's taxonomy. Bacteria's growth and multiplication. Physical and chemical features of the bacteria. Actinomycete - structure. Physiology of the actinomycete. Actinomycete's taxonomy. Saccharomyces cerevisiae - structure, physiological features, taxonomy. Fingus - structure, physiological features, taxonomy. Viruses. Bacteriophages. Nitrition and metabolism of the microorganisms. Influence of the physical factors upon the microorganisms growth. Influence of the chemical factors upon the microorganisms growth. Influence of the biological factors upon the microorganisms growth. The role of the microorganisms upon the substances circle.
Teaching and assessment:
The teaching on the course is made with lectures and practical exercises. In the end of each exercise a report's defense is made (then is given up to 2 points for a paper). The presence of the lectures and exercises is evaluated with points also (up to 45 points). To acquire a certification the student has to reach minimum 40 points. The overall valuation on the discipline is forming after test control in the end of semester, including 2 theoretical topics. The correctional exam is written also.

2360 Air Pollution and Influence on the Environment

ECTS credits: 6 **Weekly classes:** 2lec+0sem+3labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Staicho Kolev PhD, tel: 02/4624511, e-mail: stayko.kolev@meteo.bg
Abstract:
In the lectures students are introduced with the structure, thermo dynamical regime and radiation characteristic of the air, as a base to understand the reasons for its movement and behavior.
The general sources for air pollution and climate change are considered. The main methods for transport of the pollutants in the air nearby the sources computations are given. The mathematical modeling of the processes in local and global scale of the pollution and their influence upon the ecosystems and the human are introduced..
Course content:
Topics and problems; Air composition; Constant and variable ingredients; Hothouse gases; Air pollution; Local and regional pollution; Global pollution of the atmosphere; Air pollution of the cities-influence of the climate characteristics; Pollution sources; Sources taxonomy; Main pollutants; Pollution from different activities-transport, agriculture, municipal and etc. Pollution investigation's methods; Experimental and statistic methods; Theoretical methods; Theory of the atmosphere diffusion; Dangerous meteorological conditions; Observation stations; Atmosphere monitoring; Inventory and control of the air pollutants; Balance equation; Mathematical modeling; Transforming of the pollutants; Absorption; Influence of the orography upon the moving and transport of the pollutants; Photochemical fog; Out border diffusion of the pollutants; Air pollution from the industry in Bulgaria; Air pollution from the transport in Bulgaria; Air pollution from the agriculture in Bulgaria;
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice is connected with lectures. It finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching. The exercises are carried out in the laboratory in engineering laboratory.
The overall valuation on the discipline is formed after written exam with duration.

2833 Ecologically Dangerous Production II

ECTS credits: 6 **Weekly classes:** 3lec+0sem+0labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Nedialko Panchev, PhD
2. Assistant Liubomir Vladimiriv, Dept. EEP, tel.: 888-418 ; e-mail: lvladimirov@ru.acad.bg
Abstract:
The aim of the course is to give knowledge to the students in atmosphere ecology, cleaning and defense of the air, meteorological aspects of the pollutions spreading from natural or artificial origin. The discipline is introducing the consistency and character of the air, radiation and thermodynamically regimes of the atmosphere, revealing the dynamics of the substance's transformation. The main technological origins of the pollutions, consistency change under influence of the human activity are introduced. Main manners for pollutions spreading evaluations near the sources are given. The mathematical modeling of the pollution in regional and global scale and influence upon the ecosystems is a part of the learning process.
Course content:
Topics. Air consistency. Permanent and changeable components. Hothouse gases. Air pollution. Local and regional pollution. Global pollution. Air pollutions in cities-influence of th eradiation and meteorological regimes. Features. Pollution sources. Sources taxonomy. Air pollution from different industrials. Transport, Agriculture, domestics. Investigation methods. Experimental and statistical methods. Theoretical methods. Atmosphere diffusion Theory. Dangerous meteorological conditions. Monitoring points. Air monitoring. Balance equation. Mathematical modeling. Pollution transformations. Absorption from gases, fog and aerosols. Relief influence upon the transformation and spreading of the pollutants. Photochemical fog. Out border pollution spreading. Air pollution from the industrial, agriculture and transport in Bulgaria.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. A multimedia, posters and etc are used during the teaching. During the practical exercises an incoming control is carried out. The students received their issue and work themselves under the observation of the teacher.
The overall valuation on the discipline is formed after written exam.

2385 Heat Engineering

ECTS credits: 3 **Weekly classes:** 2lec+1sem+0labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Iliya Krastev Iliev, PhD, Dept. HTHPM, e-mail: ik_iliev@abv.bg
Abstract:
The subject offers basic knowledge on heat and engineering. The aims of the teaching on the subject are the students to be given knowledge on main thermodynamic laws, basics of heat engineering and heat exchangers.
Course content:
Basic thermodynamics knowleges. Gases as working bodies. First thermodynamic law. Basic thermodynamic processes with ideal gas. Circle processes. Entropy. Water steam. Thermodynamical perfect of het processes. Cycles of refrigeration aggregates. Humidity air. Conductivity. Convection. Radiation. Heat exchangers.
Teaching and assessment:
The teaching on the subject is accomplished by means of lectures and laboratory drills. The students ate to get acquainted with the theory grounds of the training material where one can find properly picked out samples from practice which are appropriate to their specialty. Studies are carried out in “Thermodynamics” and “Heat transfer” laboratories where active power producing models, posters and devices are exhibited.
Students have to be prepared for the laboratory drills studying lectures which have been taught before as well as the examples given there.
Tests are to be held out of lecture time (7-th and 14-th week). In the tests short theoretical items from the lectures are included. Students’ evaluation is carried out taking into account their mark from the yearly task on the subject and their participation in the process of continuous assessment.

2386 Technical Drawing and Machine Design

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+cp
Assessment: exam **Type of exam:** written
Departments involved: Department MME, Faculty of Transport Engineering
Lecturers:
1. Assoc. Prof. PhD Vasko Iliev Dobrev, Dept. MME, tel.: 888-492, e-mail: vdobrev@ru.acad.bg
2. Assoc. Prof. PhD Petar Dimitrov Pantileev, Dept. ED, tel.: 888-491, e-mail: pantileevp@ru.acad.bg
Abstract:
The objective of the Technical Drawing and Machine Design course is that the students acquire knowledge of design methods, normative documents and rules for reading constructor documents; learn the theory of machine elements with general application, the methods for their calculation and construction. Prerequisites for the discipline are: Physics; Applied mathematics; Applied mechanics; Informatics; Mechanization in crop-growing I. The discipline will facilitate studying such courses as: Mechanization in crop-growing II; Mechanization in animal husbandry; Hydraulics and hydraulic machines; Service and usage of agricultural machinery; Basics of repairs. It will also be helpful in the design of graduation work and in practice.
Course content:
Design of geometric objects. Types of images. Elevations, sections, extracted elements. Joints. Detail drawing. Basic requirements for compiling of constructor documentation. Simplified depiction. Possibilities of automatization of engineering-graphic work. Criteria of effectiveness and calculation of machine elements. Selection of materials. Pin, key, groove and press conjunctions. Elements of spin movement – axles and shafts, sliding and rolling bearings. Clutches. Gear, chain and belt mechanical transmissions.
Teaching and assessment:
Lectures are given before a class of students in a lecture hall. Laboratory tutorials are carried out in IG halls and the MME laboratory with demonstrative materials, experiment and laboratory installations, models. Students actively take part in the solving of different problems and the conduct of experimental research. The 3-hour examination is in written form and is taken by all the students in a group simultaneously.

2393 Water Pollution and Impact on the Ecosystems

ECTS credits: 7 **Weekly classes:** 3lec+0sem+2labs+0ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Blaga Raikova, PhD, tel.: 888-498
2. Senior Assistant Plamen Manev, Dept. EEP, tel.: 888-485, e-mail: pmanev@ru.acad.bg

Abstract:
The objectives of the discipline are to get the students acquainted with the main characteristics of water, its specific classification, pollution measurement techniques, sources of pollution, migration of pollutants, different kinds of pollution, establishment of sanitary zones and categorization of water currents. A special emphasis is laid on the impact on the ecosystems.
It has the incoming links with Mathematics, Chemistry 1,2,3, Ecology, dangerous waste and outgoing links with Environmental protection, Ecological monitoring, Ecological legislation and standards, Environmental protection management.

Course content:
Water as an element of the environment. Different kinds of rock waters, coefficient and filtration. Infiltrated, sedimentary and metamorphosed waters. Water in aeration and saturation zones. Interlayer karst waters. Water springs and underground water currents. Structure of water; physical and organoleptic features, solubility of solid substances. Active reaction. Chemical composition. Microcomponents and radioactive components. Natural-gas quantities in water. Organic substances in natural waters. Biological composition of water. Mechanical, chemical and radioactive water contamination. Migration of pollutants –distribution processes, self-purifying features. Impact of pollutants on ecosystems. Categorisation of water currents.

Teaching and assessment:
The lectures are supported with a lot of charts and students are recommended available reading matter. The practice sessions are both in laboratories and along rivers in the Ruse region. Students are taught to analyse river pollution. The course assignment is on attenuation of waste waters, water currents circulation and pollution of rivers, lakes and other water basins.
The final assessment is the average of the exam mark, the course assignment and the student's successful participation in practice sessions.
The overall valuation on the discipline is formed after written exam.

2394 Physical Chemistry

ECTS credits: 3 **Weekly classes:** 2lec+0sem+1labs+0ps+p
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Petar Vasilev Kopchev, PhD, Dept. RRCT, tel.: 888-228, e-mail: pkopchev@ru.acad.bg
2. Senior assistant Jasmina Pencheva, PhD, Dept. RRCT, tel.: 888-733, e-mail: jasmina@ru.acad.bg

Abstract:
This subject studies the physical conditions of substances and their conversions, the thermal dynamics of physical and chemical processes, the phase equilibria of a single and multi-component systems, the surface phenomena, etc. It gives theoretical explanation for the physical-chemical processes, occurring in Nature as well as in Industry.

Course content:
Gases; Liquids; Solid state; Equilibriim in homogeneous and heterogeneous systems; Solutions; Surface phenomena; Kinetics of chemical reactions; Colloidal state.

Teaching and assessment:
The subject is studied in the form of lectures and laboratory exercises. Laboratory classes are carried out with subgroups. Methodical instructions to every exercise is regularly given. Certification is given for regular attendance at lectures and exercises. Form of knowledge testing: continuous written and oral assessment.

2395 Soil Pollution and Impact on the Ecosystems

ECTS credits: 5 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Blaga Raikova, PhD
Abstract:
The objectives of the discipline are to get the students acquainted with the main characteristics of soil, its specific classification, pollution measurement techniques, sources of pollution, migration of pollutants, different kinds of pollution, establishment of sanitary zones and categorization of soils. A special emphasis is laid on the impact on the ecosystems.
Course content:
Soil as an element of the environment. Different kinds of soils. Local and global change in soil structure, Natural and human factors, Soil adsorbent, Soil pollution with petroleum, cupper, organic substances, biological composition, micro components and radioactive components, Pb, Co, Ni. Self-purification of the soil. Soil sustainability.
Teaching and assessment:
The lectures are supported with a lot of charts and students are recommended available reading matter. The practice sessions are both in laboratories and along rivers in the Ruse region. Students are taught to analyse river pollution. The course assignment is on attenuation of soil, water currents circulation and pollution of soils. The final assessment is the average of the exam mark, the course assignment and the student's successful participation in practice sessions. During the practical exercises an incoming controlis carried out. The students received their issue and work themselves under the observation of the teacher. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

2396 Environmental Protection

ECTS credits: 6 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Vladimir Vladimirov, DSc, Dept. EEP, tel.: 888-481, e-mail: vtomov@ru.acad.bg
2. Senior Assistant Plamen Manev, Dept EEP, tel.: 888-485, e-mail: pmanev@ru.acad.bg
Abstract:
The main aim of the discipline is to develop a methodoligal transition from natural science disciplines to those related to the sources, kinds and characteristics of pollution and its impact on ecosystems with emphasis on various environmental measurement techniques relevant to environmental problems during the further levels of education. The learning approach promotes deeper understanding of the global strategies for environmental protection.
Course content:
The current global ecological crisis-problems. The fundamentals of the sustainable development. Environmental protection. Aims and objectives of the discipline. Basic principles of environmental protection. Natural resources. The air as a natural resource. Energy resources. Water resources. The soil as a main natural resource. Biological resources. Demographical problems of the environment. Information supply in the environment. Environmental database. Evaluation of the impact on the environment and its relevant reaction. Methods of making preventive decisions. Technological methods and means for dealing with the increasingly complex environmental issues. How to reduce pollution of industrial origin. No-waste and low-waste technologies. Methods of making corrective-reducing decisions for environmental protection. Methods of making compensating decisions. Preservation of biological diversity. Ecological understanding, ethics and education accompanying environmental protection activities. The importance and placement of environmental protection in the national economy management. Responsibilities and rights in the environmental protection.
Teaching and assessment:
For subject visualization lots of information is used. The practice is connected with lectures. It finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
As an out course works each student have to make a graduate work and to defend it until the end of the semester. During the practical exercises a report is carried out. The students received their issue and work themselves under the observation of the teacher. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

2728 Economics

ECTS credits: 3 **Weekly classes:** 2lec+1sem+0labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department of Economics, Faculty of Business and Management
Lecturers:
1. Assoc. Prof. Djanko Minchev, PhD, Dept. Economics, tel.: 888-557, e-mail: dminchev@ru.acad.bg
2. Assoc. Prof. Emil Trifonov, Dept. Economics, tel.: 888-557

Abstract:
The subject is concerned with the general problems, laws and categories of the contemporary market economy. Thus it creates a certain basis for the remaining economic objects. It also gives general knowledge, which is expressed in alternative ways of economic viewing and which forms and creates abilities for independent and expert choice in economic surroundings. Course prerequisite is knowledge of mathematics and it is related to concrete branch and functional economic subjects.

Course content:
Introduction – the economic system and the fundamentals of economic theory. Market mechanism. Public sector. Consumer demand and behavior. Manufacture, company assets and expenses. Imperfect competition and supplying. Price formation and incomes depending on production factors: Gross domestic product and economic growth. Economic cycles, unemployment and inflation. Taxation, budget and monetary policy.

Teaching and assessment:
Material is taught in two ways – lectures and practical classes, which elucidate and develop further some of the issues discussed at lectures. Continuous assessment is carried out. It includes two test assignments and student performance during the semester. Final assessment is the average of the above-mentioned components of evaluation.

2787 Ecological Legislation and Standards

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Stefka Naumova, tel.: 888-434
2. Prof. Vladimir Tomov, DSc, Dept. EEP, tel.: 888-481, e-mail: vtomov@ru.acad.bg

Abstract:
The aim of this course is to provide students of the Department of Ecoligy and Environmental Protection with acceptable and easy to understand knowledge in relation to their future professional career as far as national environmental legislation is concerned. They should be acquainted with international acts with regard to the problem. The attention is focused on the intrinsic law regulations of the environmental protection - the basic law of environmental protection, specific public relations, particular nature-preservation regulations, including sub-legislation normative acts concerning various ecological problems.
We also place emphasis on mutual and global collaboration in this sphere. With reference to that we have included a number of significant international agreements in the course, which Bulgaria has signed, and the consequent rights and obligations for the country.
Having in mind the national agreement which has been achieved concerning our joining the European Union, the course also contains basic aspects of politics, management and normative organization of nature-protecting activities within the Union, including the criteria of harmonizing national legislation in all the countries of the Union.

Course content:
National legislation. International acts in the sphere of environmental protection. The studied matter is particularly related to Bulgarian legislation. Mutual, regional and global collaboration on environmental protection – international conferences Bulgaria has participated in and international agreements signed.

Teaching and assessment:
The lectures acquaint students with the most important normative acts relevant to environmental protection. The themes cover both theoretical and practical aspects of ecological normative agreements with emphasis on the law nature and significance of environmental measures. The exam is on 2 questions -one on national legislation and one on international law agreements.

2934 The Risk Theory

ECTS credits: 7 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Dragol Dragolov, DSc, Dept. EEP, tel.: 888-446, e-mail: ddragolov@abv.bg
2. Ass. Liubomir Vladimirov, Dept. EEP, tel.: 888-418, e-mail: lvladimirov@ru.acad.bg

Abstract:
The programme aims at equipping students with knowledge and skills in the theory of hazardous events, analysis and evaluation of the probable risk. This requires an in-depth knowledge in the subjects studied so far which enables the students to develop and implement various techniques and approaches to limiting risks or even risk prevention.

Course content:
Hazardous situations and events and their ecological consequences(incidents,accidents,damage, crises). Risks (probability and improbability, dangers and safety). Risk analysis and investigation (different methods of analysis and investigation). Terrorism. Ecological safety. National security. Subjective risk. Financial risk. Insurance risk. General and detailed analysis. Logical analysis. Deviation analysis. Danger and safety.Risk taxonomy. Dow analysis. Inspection lists and questioneers. Pre-analysis of dangers. Danger predictions. Energy analysis. Danger analysis and work efficiency. Semiotic analysis. Conventional risk assessment. Private risk assessment. Expert analysis, etc.

Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice and multimedia, posters and etc are used during the teaching reflecting some critical situations with natural and human origin. For subject visualization lots of information is used.
During the practical exercises an incoming controlis carried out. The students received their issue and work themselves under the observation of the teacher. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

2980 Waste Water Contamination I

ECTS credits: 7 **Weekly classes:** 3lec+0sem+0labs+2ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Nastya Vasileva Ivanova, PhD, tel.: 084/21553, e-mail: nastiav2001@yahoo.com
2. Senior Assistant Plamen Manev, Dept EEP, tel.: 888-485, e-mail: pmanev@ru.acad.bg

Abstract:
The aim of the course “Waste water contamination I” is to give the students knowledge about the main methods for contamination and their application in the technological schemes for industrial or natural water purification. Physical-chemical, and bacterial parameters of the water necessary for water evaluation.
Steeply acquiring of the mechanical, biological and physical and chemical methods for contamination and sediment treatment.

Course content:
The water-main source of life. Origin and quantity of the water on Earth. Water circle on the earth. Physical and chemical characteristics of the water. Consistency and qualitative parameters for evaluation of the natural or industrial water. Introduction to water contamination technologies. Methods mechanical water contamination. Methods biological water contamination. Methods Physical and chemical water contamination.

Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. Defining the extent of contamination of a real process with practical conclusions will be able to the students. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. The students received their issue and work themselves under the observation of the teacher. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

2985 Ecological Monitoring

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+1ps+ca
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department ICE, Faculty of Transport Engineering
Lecturers:
1. Assoc. Prof. Cyril Barzev, PhD, Dept. ICE, tel.: 888-432, e-mail: barzev@ru.acad.bg
2. Senior Assistant Nikolai Kovachev, Dept. EEP, tel.: 888-485, e-mail: nkovachev@ru.acad.bg.

Abstract:
The monitoring as a system for watching and control of environmental state, traces the changes of ecological systems as a result of human influence and natural reassures dynamics.
This course aims to equip students with knowledge and expertise on the methodology of all components in ecological monitoring. The students acquire knowledge and skills for analysis in different factors defining influencing the climate.

Course content:
Environmental monitoring. National system for environmental monitoring. Air monitoring. Water monitoring. Soil monitoring. Waste monitoring. Biological diversity. Ionizing and non-ionizing radiation. Background monitoring. Ecological monitoring and environmental management.

Teaching and assessment:
The course assignment aims individual deeper acquiring of course material. The topics of the course assignment are given by the lecturer in the beginning. Methodological indications are given in the course assignment. Consultations are lead with the students on the different stages on the development. An oral defense finalizes the semester. The overall assessment is an arithmetical mean- the assessment from course assignment and oral defense. The practical training is leading on cycles. After getting the lectures students have training.
There is a requirement for the students to be prepared for the exercises. They are checked with control questions. In the end of each exercise they are making and introduce a protocol. The results from each protocol are assessed with maximum 2 points.
The overall assessment in the discipline forms on the base of continuous assessment.

2986 Hydraulic and Pneumatic Equipment

ECTS credits: 3 **Weekly classes:** 2lec+0sem+1labs+0ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Gencho Stoykov Popov, PhD, Dept. HTHPM, tel.: 888-580, e-mail: gspopov@ru.acad.bg

Abstract:
The subject aims is to introduce students to the basic laws of equilibrium and movement of fluids and gases and also the various types of hydraulic and pneumatic machines that take place in the systems for transport and purifying of fluids. The basic topics are the construction, and working principle of the different hydraulic and pneumatic machines, their characteristics and flow control methods for hydraulic systems.

Course content:
Basic properties of fluids. The basic equation of hydrostatics. Continuous and Bernulli's equations. Hydraulic losses and hydraulic calculation of pipes. Introduction of hydraulic and pneumatic machines. Construction, and working principle of centrifugal and axial pumps. Fundamentals of turbomachinery. Characteristics of turbo pumps and funs. Flow control of hydraulic systems. Working principle and classification of positive displacement pumps. Basic notes and classification of compressors. Working principle, ideal and real compressor, multistage compression.

Teaching and assessment:
The lectures are presented by usual method and by multimedia. During laboratory exercises various measurement tools and hydraulic and pneumatic machines are demonstrated. Every laboratory exercises finishes with a protocol. The course problem includes two stages. The final mark is complex from the both control works and course problem.

2987 Waste Water Purificatipn II

ECTS credits: 6 **Weekly classes:** 2lec+0sem+0labs+3ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Nastya Vasileva Ivanova, PhD, tel.: 084/21553
2. Senior Assistant Plamen Manev, Dept. EEP, tel.: 888-485, e-mail: pmanev@ru.acad.bg

Abstract:
The aim of the course "Waste water purificatipn II" is to give the students knowledge about the main methods for purification and their application in the technological schemes for industrial or natural water purification. Physical-chemical, and bacterial parameters of the water necessary for water evaluation.
Steeply acquiring of the mechanical, biological and physical and chemical methods for contamination and sediment treatment.

Course content:
Introduction to water contamination technologies. Taxonomy of the methods for water purifying-mechanical, physical and chemical, chemical, biological. Methods Chemical water contamination. Main processes in sediment treatment and working.

Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice is connected with lectures. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results and course work. Defining the extent of contamination of a real process with practical conclusions will be able to the students. A multimedia, posters and etc are used during the teaching. During the practical exercises an incoming control is carried out. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

2988 Waste Water Purification II – Course Project

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment: project defence **Type of exam:** course project presentation
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Senior Assistant Plamen Manev, Dept. EEP, tel.: 888-485, e-mail: pmanev@ru.acad.bg

Abstract:
The objectives of the discipline are to improve the students their knowledge with the main characteristics of water, its specific classification, pollution measurement techniques, sources of pollution, migration of pollutants, different kinds of pollution, establishment of sanitary zones and categorization of water currents. A special emphasis is laid on the impact on the ecosystems. They are able to apply practically the knowledge in the discipline "Waste waters purification II" for equipment development.
It has links with Mathematics, Chemistry,Ecology, dangerous waste, Environmental protection, Ecological monitoring, Ecological legislation and standards, Environmental protection management. Waste waters treatment, Hydraulic techniques.

Course content:
The course project envelope scientific literature analysis and the different methods in practice used to purify the waste water. He students have to project the purification installation, on the base of concrete topic to each. The students chooses a technological scheme and improve its reliability and applicability.
In the graphical part of the project, the student visualizes the scheme and explain the working process.
A detailed drawing in scale A3 is presented.
The volume is up to 20 pages, including text, tables, pictures and drawings.

Teaching and assessment:
The course project is given on the start of the semester. In the last week the students defense their projects in the presents of the teacher. During the semester a consultations are made.
The continuous assessment is held on the consultations. The extent of the readiness is accounted.
The certification is given after 50% presence minimum on the consultations.
The valuation is given with up to 6 rating.

2989 Waste Gases Purification I

ECTS credits: 7 **Weekly classes:** 3lec+0sem+0labs+2ps+1ca
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Nastja Vasileva, PhD, tel.: 084/611012, e-mail: nastiav2001@yahoo.com
2. Senior assistant Nikolai Kovachev, Dept. EEP, tel.: 888-485, e-mail: nkovachev@ru.acad.bg

Abstract:
The objectives of the discipline are to improve the students their knowledge with the main characteristics of gases, its specific classification, pollution measurement techniques, sources of pollution, migration of pollutants, different kinds of pollution, establishment of sanitary zones and categorization of gases currents. A special emphasis is laid on the impact on the ecosystems. They are able to apply practically the knowledge in the discipline “Waste gases purification I” for equipment development.

Course content:
The course project envelope scientific literature analysis and the different methods in practice used to purify the waste gases. The main characteristics and parameters of the gases and pollutants are given-different powders, humidity, density, hydraulic parameters. Lots of purifying methods are presented-absorption, filtration and the equipment, used this method for purifying.

Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results and course work. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. The students received their issue and work themselves under the observation of the teacher. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

2990 Noise and Vibration Protection

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Rusi Rusev, PhD, tel.: 888-526, e-mail: rgr@ru.acad.bg
2. Senior Assistant Nikolai Kovachev, Dept. EEP, tel.: 888-485, e-mail: nkovachev@ru.acad.bg

Abstract:
The aim of the discipline “Noise and vibration protection” is the students to acquire skills and knowledge for applying the methods and resources for noise pollution limitation in environment.
The topics to consider in studying process are for the student to acquire the methods and resources for: Noise emission and imission characteristic’s analysis; Noise emission in the open and in the premises prediction; Noise isolation, noise absorption and obstruction; Methods and means for acoustic optimization.

Course content:
Environmental acoustic; noise emissions; noise imitations; noise defenders; noise absorption; noise protections; methods and manners for noise optimization in the environment.

Teaching and assessment:
Students learn the basic theoretical principles of the material, which accompanies with properly chosen practical topics. The lectures are visualized with a lot of graphical information. The practical exercises are bound by the lectures. They are taking part in cycles, which duration depends on the analysis. They finish with the results, allow practical conclusions. During the training process a multimedia is used.
An oral or written test - 15 minutes long, which contains control on the discipline, is lead during the practical exercises.
The overall assessment in the discipline forms after written examination.

2991 Radiation Protection

ECTS credits: 3 **Weekly classes:** 2lec+0sem+0labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Tamara Grigorievna Pencheva, PhD, tel.: 888-218, e-mail: tgp@ru.acad.bg
2. Assistant Liubomir Vladimiriv, Dept. EEP, tel.: 888-418, e-mail: lvladimirov@ru.acad.bg

Abstract:
The main part of the course is aimed at students' acquiring knowledge of the methods and technologies for radiation protection. The aim is achieved by studying Physics of ultraviolet, infra-red, laser and ionizing radiation and electromagnetic fields, their characteristics, standardisation and effect on organisms and on people preferably. Having mastered that and implemented skills in other integrated disciplines, students learn to choose techniques and methods for analysis to invesligate in the sphere of environmental protection both in industry and in nature.

Course content:
Electromagnetic filed with industrial, radio and hype high frequency; Infrared radiation; Ultraviolet radiation; Ionizing radiation; Laser radiation;

Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming controlis carried out. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

2992 Safety Technology

ECTS credits: 5 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Dragol Dragolov, DSc, Dept. EEP, tel.: 888-446; e-mail: ddragolov@abv.bg
2. Assistant Liubomir Vladimiriv, Dept. EEP, tel.: 888-418, e-mail: lvladimirov@ru.acad.bg

Abstract:
The aim is the students to acquire the methodic and theoretical basis of the safety technology.
The main topics of the teaching are: Main topics, terms and taxonomy in the course acquiring; Acquiring the procedure for ergonomic systems content, their modeling and teaching; Acquiring knowledge for the formalization, analysis and classification of the critical situations; Knowledge acquiring for: Safety synthesis, Information feeding, Safety technology of the industrial systems.

Course content:
Main terms and definitions, Nature and assessment of the safety, System definition and integral morphological model of the safety and dangerous, Differential and integral risk, Critical situations, Safety technology of the ergonomic system-stages, phases, operations. Measurement of the safety, Critical situations taxonomy, Integral morphological model of the critical situations and events, Technology of the safety modeling of the industrial systems-planning, design concept, design, creation, organizing, control of the realization, Dangerous synthesis.

Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice and multimedia, posters and etc are used during the teaching reflecting some situations and events in safety technology of the ergonomic systems.
Controlling questions are revealing the extent each student is ready for the exercise.
During the practical exercises an incoming control is carried out.

2993 Enrichment Processes and Technologies

ECTS credits: 3 **Weekly classes:** 2lec+0sem+0labs+1ps+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Boris Borisov, PhD, tel.: 888-325, e-mail: bborisov@ru.acad.bg
Abstract:
The aim of the discipline is to give knowledge about the enrichment process in different productions. For the aim reaching different teachings are taking part-they concern the materials and their emission from industrial.
Incoming links are with Physics, Chemistry, Danger materials, Hydraulic equipment and etc, and outgoing links with Waste management, energy saving technologies and etc.
Course content:
Wastes enrichment; Wastes breaking; waste grinding; Packing processes; taxonomy; enrichment technology in the building, different productions, that emitted Ni, Cd, Co, Cu, Pb and etc., in the forest and agriculture, renewable technologies and etc.
Teaching and assessment:
The laboratory exercises are organized as cycles. Each cycle is developed by 2-3 students. Methods are developed in advance for each exercise, including a short theory and instructions for practical work. In some of the exercises any type of tasks are solved. They are used for experimental data processing. After the experiments, the data are introduced on the shown manner. They finished with talking with the teacher and making a report with the results.
The teaching on the course is using multimedia, posters and tables for material's visualization. The laboratory exercises are organized in the laboratory using the appropriate stands. The students have to prepare themselves in advance. The exercises begin with a test. The exercise finishes with a report.
During the semester a course work is implemented. The final valuation is made in addition after a written and oral exam.

2995 Soil Protection

ECTS credits: 6 **Weekly classes:** 2lec+0sem+0labs+2ps+1ca
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Georgi Mitev, PhD, tel.: 888-610, e-mail: gmitev@ru.acad.bg
Abstract:
Today's industrial society lives in a dynamic cycle. Often the people pay with the resources that are going down in quality for the next generations. The soil is an important part of this process.
This is a course for the students of ecology and it aims at providing them with knowledge and practical skills in understanding soil protection technologies. To achieve this aim we set the tasks listed below: basic terms, definitions and normative documentation on soil protection; the importance of planning, predicting and assessment of soil; meliorative, chemical, agro-technical and anti-erosion methods and technologies.
Course content:
Aims and objectives of soil protection. Main terms and legislation; main characteristics of the soil; Physical and chemical characteristics; Biological characteristics; The soil as a main component for organisms development-structure, influence upon the development, waste storage, water filtration; methods for soil protection; main methods for sustainable soil development; Meliorative methods of protection – removing the surface layer, deep plough soil treatment. Chemical methods – diluting and localisation of contaminants, neutralising substances. Agro-technical methods - adding organic substances, mineral fertilizers,etc.; Erosion soil protection methods – agro-technical, forest-meliorative, meliorative etc. Protection of the natural soil regions. Software and programs for efficiency manage with soil protection.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice is connected with lectures. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. The students received their issue and work themselves under the observation of the teacher. During the semester a test work is carried out.
The overall valuation on the discipline is formed after written exam.

2996 Waste Gases Purification II

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+3ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Nastja Vasileva, PhD, tel.: 084/611012, e-mail: nastiav2001@yahoo.com
2. Senior assistant Nikolai Kovachev, Dept. EEP, tel.: 888-485, e-mail: nkovachev@ru.acad.bg
Abstract:
The objectives of the discipline are to improve the students their knowledge with the main characteristics of emitted gases, its specific classification, pollution measurement techniques, sources of pollution, migration of pollutants, different kinds of pollution, establishment of sanitary zones and categorization of gases currents. A special emphasis is laid on the impact on the ecosystems.
Course content:
The course project envelope scientific literature analysis and the different methods in practice used to purify the waste gases. The main characteristics and parameters of the gases and pollutants are given-different powders, humidity, density, hydraulic parameters. Lots of purifying methods are presented-absorption, filtration and the equipment, used this method for purifying.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice is connected with lectures. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results and course work. Defining the extent of contamination of a real process with practical conclusions will be able to the students. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. The students received their issue and work themselves under the observation of the teacher. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

2997 Waste Gases Purification II – Course Project

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+0ps+cp
Assessment: project defence **Type of exam:** course project presentation
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Senior assistant Nikolai Kovachev, Dept. EEP, tel.: 888-485, e-mail: nkovachev@ru.acad.bg
Abstract:
The objectives of the discipline are to improve the students their knowledge with the main characteristics of gases, its specific classification, pollution measurement techniques, sources of pollution, migration of pollutants, different kinds of pollution, establishment of sanitary zones and categorization of gases currents. A special emphasis is laid on the impact on the ecosystems. They are able to apply practically the knowledge in the discipline “Waste gases purification I” for equipment development.
Course content:
The course project envelope scientific literature analysis and the different methods in practice used to purify the waste gases. He students have to project the purification installation, on the base of concrete topic to each. The students chooses a technological scheme and improve its reliability and applicability.
In the graphical part of the project, the student visualizes the scheme and explain the working process.
A detailed drawing in scale A3 is presented.
The volume is up to 20 pages, including text, tables, pictures and drawings.
Teaching and assessment:
The course project is given on the start of the semester. In the last week the students defense their projects in the presents of the teacher. During the semester a consultations are made.
The continuous assessment is held on the consultations. The extent of the readiness is accounted.
The certification is given after 50% presence minimum on the consultations.
The valuation is given with up to 6 rating.

2998 Treatment Technologies

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Nastja Vasileva, PhD, tel.: 084/611012, e-mail: nastiav2001@yahoo.com
2. Senior Assistant Plamen Manev, Dept. EEP, tel.: 888-485, e-mail: pmanev@ru.acad.bg
Abstract:
Treatment Technologies is a specialized course. Its main aim is to give students knowledge, skills and tools necessary for choosing adequate methods and technologies for the treatment of different kinds of sewage water. The programme focuses on the qualitative indicators for water assessment and the most important mechanical, physical-chemical and biochemical methods of decontamination.
Course content:
Different methods and technologies for treatment of different kinds of sewage water. The programme focuses on the qualitative indicators for water assessment and the most important mechanical, physical-chemical and biochemical; Sewage nets-types, construction; Reservoirs - application, types, structure; Preparing, doze adjustments and mixing of the reactive; Water decontamination; Water types treatment for different needs.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice and multimedia, posters and etc are used during the teaching reflecting some methods for projection in the waste treatment. For subject visualization lots of information is used.
The practical exercises allow the student to evaluate the efficiency of the treatment methods;
During the practical exercises an incoming control is carried out. During the semester 2 test controls are carried out.

2999 Treatment of Dangerous Waste

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Nastja Vasileva, PhD, tel.: 084/611012, e-mail: nastiav2001@yahoo.com
2. Senior Assistant Plamen Manev, Dept. EEP, tel.: 888-485, e-mail: pmanev@ru.acad.bg
Abstract:
The main objective of the course is to get students acquainted with systems of control, reduction, preservation, transport, utilization, making harmless and dumping of dangerous waste.
To acquire it the students have to solve the following problems: Learning the consistency, characteristics, and taxonomy of the dangerous waste; Organizing the trans boarder moving; Acquire the methods for treatment and transport of the wastes; Acquire knowledge about the terrains, machines and installations for temporary preservation, burning and making them harmless.
Course content:
Dangerous waste nature, dangerous waste management, trans boarder moving, site selection for construction of facilities for dangerous waste treatment, consistency, characteristics, and taxonomy of the dangerous waste, dangerous waste processing technologies, dangerous waste dumping, dangerous waste soil treatment, terrains, machines and installations for temporary preservation, burning and making them harmless, treatment and transport of the wastes, open reservoirs for liquid refuse, dangerous waste injecting into test- pits, dangerous waste incinerating, behavior in dangerous situations, rights and obligation of the organization on waste treatment.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice and multimedia, posters and etc are used during the teaching reflecting some methods for projection in the waste treatment. For subject visualization lots of information is used.
During the practical exercises an incoming control is carried out. The students received their issue and work themselves under the observation of the teacher. During the semester 2 test controls are carried out.
The valuation from the examination is formed on the base of continuing assessment.

3000 Technical Safety

ECTS credits: 3 **Weekly classes:** 2lec+0sem+0labs+1ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Vladimir Tomov Vladimirov, DSc, Dept. EEP, tel.: 888-481, e-mail: vtomov@ru.acad.bg
Abstract:
The main object for the students is to acquire skills for analysis and synthesis of technical and organizing solutions in production processes and equipment safety applying. The activities to work out in training course are: assimilate the main terms, definitions and categories in risk and safety theory, the principles and methods for technical and producing systems risk analysis, risk sources, characteristics, actions, normalizing, measurements and evaluation of the standardized in Bulgarian and international standards risk factors, assimilating of the methods for creation of safety technical and producing systems.
Course content:
Main terms and definitions. Risk management. Ergonomic fundamentals of technical and manufacturing systems safety. Subjective safety. Mechanical safety. Electrical safety. Electro-magnetic safety. Emission safety. Noise and vibration safety. Ray safety. Ecological safety. Fire safety. Damage, rescue and rebuilding technologies. Different safety activities.Social and economical effectiveness of the safety.
Teaching and assessment:
The lectures are supported with examples in accordance with the specifics of the course. The laboratory exercises are of experimental and investigation character. It is required that students be prepared in advance on the lecture themes, which is checked by questions. They also have to do two written tests on pre-given topics. The final mark is formed considering the results of both tests and successful participation in the practice sessions.

3001 Solid Waste Treatment Technologies

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Vladimir Tomov, DSc, Dept. EEP, tel.: 888-481, e-mail: vtomov@ru.acad.bg
2. Assistant Liubomir Vladimiriv, Dept. EEP, tel.: 888-418, e-mail: lvladimirov@ru.acad.bg
Abstract:
The aim of this subject is to familiarize students with technologies for removal and utilization of industrial solid waste. To achieve this aim students study the composition, the properties and the quantity of solid waste. They learn how to choose ways of collecting, transportation, storage and methods of decontamination. Utilization of industrial waste – siliceous waste, construction debris, plastics scraps, wastepaper, etc. is also examined.
Course content:
Classification, composition and properties of solid domestic waste; collecting, transportation, temporary storage; compost making; burning, pyrolisis, recycling of waste. Utilization of plastics scraps. Utilization of siliceous waste and construction debris. Utilization of metal waste.
Teaching and assessment:
Lectures are illustrated with visual aids. In workshops students acquire knowledge how to choose the most suitable technologies for solid waste treatment. Students get individual tasks for their course assignment. The final grade comprises the marks from the tests during the semester, the mark from the course assignment and the mark from the examination itself.
During the practical exercises an incoming control is carried out. The students received their issue and work themselves under the observation of the teacher.
In the end of the exercise each student develop his report
The valuation from the examination is formed from the written examination.

3002 Purification Technique's Testing

ECTS credits: 4 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Dragol Dragolov, DSc, Dept. EEP, tel.: 888-446; e-mail: ddragolov@abv.bg
2. Senior Assistant Plamen Manev, Dept. EEP, tel.: 888-485, e-mail: pmanev@ru.acad.bg

Abstract:
The aim of the course is to give knowledge to the students in the theoretical bases of the Purification technique's testing.
The tasks to solve are: Acquiring of the main terms, definitions and categories in the system manner of Purification technique's testing. Essentials and specification of the devise testing and techniques for different pollutions monitoring. How to define: Legislation and standard for air, water and soils; Chemical methods for purifying; Mathematical bases of different models for air, water and soil purifying

Course content:
Multifactor object to investigate. Experiment development. Main information about the experiments. Data processing from full factor experiment type 2m. Mathematical bases of an example with active sediments. Parameters to measure. Temperature, time, concentration and acidity define. Prepare and Purification technique's testing. Purification technique's for waste waters under action of gravity testing. Purification technique's for waste waters under action of centrifugal forces testing. Devise for air control and monitoring testing. Devise for soil control and monitoring testing. Testing of bio reservoir.

Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice and multimedia, posters and etc are used during the teaching reflecting some methods for projection in the waste treatment. For subject visualization lots of information is used.
During the practical exercises an incoming control is carried out. The students received their issue and work themselves under the observation of the teacher. During the semester 2 test controls are carried out.
The valuation from the examination is formed on the base of continuing assement.

3003 Logistics Technologies

ECTS credits: 4 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department IM, Faculty of Business and Management
Lecturers:
Assoc Prof. Ivan Hristov Mitev, PhD, Dept. IM, tet.: 888-521, e-mail: ichmitev@ru.acad.bg

Abstract:
The aim of the discipline Logistics technologies is the students to obtain knowledge and basic operational skills to analyze, organize and evaluate logistics technologies for transport, transport-handling and warehouse activities in the economic and public sphere. The following is included in this discipline: basic transport and warehouse characteristics and load preparation for logistics operations, the local and area logistics infrastructure, the selection of appropriate main and local transport technologies and systems, warehouse technologies for typical loads.

Course content:
Introduction Transport and warehouse characteristics of the loads. Load preparation for transport-handling and warehouse activities. Packing and consolidating the loads. Systems for identification of the load units. Main and local transport technologies and systems - types, elements, advantages and disadvantages, application, criteria for selection, model solutions for typical loads. Grounding in designing of local transport systems. Warehouse technologies and systems for unit and bulk loads. Transport and warehouse technologies for dischaging of scrap material resources. Local logistics infrastructure.

Teaching and assessment:
The basic part of the syllabus content is presented during the lectures, that are illustrated by foliograms, slides, etc. The practical exersices help the students to master the important themes. In order the students to take an active part in the educational process some discussions will be held in the end of the classes. Two times during the semester control tests are carried out according to the schedule. The students will obtain attestation provided they took a part in all practical exercices, they have minimum 50% presence at the lectures and have an average score of the control test at least Satisfactory (3). 80% of the final assessment is to be formed as an average score of the control tests (the result of each one of them is to be at least Satisfactory (3) and 20% - from the partisipation in the practical execises and discusions.

3004 Ecological Management

ECTS credits: 2 **Weekly classes:** 2lec+0sem+0labs+1ps+ca
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Vladimir Tomov, DSc, Dept. EEP, tel.: 888-481, e-mail:; vtomov@ru.acad.bg
2. Assistant Liubomir Vladimiriv, Dept EEP, tel.: 888-418, e-mail: lvladimirov@ru.acad.bg

Abstract:
The course of "Ecological management" is obligatory for the students from the specialty "Ecology and technology for environmental protection". It topics takes into account the conditions that characterize the market economy, the action and demand of its complement mechanism.
The course aims the student knowledge acquiring of the main approaches and structures in environmental management applying.

Course content:
Introduction to "Ecological management"; Management-Theory and Practice; Management, functions and structure; Management technology; General methods in management and development of rules; Strategy management; The human factor in management; Management of the investments in environmental protection.

Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice is connected with lectures. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. The students received their issue and work themselves under the observation of the teacher. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

3005 Ecological Investigation

ECTS credits: 4 **Weekly classes:** 3lec+0sem+0labs+3ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Nedialko Panchev, PhD
2. Senior Assistant Nikolai Kovachev, Dept. EEP, tel.: 888-485, e-mail: nkovachev@ru.acad.bg

Abstract:
The aim is the students to acquire the methodic of the ecological investigation as a system of procedures and methods for reasons identifying, action and consequences in industrial area and environment.
The main topics of the teaching are: Main topics, terms and taxonomy in the course acquiring. Acquiring the procedure for hypothesis and versions identifying, their checking and verifying or cancellation. Knowledge acquiring for the methods for the different events with ecological impact, such as crashes and industrial pollution, industrial explosions and fires, hydraulic accidences and pollutions, calamities and etc.

Course content:
Hypothesis and versions for ecologically dangerous phenomena and events. Investigation of industrial pollution of the production medium and environment with toxicity and radioactivity. Investigation of emergency industrial emissions of explosion substances. Investigation of industrial and domestic explosions. Investigation of industrial and domestic fires. Investigation of hydro technical accidents and crashes, actions and harms. Investigation of natural calamities. Investigation of agricultural accidents. Investigation of veterinary-medical accidents. Investigation of human-medical accidents. Investigation of dangerous waste emissions and wastes, generated by transport crashes and accidents. Investigation of ecological dangerous of goods and services. Account and documentation of the results.

Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice is connected with lectures. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. The students received their issue and work themselves under the observation of the teacher. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

3007 Ecological Projects Management

ECTS credits: 2 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Jancho Naidenov, PhD, tel.: 888-520, e-mail: nnaydenov@ecs.ru.acad.bg
2. Assistent Liubomir Vladimirov, Dept. EEP, tel.: 888-418, e-mail: lvladimirov@ru.acad.bg

Abstract:
This programme aims to provide students with the basic approach, methods and means of efficient environmental projects management. In order to achieve the targets set students have to examine the importance and subject matter of eco-projects. The emphasis is laid both on the functions, structure and various ways of executing the separate parts of the projects and on the technologies of their development.

Course content:
Aims and objectives of eco-projects management. Basic functions of eco-projects management. Eco-projects classification. Pre-projects research. Analytical part. Resource part. Organisation-managing part. Technology of development and realisation. Precursory phase – reasons and preparation. Condition analysis. Setting the main aim. Formulating minor aims and strategies. Resources provision and choice of an adequite strategy. Management, control and realisation.

Teaching and assessment:
Students learn the basic theoretical principles of eco-projects management during lectures. The practice sessions develop the students' skills of higher level thinking and understanding how to use methods and ways of developing projects. The course assignment is individual and each student has to deal with a specific problem on a pre-given task and make a presentation on it at the end of the course.
During the practical exercises an incoming control is carried out. The students received their issue and work themselves under the observation of the teacher. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

3008 Modelling of Treatment Processes

ECTS credits: 2 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Dragol Dragolov, DSc, Dept. EEP, tel.: 888-561, e-mail: d.dragolov@abv.bg
2. Assoc. Prof. Inanka Zheleva, PhD, tel.: 888-766, e-mail: izheleva@ru.acad.bg

Abstract:
In this subject students acquire knowledge about the methods of modeling of purification processes which are complex control systems. Issues concerning physical, mathematical and computer modeling are investigated. This subject is connected with the rest of the technological subjects. It is a prerequisite for the following subjects: Higher mathematics, Technical mechanics, Fluid's mechanics, Fluid purification, Thermotechnics.

Course content:
Introduction. Model. Model's types. Mathematical models. Treatment processes, physical modeling, the theory of similarity, physical modeling of the process of sedimentation of insoluble impurities, mathematical modeling and optimization of treatment processes, analysis and synthesis of the structure of the treatment process, models of treatment processes, modeling the operation of water – treatment plants; optimization methods for complex purification systems, technologies for solid waste treatment, computer modeling of purification processes and systems.

Teaching and assessment:
Lectures emphasize the application of modeling rather than the underlying theory. In seminars students solve practical problems. First they get acquainted with the methodology of modeling, next they set the relevant data and finally they build models using computers.
During the exercises the student has to show, he has introduced with the lectures and the topics. The teacher put concrete tasks for self preparing and gives advices to it solving.
The overall valuation on the discipline is continuous assessment. It is the mean valuation from the test papers, made during the semester. On the test papers each student receive variants, including the problems from the theory and tasks.

3009 Rehabilitation Technologies

ECTS credits: 2 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Dragol Dragolov, DSc, Dept. EEP, tel.:888-446, e-mail: ddragolov@abv.bg
Abstract:
The course of "Rehabilitation technologies" aims to give knowledge and skills to the students in rehabilitation in the normal work conditions after accidents, disasters and crashes.
To acquire this they have to solve the following problems: To acquire the main terms of the legal defense of disasters and crashes. To acquire knowledge on the content of any rehabilitation process, the condition and circumstances in their organizing. To learn the possibilities and used manners in the rehabilitation technologies.
Course content:
Legal defense in accidents, disaster, calamity and crashes. Topic, aim and meaning of the rehabilitation technologies. Pollution substances and water streaming transformation. Self contamination. Soil pollution. Air self-purification. Flora and fauna self-purification. Environment rehabilitation after calamity or disasters.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice and multimedia, posters and etc are used during the teaching.
The valuation from the examination is formed from the written examination.

3010 Veterinary and Hygienic - Sanitary Investigation

ECTS credits: 3 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Ivan Stefan Venev, PhD, tel.: 888-556
Abstract:
The aim of the programme is to equip students with knowledge in high quality food production and health caring. The main kinds and quality characteristics of foods are studied as well as veterinary and hygienic-sanitary requirements of food-production, transportation, storage and trading.
The quality deviations likely to occur are discussed along with durability and term-validity of foods. Students are acquainted with different kinds of veterinary and hygienic-sanitary inspection and investigation – organoleptic, physical-chemical and microbiological; analysis of the results, conclusions and documentation.
Course content:
Aims and objectives of veterinary and hygienic-sanitary investigation. Main kinds and quality characteristics of food production. Veterinary and hygienic-sanitary requirements of production, transportation, storage and trading. Quality deviations of hazardous nature and factors causing them. Veterinary and sanitary-hygienic control and investigation-methods, application, documents. Veterinary and sanitary investigation of meat, milk, chicken, eggs and other products cultivation, transport, contribution. Veterinary and sanitary requirements for disinfection;
Teaching and assessment:
Lectures give theoretical basis. A lot of illustrative materials to support them. Slides and charts are used to show deviations from normative requirements in food-processing industry. Students become familiar with some practical aspects during practice sessions. The lection on the discipline "Veterinary and Hygienic – sanitary Investigation" are taken part 2 times during the week, and 3 hour of practical exercises on the semester.
The valuation from the examination is formed from the written examination.

3006 Diploma Practice

ECTS credits: 4 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: colloquium **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
The tutors of diploma projects
Abstract:
Pre-graduation practice is aimed at providing graduating students with the opportunity to extend their knowledge through an introduction to the latest achievements in the field of their diploma project and to the current state of problems in the organization which has offered them the topic of the project. Besides, the pre-graduation practice provides them with the opportunity to get acquainted with the specific character of the diploma project, to adapt and prepare for its development
Course content:
Depending on the topic of the diploma project, students get acquainted with: available literature sources, patents, inventions; methods of theoretical research and experimental studies, as well as with their results; constructive and technological solutions; laboratory installations, stands and measuring appliances; available samples of hydraulic and pneumatic machines, mechanisms and driving systems; methods of hydraulic and constructive calculations; programme products for solution of engineering problems; quality control systems, etc.
Teaching and assessment:
If possible, the pre-graduation practice is carried out in a firm, where the topic of the diploma project could be implemented or where the tutor works; in a designing office or department, libraries, etc. The results of the tasks, assigned by the tutor are recorded in a journal and they are used in the formation of the cited literature and in the working out of the particular parts of the diploma project. The pre-graduation practice finishes with a written report, defended before the tutor.

3011 Diploma Project

ECTS credits: 15 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors.
Abstract:
The diploma project aims at giving to the students the opportunity to apply the obtained knowledge and skills in self-independent and entire development of engineering projects. The students who have excellent achievements are given topics with research character. The Final Year project gives the students practical skills and experience for the future engineering practice or for continuing their study in a Master degree course.
Course content:
Review of the information regarding the diploma project topic. Formulating the aim and the tasks. Analysis of the output and the work conditions. Idea project or methodology of the research. Design of the necessary equipment and devices. Running of tests and processing of the results. Technical and economical analysis of the developed variants. Development of technical documentation and graphical representation of the results from the research.
Teaching and assessment:
The diploma project is developed following a given routine. The students work individually, using paper or electronically based information, the equipment of the department or other departments, and their instructor's help. The diploma project instructor assesses the degree of involvement, the public and moral qualities of the student. The assessor evaluates the diploma project. The student defends the diploma project in front of the State Exam Committee and the open public. The State Exam Committee evaluates both the diploma project and the way it is defended.

POSTGRADUATE PROGRAMS

POSTGRADUATE STUDIES IN AGRICULTURAL MACHINERY AND TECHNOLOGIES

PROFESSIONAL STANDARDS
OF A MASTER IN

AGRICULTURAL MACHINERY AND TECHNOLOGIES

DEGREE COURSE: Agricultural Machinery and Technologies
Degree: Master
Qualifications: Mechanical engineer
Duration: 2 years (3 semesters)

Modern agricultural production will challenge the system of training to be able to use scientific approaches and apply new principles to design, create, use, service and management of agricultural machinery.

In the Master's degree students of the subject Agricultural machinery and technologies will enhance their specialized knowledge obtained after completion of the Bachelor's degree They will study: theory experiment; Technological services in agriculture, Theory and maintenance of equipment, machinery of Theory, Design of mechanized technology in agriculture, Control and management of agricultural working units; Resource recovery technology; Theory techniques in livestock. Furthermore, students will improve their knowledge of marketing, management quality and reliability of machines and get acquainted with some non-traditional energy sources.

Ending educational qualifications Master, they can perform the following activities:
- Optimal design, modeling and testing of agricultural machinery;
- Optimization of production processes and technologies in agriculture;
- Design methods and tools for repairing restoration technologies;
- Engineering in agriculture;
- Expertise and control functions.

Graduates' and technologies with Master's degree can be realized by highly qualified specialists in agriculture, which conditions our country is characterized by great diversity in form and scale of production. They will be able to work as experts and consultants at a higher level by designers in manufacturing companies and also freelance.

Graduates educational qualifications Master find realization and as teachers in middle and high schools, and researchers at institutes, experimental stations and laboratories. They can continue their education in the educational and scientific degree PhD. Engineers agricultural machinery and technology as the proposed training will fully meet the challenges of the market and the European requirements for senior staff in the field of agricultural production.

CURRICULUM

of the Master's degree course in

AGRICULTURAL MACHINERY AND TECHNOLOGIES

First year

Code	*First semester*	*ECTS*	*Code*	*Second semester*	*ECTS*
0290	Technological service in agriculture	7	0296	Theory of agricultural machinery	10
0292	Non-traditional energy sources	6	0299	Design of mechanized technologies in agriculture	7
0510	Theory of maintenance of equipment	7			
0593	Theory of the experiment	6	0295	Control and management workability of the agricultural units	7
0609	Bases of the marketing and the management	4	0621	Resource recovery technologies	6
	Total:	***30***		***Total:***	***30***

Second year

Code	*Third semester*	*ECTS*
0304	Quality management and reliability	7
0305	Theory of Technology in livestock	6
0177	Diploma practice	2
0291	Diploma work	15
	Total:	***30***

Total for the training course: 90 ECTS credits

0290 Technological Service in Agriculture

ECTS credits: 7 **Weekly classes:** 3lec+0sem+3labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Chavdar Zlatkov Vezirov, PhD, Dept. AM, tel.: 888-442, e-mail: vezirov@ru.acad.bg
Abstract:
The course unit gives students general knowledge and skills in technological service for agricultural production. The teaching process is based on previous information about agricultural technologies and machinery. During the laboratory exercises, some practical problems are solving. Students receive ability to make adjustment of agricultural machines. The subject knowledge has implementation in theses preparing and in practical problems' solving.
Course content:
Object and basic terms in discipline. Goods and transport means. Packing, palettes, containers. Parameters and indices of transport means. Graphic and analytic methods for transportation modeling. Transport service in some real cases. Adjustment of tractors' and tool carriers' parts. Adjustment of sowing, planter, harvester machines. Technological service of others agricultural machines.
Teaching and assessment:
Lectures give opportunity to know some basic topics of technological service in agriculture. Students are preparing in advance for laboratory exercises. The exercises include skills obtaining, practical making of the adjustment for concrete objects. The results are assessing oral in classes by free discussion. During the exam students use schemes, tables and other subsidiary information.

0292 Non-traditional Energy Sources

ECTS credits: 6 **Weekly classes:** 3lec+1sem+0labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Yassen Dochev Georgiev, PhD; Princ. Assistsnt Krasimir Tuzharov, PhD
Abstract:
The course comprises basic organization methods, experiment planning method in the sphere of engineering and processing and analysis of results attained. In view of that, objects are classified into three groups according to the number of control factors - without control factors, with one control factor and with more than one control factors. For the first object group methods of statistical assessment and methods of statistical hypothesis test are discussed. For the second and third group methods of single factor and multi factor regressive and dispersive analysis are discussed. The courses Mathematics I, II and III are a prerequisite for the course. Mathematical Bases of Engineering Experiment is a prerequisite for Analysis and Test of Various Objects, Management and Quality, etc.
Course content:
General (cybernetic) approach in the study of objects in an experimental way. The role of experiments in scientific tests. Kinds of experiments. Study of objects without forced, external impacts. Study of single factor objects. Single factor regressive analysis. Single factor dispersive analysis. Study of multi factor objects. Multi factor regressive analysis. Multi factor dispersive analysis. Planning of regressive experiments. Plans of I order. Plans of II order. Processing of multi factor objects. Statistical optimization. Software of experiment data processing.
Teaching and assessment:
Lectures are given in the traditional way. At seminars relevant problems are solved with partial use of PCs. The exam is written on two questions with one assignment.

0510 Theory of maintenance of equipment

ECTS credits: 7 **Weekly classes:** 4lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Plamen Kangalov, PhD, Dept. RRCT, tel.: 888-441, e-mail: kangalov@ru.acad.bg
Abstract:
The course aims to enhance scientific and theoretical and practical knowledge necessary for the realization of specialists in practice in maintaining equipment in working condition. Course material is based on current conditions on studying the processes of various types of wear, determining technical condition of machine examining the scientific basis of technological processes in repair and maintenance of equipment and management in order to obtain maximum impact.
Course content:
Production and technological process of repair and maintenance of machinery and equipment. General questions of physics deficiencies. Failure of power and contact effects. Methods for increasing the sustainability of details on the appearance of failure, basic requirements for construction machinery and their diagnosis. Diagnostic tests and diagnostic algorithms. Structure of operating properties and repair the machines. Factors leading to the need to conduct repair different effects of complexity.
Teaching and assessment:
Training schemes are used, laboratory equipment, real machines and units thereof, and modern measuring equipment. Lectures follow the classic method. The workshops are held n individual jobs on 3-4 students are certain elements of scientific and practical character.

0593 Theory of the experiment

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Prof. Atanas Leshkov Mitkov, PhD, tel.: 888-553, e-mail: amitkov@ru.acad.bg
Abstract:
The course comprises basic organization methods, experiment planning method in the sphere of engineering and processing and analysis of results attained. In view of that, objects are classified into three groups according to the number of control factors - without control factors, with one control factor and with more than one control factors. For the first object group methods of statistical assessment and methods of statistical hypothesis test are discussed. For the second and third group methods of single factor and multi factor regressive and dispersive analysis are discussed. The courses Mathematics I, II and III are a prerequisite for the course. Mathematical Bases of Engineering Experiment is a prerequisite for Analysis and Test of Various Objects, Management and Quality, etc.
Course content:
General (cybernetic) approach in the study of objects in an experimental way. The role of experiments in scientific tests. Kinds of experiments. Study of objects without forced, external impacts. Study of single factor objects. Single factor regressive analysis. Single factor dispersive analysis. Study of multi factor objects. Multi factor regressive analysis. Multi factor dispersive analysis. Planning of regressive experiments. Plans of I order. Plans of II order. Processing of multi factor objects. Statistical optimization. Software of experiment data processing
Teaching and assessment:
Lectures are given in the traditional way. At seminars relevant problems are solved with partial use of PCs. The exam is written on two questions with one assignment.

0609 Bases of the marketing and the management

ECTS credits: 4 **Weekly classes:** 3lec+1sem+0labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department of Economics, Faculty of Business and Management
Lecturers:
Assoc Prof. Lyubomir Dimitrov Lyubenov, PhD; Assoc Prof. Nickolai Stefanov Naidenov, PhD
Abstract:
The course is aimed at getting students acquainted with the main marketing theoretical and methodological issues. It is elaborated on the basis of fundamental knowledge in economic theory and world economy problems. The course enables further study in other subjects the methods and approaches for realization of marketing concept in business management. Training is aimed at students acquiring knowledge about business management and necessary resources in small and medium- range industrial firms under market economy conditions. Entry links are with the course “Economics”, and exit links- with diploma project.
Course content:
Introduction into the course, definition of marketing. Types and kinds of marketing. Marketing environment. Consumer behavior. Marketing information system. Market segmentation. Strategic marketing planning and types of strategies. Factors determining the choice of marketing strategy. Product and innovation policy. Life cycle concept. Nature, range and principles of price policy. Price research in marketing. Realization of firm’s price strategy. Corporate distribution policy. Marketing logistics. Business communications in modern marketing. Advertising and kinds of advertising policy means. Organization and launching advertising campaign.
Nature and problems of management. Organization forms of business and corporate management structures. Business planning. Capital and capital investment analysis. Corporate staff management. Management of technical and material resources. Information basis of management in industrial firms.
Teaching and assessment:
Lectures provide necessary knowledge for practice, giving concrete examples. Lectures are visualized with head- projectors or multimedia. At some practice classes management applied programmes are used. Final continuous assessment is made from the results of 2 written tests on the term information.

0296 Theory of Agricultural Machinery

ECTS credits: 10 **Weekly classes:** 4lec+0sem+3labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc Prof. Jivko Jordanov Demirev, PhD, Dept. AM, tel.: 888-342, e-mail: jdemirev@ru.acad.bg
Abstract:
Theory of agricultural machinery aims to broaden the students' theoretical knowledge relating to the principle of work and interaction with the environment of arable working bodies of the soil and seeshtite machines, machines for sowing and machines for plant protection, machinery for harvesting crops and machines for cleaning grains. Necessary knowledge appropriate to the degree "Bachelor" and in the course theory experiment. The course is based on final projects for the title "Master".
Course content:
Key technology features of soil, seeds, fertilizers, theoretical foundations of machining of soil theory wedge and working on soil and seed-drills machines, cutting machines theory, ways and means to separate the grain blends modern trends in the development of machines - combined units combined working machines.
Teaching and assessment:
Lectures presented theoretical questions are utilized by the students during labs. The seminars have research and conduct soil channel and experimental systems. The practical results are processed statistically and make appropriate conclusions. Written exam with two theoretical questions, followed by oral exam.

0299 Design of mechanized technologies in agriculture

ECTS credits: 7 **Weekly classes:** 3lec+0sem+3labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc Prof. Chavdar Zlatkov Vezirov, PhD, Dept. AM, tel.: 888-442, e-mail: vezirov@ru.acad.bg
Abstract:
The subject Design of mechanized technology in agriculture is concerned the design of the main processes and business operations in the field of plant and livestock. Object Design was production activity.
Course content:
Approaches and steps in problem solving, modeling processes and objects, preparation of initial data, designing control, reliability engineering processes, design of stocks. Selection of technical means of mechanized processes. Affairs, design processes affecting the soil; agrochemical design work; design processes in gathering, the design of transport.
Teaching and assessment:
Training is done through lectures and laboratory exercises. It is written by two of the lectures and a laboratory classes.

0295 Control and management of agricultural working units

ECTS credits: 7 **Weekly classes:** 3lec+0sem+3labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Dimitar Petrov Dimov, PhD, Dept. AM, tel.: 888-242, e-mail: dpdimov@ru.acad.bg
Abstract:
The course is designed to form students with knowledge and skills in management and control of agricultural working units, and first of tractors as the main energy vehicle in agriculture.
Course content:
Review the impact of working conditions of agricultural workers on their units. The basic principles of the establishment and operation of the control system and management of working for. Different means of measuring and reporting on individual performance and management methods of working of machinery.
Teaching and assessment:
Training is done through lectures and laboratory exercises. It is written by two of the lectures and a laboratory.

0621 Resource-rehabilitating technologies

ECTS credits: 6 **Weekly classes:** 4lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Mitko Ivanov Nikolov, PhD; Assoc. Prof. Vasil Antonov Stojanov PhD
Abstract:
The propose of Resource-rehabilitating technologies branch of science is that the students gain eruditions about basic processes used in recovering of the details efficiency off hydraulic and pneumatic machines. In conjunction with the theoretical aspects, used machines, working conditions and application spheres, the students will gain knowledge and abilities for their control which gave a possibility for design of technological processes and their adaptation to detail's real construction and respective restrictions according the final results.
Course content:
Indispensability of detail's repairing. Arc welding processes for repairing of the details. Defect elimination with arc welding. Other electrical processes for detail repairing. Hot processes for details repairing. Repairing of worn out details with electrochemical coatings. Application of the electrochemical coatings for repairing of worn out details. Details repairing with plastic deformation. Laser treatment. Characteristics of the thermo and thermo-chemical treatments in details repairing. Forms of organizations in details repairing. Ration of the repairing processes. Economical aspects in details repairing.
Teaching and assessment:
The tuition is taken by lections and laboratorial exercises. The exam is in written form with two question points off lections and one point off laboratorial exercises. The final rate is reached by exam in written form and term project.

0304 Management of the quality and reliability

ECTS credits: 7 **Weekly classes:** 4lec+0sem+4labs+0ps+0
Assessment: exam **Type of exam:** oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc.Prof. Mitko Ivanov Nikolov, PhD
Abstract:
The propose of this subject is meeting of the students with the basic periods and tendencies in the management of the quality, to obtain of science-practical knowledge about the methods for securing of the quality and reliability of the agriculture machines in the process of their design, elaboration and exploitation. The students receive knowledge and abilities about preparing and realizing of projects about improving the quality and reliability of the agriculture machines.
Course content:
Essence and content of the quality as a term. Development of the quality and reliability. Management and control of the quality upon ISO 9000 standards. Management of the total quality. Quality, life cycle and market cycle of the merchandises. Objects of the quality and reliability. Conceptual theory about management of the quality and reliability. Principles, methods and strategies about management of the quality and reliability. Demonstrating the truth of necessity about improving of the quality. Identification of projects about improving of the quality. Project about improving the foods sales. Project about improving the technical products sales. General regularities in the projects about improving the quality. General characteristics of the projects about improvements. Factors, controlled from the operator and guidance.
Teaching and assessment:
The tuition is taken by lections and laboratorial exercises. The exam is in written form including 2 question points from lections and one question point from laboratorial exercises.

0305 Theory of Technique in Livestock

ECTS credits: 6 **Weekly classes:** 4lec+0sem+3labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc.Prof. Boris Georgiev Borisov, PhD, Dept. AM, tel.: 888-325, e-mail: bborisov@ru.acad.bg
Abstract:
The course aims to enrich the students' knowledge in the field of theory and methods of calculation, design and testing of equipment. Learn the system of knowledge on the theoretical foundations for the principles of work skills and habits for optimal design and art through simulation work processes. Learn principles of the theory of similarity and modeling. Different issues in automation and information management of milking, feeding, collecting eggs, maintaining optimum microclimate of the application of high technologies
Course content:
Methodological approaches and exit for the calculation and choice of rational processes and operations. The theory of similarity and modeling as a method for testing and creating new bodies and machines - applications in livestock. Theoretical aspects of the water, ventilation, heating, cleaning and feeding of fertilizer. Theory in harvesting machines, blending and dosing of feed. Theory in milking machine, coolant, pasteurizer, centrifuges and presses for granulation.
Teaching and assessment:
The lecture is illustrated with multimedia products, slides, transparencies, models, posters, videos. The workshops are held to certain jobs with real machines or working them suitable for simulation of work processes and use of computer animation. Results are formed at individual accounts - protocols. Outside the audience during the semester, students participate in research - research with post-graduate students, as specifically set to perform research work, which may be extended as a graduation work, including and application of practice.

0177 Diploma Practice

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+30ps+0
Assessment: colloquium **Type of exam: paper**
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors
Abstract:
The aim of the Diloma practice is to familiar students with the basic technologies and to confirm the obtained knowledge, skills and abilities, necessary for their realization into the practice.
Course content:
Understanding and study of the production and technological processes and Agricultural Systems Application.
Teaching and assessment:
Teaching is illustrated with diagrams, text and rteference books, real machines or separate machine units, modern measuring and diagnostic devices.

0291 Diploma project

ECTS credits: 15 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: diploma defence **Type of exam:** paper and presentation
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors
Abstract:
The aim of the Diloma project is students to solve more complicated problems with scientific or practical direction.
Course content:
The diploma project may be as the product from the course extention or as a new topic. The main objective is to solve problem, to design some new constructions, new technology and etc. Modern computer software should be used.
Teaching and assessment:
Knowledge collected during the study period are used, including reference books, field experiments and observations. Tools and devices for measurements arfe used, too.

POSTGRADUATE STUDIES IN MANAGEMENT TECHNIQUES IN AGRICULTURE

PROFESSIONAL STANDARDS
OF A MASTER IN

MANAGEMENT TECHNIQUES IN AGRICULTURE

DEGREE COURSE: Management techniques in agriculture
Degree: Master
Qualifications: Agricultural engineer
Duration: 2 years (3 semesters)

The main objective of the study: Development of modern and qualified specialists profiled management and sustainable agricultural production.

General and specific training:
Common training is conducted within three semesters after Bachelor's degree including a learning process courses contribute to building a high professional level of knowledge and skills: high competence in solving problems field of use of the techniques in crop and livestock production.
Specialized training is done during the training, including learning process disciplines contribute to building a professional culture in agriculture: specific competence in solving complex problems in the agricultural production systems.

General and special skills:
General professional skills find expression in shaping career in one of the branches, such as crop, livestock and / or mechanization of agriculture.
Subjects forming these skills are in the first semester of study and include the unification of knowledge and skills in planning for scientific and experimental work, modeling and analysis of developments in agriculture, management of programs and projects, laying the foundations of agriculture and precise identification issues relating to environmental protection and management of natural resources for agriculture.
Special skills are formed in accordance with individual characteristics and preferences of students in several areas: systems analysis of agricultural production, optimizing production processes, application of engineering studies, making expertise, application of controls and more. They are developed in research combined both the fundamentals of research, transfer of knowledge and skills and knowledge on intellectual property.
An integral part of the educational process is specialized skills, which crosses the entire period of study.
The diploma project is the outcome of a process begun by the collective formulation of problems in research and further developed in an individual plan.

Job opportunities:
Graduates will be very well adaptiruemi due in three major professional fields of agricultural production - crop, livestock and machinery.
General description and features of the curriculum:
The curriculum was developed in accordance with the requirements of the European educational system complexity in training and requirements for training students in agriculture.

CURRICULUM

of the Master's degree course in

MANAGEMENT TECHNIQUES IN AGRICULTURE

First year

Code	*First semester*	*ECTS*	*Code*	*Second semester*	*ECTS*
2412	Theory of the Agricultural Experiment	5	2422	Research work I (Basics of research)	4
			2424	Specific Language education	7
2413	Modeling and Analysis of Agricultural Processes	5	2471	Theory of Agricultural Machinery	5
			2473	Use of Resources in Agriculture	5
2414	Programmes and project management	4	2474	Machine Uses Strategies in Agriculture	5
2415	Base of Precision Farming	4	2475	Alternative Energy Resources	4
2416	Environment and Management of the Natural Resources	7			
2417	Specific Language education	5			
	Total:	***30***		***Total:***	***30***

Second year

Code	*Third semester*	*ECTS*
2426	Research Work II (Transfer of Knowledge and Innovation)	4
2427	Specific Language education	4
2428	Intellectual Property	3
2476	Management Working in Technology	4
2429	Diploma work	15
	Total:	***30***

Total for the training course: 90 ECTS credits

2412 Theory of the Agricultural Experiment

ECTS credits: 5 **Weekly classes:** 2lec+2sem+0labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Atanas Leshkov Mitkov, PhD, Dept. AM, tel.: 888-553, e-mail: amitkov@ru.acad.bg
2. Assoc. Prof. Hristo Beloev, PhD, Dept. AM, tel. 888-556, e-mail: hbeloev@ru.acad.bg

Abstract:
The course examines a number of methods for agricultural experiments, as well as methods for the analysis of the results. Students learn how to define the statistical characteristics and properties of various biological and technical objects by means of checking the statistical hypotheses about them and their correlation. They carry out single-factor experiments, process the data, analyse the results and compare them with results from other experiments. Mathematics is a prerequisite for this degree course, which in turn, is a prerequisite for another course – Agricultural Experiment II, and for all other courses dealing with measuring, observation and experiment.

Course content:
General approach to the experimental study of objects. Significance of experiment in scientific research. Measuring and observation data, data processing – defining the experimental values of mathematical expectation, variance, root-meansquare deviation and deviation ratio of the studied properties. Defining the integrals of the main statistical characteristics of these properties. Defining the correlation between the two properties. Factorial regression analysis. Single-factor variance analysis.

Teaching and assessment:
Teaching is by lecture. At laboratory sessions students solve problems based on the material covered in lectures and connected with real-life agricultural issues. Acquire skills in using data processing software. Students' results from two written tests and the mark given for their course assignment make up the final semester mark.

2413 Modeling and Analysis of Agricultural Processes

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Atanas Leshkov Mitkov, PhD, Dept. AM, tel.: 888-553, e-mail: amitkov@ru.acad.bg
2. Assos. Prof. Todor Tcanev Todorov, Dept. of Mathematics, tel.: 888-252; ttodorov@ru.acad.bg
3. Assoc. Prof. Georgi Mitev, Dept. AM, tel.: 888-610, e-mail: gmitev@ru.acad.bg

Abstract:
Modelling and analysis of agricultural processes going in dept into the agricultural science and practice. The aim of the discipline is to understand the role and relationships in collection, treatment and analysis of the specific information that agricultural production needs. Familiar with the modern modelling methods, analysis and applying in agricultural production systems evaluation and from management of natural resources point of view. Students should know how to discuss, analyse and defence already develop advanced production systems
Particularly, this discipline will use knowledge and experience from the Geographic Information systems, (GIS), Decision Taking Systems (DSS), having links with other causes carried out throughout the BsC education process.

Course content:
The system systemology, model and modelling. Type and classes of mathematical models, using in agriculture. Basic requirements when apply such mathematical and economic models. Theoretical aspect in modelling. Agricultural production specifics and its reflection on the models. Modelling crop and animal production. Program realization.

Teaching and assessment:
Teaching is by lecture. At laboratory sessions students solve problems based on the material covered in lectures and connected with real-life agricultural issues. Acquire skills in using data processing software. Students' results from two written tests and the mark given for their course assignment make up the final semester mark.

2414 Programmes and project management

ECTS credits: 4 **Weekly classes:** 2lec+1sem+0labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department BM, Faculty of Business and Management
Lecturers:
1. Assoc. Prof. Nikolaj Najdenov, PhD, Dept. BM, tel:.888-520, e-mail: nnaydenov@ecs.ru.acad.bg
2. Senior Assistant Daniela Iordanova, Dept. BM, tel:888-520, e-mail: dyordanova@ecs.ru.acad.bg
Abstract:
The discipline aims to provide to students basic knowledge for of good project management and will provide students with the knowledge and skills to participate effectively in project teams.
Course content:
The course will focus on such topics as: the essence, objective, and main functions of project management, types of public and private projects. Emphasis will be placed on the project management principles, project definition, and project design. Continuing attention will be paid to detailed planning and scheduling, project team building, fund raising, risk management and quality management. Concepts will be applied to monitoring and project completion.
Teaching and assessment:
Most of the teaching is by lecturers introducing the main issues of project management. Practical exercises help students to consolidate the knowledge they gained from the lectures. Computer software packages are used for project management training. Authentic project management forms help task completion. The final mark is awarded from the results shown in the written exam.

2415 Base of Precision Farming

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Miroslav Dimitrov Mihaylov, PhD, Dept. AM, tel.: 888-342, e-mail: mmihaylov@ru.acad.bg
Abstract:
Knowledge about: the working principles, structure and application of the GPS system; potential advantage of using it in agriculture; computerized creation of yield maps and application maps is given to the students. During the course they become familiar with the principles of receiving, storage, processing and transferring of information from mobile agricultural machines in order to use it for precision planning, automated and automatic control of production processes.
Course content:
Structure and technical support of the GPS and DGPS. GPS receivers. Standards and protocols for data transferring in systems for precision farming. Remote sensing of agricultural areas and its application. Image analyses. Strategies for creating of precision farming systems. GIS in agriculture. Technical resources for measuring the yield, conductivity and density of the soil. Structure, working principles and special features of the guiding systems and systems for site specific application of seeds, fertilizers and chemicals. Capabilities and settings of software for precision farming.
Teaching and assessment:
The lecturer uses PC, multimedia facilities, video films and slides for illustrating of the teaching material. Practical working includes investigation and analyzing the properties of software and hardware for precision farming. The students give written answer during the exam. The end valuation is given after an oral discussion.

2416 Environment and Management of the Natural Resources

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Vladimir Tomov, Dept. of EEP, tel.: 888-498, e-mail: tomov_vlado@abv.bg
2. Assoc. Prof. Georgi Mitev, PhD, Dept. AM, tel. 888-610, e-mail: gmitev@ru.acad.bg

Abstract:
Classification of the basics for synchrony between the environment and the accompanying agricultural production, as well as how to penetrate into the philosophy aspects linked to environment- society (ecological policy) – agriculture – sustainable development of the regions. Development and improving of the student's skills related to the evaluation of the national and international environmental protection policy and in the agricultural systems development. The opposite task is quite important – influence of the agricultural production on the environmental parameters

Course content:
Understanding the role and relationships in management of the environmental policy and the regional development. Familiar with the modern technology evaluation and applying methods from environmental point of view. Development and recommendation of Agricultural systems management procedures related to applying techniques, machines, erosion resistance, soil compaction dynamics, effective use of water, fertilizers, pesticides and economic parameters

Teaching and assessment:
Teaching is by lecture. At laboratory sessions students solve problems based on the material covered in lectures and connected with real-life agricultural issues. Acquire skills in using data processing software. Students' results from two written tests and the mark given for their course assignment make up the final semester mark.

2417 Specific Language education

ECTS credits: 7 **Weekly classes:** 0lec+0sem+0labs+6ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department FL, Faculty of Law
Lecturers:
1. Senior Lect. Elitca Georgieva, Dept. FL, tel.: 888-230, e-mail: egeorgieva@ru.acad.bg
2. Senior Lect,.Sergej Bertenev, Dept. FL, tel.: 888-230; e-mail: sbertenev@ ru.acad.bg

Abstract:
The foreign language education aims to finalize students' skills to communicate in written and oral by studying language and by improving the four language components – listening; speaking; reading, writing and developing of active skills by expanding and development of grammatical competences in pronunciation and self acquire of the foreign language development.

Course content:
Determination of the level of language command. Introduction to foreign language education. Initial introducing and personal information exchange. Lecsical competences development in topics such as reading with aim to understand the whole text; readings aimed to understand details and specific information (skimming/scanning); understanding the meaning of some words and phrases by using of text information. Development of written skills – personal correspondence; formal correspondence; description; based on point of view and opinion.

Teaching and assessment:
Most of the teaching is by practices introducing the main issues. Practical exercises help students to consolidate the knowledge. Computer software packages are used. The final mark is awarded from the results shown in the written exam.

2422 Research work I (Basics of research)

ECTS credits: 4 **Weekly classes:** 1lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Prof. Nikola Atanasov Orloev, PhD, Dept. ID, tel.: 888-554, e-mail: norloev@ru.acad.bg
Abstract:
The course aims to contain the scientific aspect research in this training is conducted in several dimensions of the theory and practice: effective creative thinking process as the basis and tools for research and analysis.These new solutions, products and services, technology research requirements under the creative multilateral strategy, and in research results; evolution of the creative. Added by academics and researchers in real market conditions.
With its entry prerequisite course fits logically into curricula in the three areas of specialization Management techniques in agriculture, Management Technologies in plant and Management of technology in livestock, respectively wherever necessary integration of effective intellectual process of effective research leading to creative implementation knowledge and intelligence potential.
Course content:
Mechanism of thinking. Heksagonal true model of effective and creative thinking. Creative process of research and creatively solve problems. Technology research. Scientific approach and practical implementation of creative multilateral system. Presentation and protection of research results. Scientific publication. Scientific report. Dissertation. Evolution of the creative personality in real scientific and market conditions.
Teaching and assessment:
The lectures are presented in traditional deductive technologies. The workshops, broadening application aspect of the lectures, decide to standard problems, discuss themes related to issues of individual research, term work. The examination assessment is based on the quality of the performance of individual term text-graphic work.

2424 Specific Language education

ECTS credits: 7 **Weekly classes:** 0lec+0sem+0labs+6ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department FL, Faculty of Law Studies
Lecturers:
1. Senior Lect. Elitca Georgieva, Dept. FL, tel.:.888-230, e-mail: egeorgieva@ru.acad.bg
2. Senior Lect,.Sergej Bertenev, Dept. FL, tel.: 888-230; e-mail: sbertenev@ ru.acad.bg
Abstract:
The foreign language education aims to finalize students' skills to communicate in written and oral by studying language and by improving the four language components – listening; speaking; reading, writing and developing of active skills by expanding and development of grammatical competences in pronunciation and self acquire of the foreign language development.
Course content:
Determination of the level of language command. Introduction to foreign language education. Initial introducing and personal information exchange. Lecsical competences development in topics such as reading with aim to understand the whole text; readings aimed to understand details and specific information (skimming/scanning); understanding the meaning of some words and phrases by using of text information. Development of written skills – personal correspondence; formal correspondence; description; based on point of view and opinion.
Teaching and assessment:
Most of the teaching is by practices introducing the main issues. Practical exercises help students to consolidate the knowledge. Computer software packages are used. The final mark is awarded from the results shown in the written exam.

2471 Theory of Agricultural Machinery

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Jivko Jordanov Demirev, Dept. AM, tel.: 888-342, e-mai: jdemirev@ru.acad.bg
Abstract:
The course broadens the students' theoretical knowledge relating to the principle of work and interaction with the environment of working of the soil and seeshtite machines, machines for sowing and out, fertilizer-spreading machinery, plant protection, harvesting machines and after harvesting machines for processing production.
Course content:
Mechanical treatment of the soil. Construction and basic technological features. Theory of the wedge. Theory of passive soil. Theory of soil Machines disk. Working actively with the drive. Balance of soil machines. Theory of machines for sowing and out. Machines with solid manure and organic fertilizers. Plant protection. Types of arrangements work processes and assessing the performance of the different types of machines.
Teaching and assessment:
The lectures are presented in traditional ways, using technical means and illustrated by lantern-slides and posters. Each student is divided into groups in specialized laboratories and problems associated with lectures and data on agricultural practices. Most of the exercises are experimental in nature. A control input. Finally assessment is based on the following written exam.

2473 Use of Resources in Agriculture

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Chavdar Zlatkov Vezirov, Dept. AM, tel.: 888-242, e-mai: vezirov@ru.acad.bg
Abstract:
Students learn how to use technical, energy, time, labor, financial and other resources for specific agricultural production and natural-climatic conditions. Will show their relation biological and natural-climate resources.
Course content:
Introduction to the use of resources. Terminology and features in agriculture. Balance of resources. Algorithm for drawing up, check balances. Current management of the use of resources. Balance of resources of time. Methods for establishing and operational management. Using technical resources as technological requirements. Management of energy resources using mobile equipment and stationary objects. Spatial use of resources. Labor resources in agriculture - features and management. Use of financial resources in agriculture. Assessment and specificity. Land and soil resources. Providing food and water resources in its agricultural production. Resources in agriculture. Assessment and Management.
Teaching and assessment:
Lectures on the subject are illustrated with slides, charts, diagrams and other didactic materials. The workshops are held primarily in the laboratory use and maintenance of agricultural machinery of the department where possible and training more experienced Division of the Department. The assessment, management and control of resources are made for specific sites. Students personally involved in the implementation of practical exercises, process and analyze the results.

2474 Machine Uses Strategies in Agriculture

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof Bojidar Russanov Kolev, PhD, Dept. AM, tel.: 888-610, e-mail: bkolev@ru.acad.bg
Assoc. Prof. Dimitar Petrov Dimov, PhD, Dept. AM, tel.: 888-242, e-mail: dpdimov@ru.acad.bg
Abstract:
In this course students acquire knowledge and skills - reasoned choice and justification of appropriate strategies and theoretical and methodological approaches to increase the effectiveness of machine uses in agriculture. Explaining the main areas of increase the effectiveness of machine uses, economic, technical and technological aspects of the election and complete system of machines and many other basic indicators and characteristics.
Course content:
Content, basic concepts and definitions. Strategies of Development mashine uses in agriculture. Types and characteristics - classification. Strategic approaches provide the competitive advantages of overriding machine uses. Methodology for selecting and optimizing strategies main criteria. Major components of the methodology basic production and economic conditions in the choice of strategies mashine uses. Theoretical and methodological foundations to increase the effectiveness of mashine uses. Theoretical underpinning of the nature, structure and main directions of the increase effectiveness mashine uses in agriculture.
Teaching and assessment:
Lectures on the subject is taught with the appropriate visualization of multimedia, tables, charts and other materials, enabling students to obtain the necessary theoretical training prior to the laboratory.
During the workshops students receive specific tasks for real objects, followed by discussion, other issues are solved, allowing the participation of each student. Monitoring on the subject is done at labs and includes: incoming inspection, acceptance of the protocols and output control for each exercise.

2475 Alternative Energy Resources

ECTS credits: 4 **Weekly classes:** 1lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Yassen Dochev Georgiev, PhD; Princ. Assistsnt Krasimir Tuzharov, PhD
Abstract:
The course comprises basic organization methods, experiment planning method in the sphere of engineering and processing and analysis of results attained. In view of that, objects are classified into three groups according to the number of control factors - without control factors, with one control factor and with more than one control factors. For the first object group methods of statistical assessment and methods of statistical hypothesis test are discussed. For the second and third group methods of single factor and multi factor regressive and dispersive analysis are discussed. The courses Mathematics I, II and III are a prerequisite for the course. Mathematical Bases of Engineering Experiment is a prerequisite for Analysis and Test of Various Objects, Management and Quality, etc.
Course content:
General (cybernetic) approach in the study of objects in an experimental way. The role of experiments in scientific tests. Kinds of experiments. Study of objects without forced, external impacts. Study of single factor objects. Single factor regressive analysis. Single factor dispersive analysis. Study of multi factor objects. Multi factor regressive analysis. Multi factor dispersive analysis. Planning of regressive experiments. Plans of I order. Plans of II order. Processing of multi factor objects. Statistical optimization. Software of experiment data processing.
Teaching and assessment:
Lectures are given in the traditional way. At seminars relevant problems are solved with partial use of PCs. Laboratory classes have research nature. The exam is written on two questions with one assignment.

2426 Research Work II (Transfer of Knowledge and Innovation)

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+4ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Prof. Nikola Atanasov Orloev, PhD, Dept. ID, tel.: 888-554, e-mail: norloev@ru.acad.bg
Abstract:
The course aims to build foundation of knowledge, techniques, technologies, tools and strategies for knowledge transfer, respectively semantic information and implementation of innovation.
In this aspect the training is done in the following basic dimensions and directions: Fundamentals of systematization. Analysis of novation with justification and selection of renovation (changing innovation) / principle novelty; basics and techniques for knowledge transfer, conversion technologies in creative changes for analysis and synthesis of new products and solutions, analysis and evaluation of creative projects, enterprise solutions, new products and services.
With its entry prerequisite course fits logically into curricula in the three areas of specialization: Management techniques in agriculture, Management Technologies in plant and Management of technology in livestock, respectively wherever necessary integration of knowledge and standard-strategies approaches to proper implementation of the transfer (transfer of knowledge and semantic information) and an appropriate type of novation, in particular - innovation, with universal applications in science, research, engineering / technology, manufacturing, business, marketing and practice in terms.
Course content:
Novation. Renovation / alteration; Innovation / novelty principle. Transfer of Knowledge / semantic information. Realization of creative project to create a new product, services and solutions. Synthesis and analysis of new solutions. Analysis and evaluation of creative solutions and projects.
Teaching and assessment:
The lectures are presented in traditional deductive technologies. The workshops, broadening Application aspect of the lectures, decide to standard problems, discuss themes related to issues of individual research, term work. Continuous assessment is based on the quality of the performance of individual term text-graphic work.

2427 Specific Language Education

ECTS credits: 4 **Weekly classes:** 0lec+0sem+0labs+6ps+0
Assessment: exam **Type of exam:** oral
Departments involved: Department FL, Faculty of Law
Lecturers:
1. Senior Lect. Elitca Georgieva, Dept. FL, tel.:.888-230, e-mail: egeorgieva@ru.acad.bg
2. Senior Lect,.Sergej Bertenev, Dept. FL, tel.: 888-230; e-mail: sbertenev@ ru.acad.bg
Abstract:
The foreign language education in the present program framework aims to develop student's skills and knowledge how to use the foreign language in specific areas such as engineering, crop and animal production and agricultural machinery using. At the same time the attention is focused on the basic language structures. On the end of their education the students should learn to read and understand authentical articles on various topics from the science and technical world; to apply different strategies in their work with new foreign language texts; to recognise and analyse the authors opinion and attitude expressed by language tools, to write on technical topics, to select and use appropriate language means in accordance of the style requirements and the aims of the text.
Course content:
Phone conversations and leave messages. Using phone to realize links with clients. Business correspondence. Letters, faxes, e-mails. Writing and replaying to offers and requests. Import-export problems. Participation at business meetings and negotiations. Expression of agreement or disagreement. Expression of opinion. Cultural differences. Introduction of company. Product presentation. Reading and interpretation of business information. Applying for a new job. Writing of Curriculum Vitae and letter of intend. Business trips. Comparison of alternatives.
Teaching and assessment:
The education is maintained in the framework of practical exercises. Various specialized tests are used and audio-video material as well. Working in groups to develop communication skills is successful way for learning. The computer room is available. The education finished by fluent evaluation.

2428 Intellectual Property

ECTS credits: 3 **Weekly classes:** 2lec+0sem+0labs+4ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Veselin Grigorov, PhD
2. Eng Kojcho Mitev

Abstract:
The course objective is to teach the forms of existence of intangible assets (Patents, models, know-how, brand names, designs, copyrights, etc.). And is also the procedures for their formation, and acquisition opportunities for their use in manufacturing and trading companies.

Course content:
Intellectual, procedures for establishing intellectual property rights and possibilities for its economic importance and use.

Teaching and assessment:
In lectures to the principal productions placed on the issues, but at the seminars are decided up cases and sample applications to the Patent Office. The examination assessment is based testing task.

2476 Management Working in Technology

ECTS credits: 4 **Weekly classes:** 3lec+0sem+0labs+3ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Dimitar Dimov, PhD, Assoc. Prof. Bojidar Kolev, PhD

Abstract:
The course management working in technology aims to provide students within their training base multi basic information about working in technology in agriculture in modern methods of optimal management, service and use.

Course content:
Importance and fundamentals of management working. Influence of working conditions on working. Characteristics of conditions. Systems and methods for establishing the tolerance limits of performance. Basic principles for the establishment and operation of the systems working. Control methods. System of controllable factors. Modeling objects for control. Management methods working.

Teaching and assessment:
Lectures on the subject is taught with the use of visualization appropriate called a multimedia projector, transparencies, slides, and other didactic materials. Workshops are conducted at the working units (3 to 5 students) acting on real objects - tractors, cars, laboratory and others. using modern measuring and control devices and systems. Admission to drill students are exposed to the incoming test exercises and ends with preparation of reports and output test.

2429 Diploma project

ECTS credits: 15 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: diploma defence **Type of exam:** paper and presentation
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors

Abstract:
The aim of the Diloma project is students to solve more complicated problems with scientific or practical direction.

Course content:
The diploma project may be as the product from the course extention or as a new topic. The main objective is to solve problem, to design some new constructions, new technology and etc. Modern computer software should be used.

Teaching and assessment:
Knowledge collected during the study period are used, including reference books, field experiments and observations. Tools and devices for measurements arfe used, too.

POSTGRADUATE STUDIES IN MANAGEMENT AND SERVICING OF MACHINERY

PROFESSIONAL STANDARDS
OF A MASTER IN

MANAGEMENT AND SERVICING OF MACHINERY

DEGREE COURSE: Management and servicing of machinery
Degree: Master
Qualifications: Mechanical Engineer
Duration: 2 years (3 semesters)

Maintenance of machines is one of the ways of managing their life cycle and insuring the corresponding reliability characteristics. For that purpose are required well qualified specialists, who possess skill in the field of diagnostics and reliability for asset management, technology of maintenance, resource utilization and management of maintenance. With the help of modern methods and learning equipment the students will obtain deep preparation combined with two specialized knowledge and skill in:

- Develop and apply technology and equipment for diagnostics, maintenance of asset in transport and agricultural industry. Organization of maintenance and repair firms and service companies for agricultural machinery
- Develop and apply technology and equipment for diagnostics, maintenance of machinery for service industry. Organization of maintenance and repair firms and service companies for agricultural machinery

Those who posses the degree "Engineer - BSc." will have specialized knowledge and skill and can perform engineering and managerial job in:

- Firms, whose activity is related with maintenance of machines and systems in transport, tractors, industrial machine building factories, light and food processing industries.
- Repair firms and repair dealer Company and organization and management of trading and maintenance of various machineries.
- Inspectors of technical systems and machineries.
- Diagnostics and maintenance shops for machines and systems.

Engineers from "Management and servicing of machinery" with the suggested qualification will satisfy fully the need inside the country as well as abroad in the European Union as a qualified personnel in the field of Maintenance and reliability of Machinery.

CURRICULUM

of the Master's degree course in

MANAGEMENT AND SERVICING OF MACHINERY

First year

Code	*First semester*	*ECTS*	*Code*	*Second semester*	*ECTS*
1364	Theory of Malfunctions and Defectology	7	1372	Technologies for Restoration of Resources	7
1368	Service Production Management	5	1373	Bases of Engineering Analyses	5
1369	Theory of Diadnostics	7	1374	Repair and Technological Processes	6
1370	Technology of Equipment Maintenance	6	1376	Service Management	5
1371	Service Marketing	5	1380	Methods and Means of Service Diagnostics	7
	Total:	***30***		***Total:***	***30***

Second year

Code	*Third semester*	*ECTS*
1377	Utilization of Operation Materials	4
1378	Design of Repairing and Dealer Enterprises	4
1379	Service Automation	4
1078	Diploma Practice	3
1404	Diploma Project	15
	Total:	***30***

Total for the training course: 90 ECTS credits

1364 Theory of Malfunctions and Defectology

ECTS credits: 7 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc.Prof. Plamen Ganshev Kangalov, PhD, Dept. RRCT, tel.: 888-441, e-mail: pkangalov@ru.acad.bg
Abstract:
The objective of the course is to give students information about theory and physics of malfunctions, including tribology, skills for detection and prevention of malfunctions and failures in modern technique at the time of its design, manufacture, repair and maintenance.
Course content:
General matters of physics of malfunctions. Malfunctions due to constant force actions, deformation and destruction of materials and their connection with crystal structure, mechanical properties and crust on metals and alloys. Malfunctions due to contact actions. Malfunctions due to abrasion of detail surfaces. Malfunctions due to corrosion and ageing of materials. Methods for enhancing detail resistance to malfunctions. Testing technical objects. Methods and means of testing details, units and plants. Defectology and flaw detection of details.
Teaching and assessment:
Lectures are delivered in the traditional way. Course material is illustrated with slides and transparencies. Laboratory classes are conducted at separate working places with 3-4 students. While training students laboratory devices, gauging and recording appliances are used.

1368 Service Production Management

ECTS credits: 5 **Weekly classes:** 3lec+2sem+0labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc.Prof. Mitko Ivanov Nikolov, PhD, Dept. RRCT, tel.: 888-458, e-mail: mnikolov@ru.acad.bg
Abstract:
The aim of training in this course is students to acquire the necessary management knowledge and skills for production managers in service. The course gets students acquainted with the basic principles of management, planning methods and mechanisms, which are prerequisites for the execution of production management in repairing enterprises
Course content:
Function and significance of production management in servicing. Basic matters in reproduction organization. Models and methods of making decisions in equipment reproduction. Organization forms of reproduction. Organization problems and calendar - planning standards in route and assembly forms of organization of equipment reproduction. Innovation management in service production. Planning of reproduction. Personnel management in equipment reproduction. Management of detrimental effects of reproduction and resource utilization.
Teaching and assessment:
Lectures are given in the standard way. Course material is illustrated with slides and transparencies.

1369 Theory of Diagnostics

ECTS credits: 7 **Weekly classes:** 3lec+0sem+0labs+3ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Todor Delikostov, PhD, Dept. RRCT, tel.: 888-441, e-mail: delikostov@ru.acad.bg
2. Assoc.Prof. Plamen Kangalov, PhD, Dept. RRCT, tel.: 888-441, e-mail: kangalov@ru.acad.bg

Abstract:
The course is aimed at giving students certain theoretical - practical knowledge In the sphere of machine diagnostics. In compliance with conditions for the execution of this activity, course material is based on modern tendencies in the development of technical diagnostics, theoretical fundamentals of diagnosing and managing of diagnostic systems, aiming at the maximum effect of diagnostics.

Course content:
Course subject matter. Machines as diagnosing targets. Basic requirements for machine construction in view of their adjustability to diagnosing. Diagnostics tests and diagnosing algorithms. Design of diagnosing technical devices. Technical - economic evaluation of diagnosing variants.

Teaching and assessment:
Lectures are given in the standard way. Course material is illustrated with slides, transparencies and posters. Practice classes are organized in separate working places of 5 - 6 students. They comprise certain theoretical - practical aspects.

1370 Technology of Equipment Maintenance

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. Daniel Likasa Bekana, PhD, Dept. RRCT, tel.: 888-701, e-mail: dbekana@ru.acad.bg
2. Assoc.Prof. Dimitar Petrov Dimov, PhD, Dept. AT, tel.: 888-242, e-mail: dpdimov @ru.acad.bg

Abstract:
The course is aimed at giving students knowledge about the role, systems and methods for doing technical service of machines different in function and construction peculiarities. The prevailing part of the course syllabus is about technological matters in technical service in operational development, shift and periodical technical service, season and after - season technical service and technical service during storage. A special emphasis is placed on problems such as: technology and diagnostic tests of technical services different in complexity, material and technical basis and organization of technical service, expenditure standards of labour and materials; control and accountancy, planning and obligatory documents in doing different types of technical service, accompanying diagnostic test when machines are in storage during off - season periods.

Course content:
Maintenance technology - definitions, standard documents. Basic concepts - definitions, documents defining these terms. Technological processes and technological operations. Role and significance of technical maintenance of machines. Factors leading to changes in technical condition. Technical service systems- types, nature, peculiarities and differences with various types of machines. Informal and formal models of technical service - structural models. Provision and control of serviceability of machines by means of technical service systems. Methods, opportunities and tendencies. Structural elements of technical service - types, nature of technological operations, technical cards. Technology of functional technical diagnostics as a necessary component of the system and types of technical service. Technology of machine storage. Peculiar features. Material and technical basis for technical service, diagnostics and storage of machines.

Teaching and assessment:
Lectures are given in the standard way. Training students schemes, laboratory devices, real machines and units, modern measuring and registering appliances are used. Course material is illustrated with slides and transparencies. Laboratory classes are conducted on separate working places with 3- 4 students each.

1371 Service Marketing

ECTS credits: 5 **Weekly classes:** 2lec+2sem+0labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department Economics, Faculty of Business and Management
Lecturers:
1. Assoc.Prof. Lyubomir Lyubenov, PhD, Dept. Economics, tel.: 888-347, e-mail: llyubenov@ru.acad.bg
2. Assoc.Prof. Georgi Valchev, PhD, Dept. Economics, tel.:888-357, e-mail: gvalchev@ru.acad.bg
Abstract:
The aim of training in the course “Service marketing” is to develop skills and knowledge for proper and accurate marketing evaluation of processes and phenomena in real market conditions using modern marketing methods and approaches.
Course content:
Characteristics of marketing. Marketing and its medium. Marketing analyses and information systems. Consumer conduct at purchase. Working out a marketing strategy of the firm. Marketing peculiarities of services. Sale of services. Stimulating service sales. Service pricing. Service policy - nature and basic approaches in servicing; types of service - main tasks and organization, developing service policy
Teaching and assessment:
Lectures are given in the standard way. Course material is illustrated with slides and transparencies At practice classes practical tasks are solved.

1372 Technologies for Restoration of Resources

ECTS credits: 7 **Weekly classes:** 4lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. Mitko Ivanov Nikolov, PhD, Dept. RRCT, tel.: 888-458, e-mail: mnikolov@ru.acad.bg;
2. Assoc.Prof. Vasil Antonov Stojanov, PhD, Dept. RRCT, tel.: 888-480, e-mail: vas@ru.acad.bg.
Abstract:
The aim of the course is students to acquire scientific and practical knowledge about the main processes used in restoring serviceability of details. Alongside with theoretical fundamentals, facilities used operation mode and spheres of process application, students acquire knowledge and skills for their manipulation which enables them to design technological processes and their adjustment to the real construction of details and the limits set for the final results.
Course content:
Introduction. Electric arc processes for restoration of details through welding and surfacing. Other electric processes for restoration of details. Other “hot” processes for restoration of details. Electrichemical processes foe restoration of details. Application of chemical coating for restoration of details. Application of plastic deformation in restoration of details. Application of high speed plastic deformation for restoration of details. Application of electiphysical and electrochemical methods for abstraction of material in restoration of details. Peculiarities of thermal and chemical thermal processing of restored details. Organization and economic problems in restoration of material.
Teaching and assessment:
Lectures are given in the standard way. Course material is illustrated with slides and transparencies. Laboratory classes are conducted in separate working places with 3-4 students each. During students’ training laboratory devices, measuring and registering appliances are used.

1373 Bases of Engineering Analyses

ECTS credits: 5 **Weekly classes:** 3lec+2sem+0labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Atanas Mitkov, PhD, tel.: 888-553, e-mail: amitkov@ru.acad.bg
2. Assoc.Prof. Todor Todorov, PhD, tel.: 888-725, e-mail: ttodorov@ru.acad.bg

Abstract:
The course is aimed at getting students acquainted with planning methods and carrying out experiments as well as with methods for processing and analysis of data achieved.

Course content:
Place of the experiment in scientific analyses. General approach in experimental analyses. Basic information from the theory of probability and mathematical statistics. Regression analysis. Variance analysis. Preliminary planning of multi- factor experiments. Planning of multi- factor regression experiments. Planning of dispersion experiments. Methods for experimental optimization.

Teaching and assessment:
Theoretical matters discussed at lectures are further given meaning at practice classes. Some of them are thought to be seminar, others - laboratory and independent. The target of analyses at these practice classes will be mainly real objects.

1374 Repair and Technological Processes

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. Ivan Asenov Mitev, PhD, tel: 888-701, e-mail: imitev@ru.acad.bg
2. Assoc.Prof. Daniel Bekana, PhD, Dept. RRCT, tel.: 888-701, e-mail: dbekana@ru.acad.bg

Abstract:
The course is aimed at enhancing scientific and practical knowledge necessary for the realization of specialists in maintaining machinery in serviceable condition. In compliance with the conditions for accomplishing this activity, course material is compiled on the bases of modern requirements for assessing technical condition of machines, there treated the scientific bases of various technological processes in the repairs and maintenance of machines and their manipulation in view of attaining maximum effect.

Course content:
Production and technological process in the repair and maintenance of machines and facilities. Factors necessitating repair work with different complexity. Structure of operation and repair properties of machines. Peculiarities of machine dismantling and cleansing details. Technology of flaw detection and completing. Fundamentals of machine assembly. Assembly, test and storage of fully- complete machines.

Teaching and assessment:
Lectures are given in the standard way. When teaching students there are used schemes, laboratory appliances, real machines and units of them, modern measuring and registering devices. Course material is illustrated with slides and transparencies/ Laboratory classes are conducted at separate working places with 3-4 students each. The results achieved are summarised in a report.

1376 Service Management

ECTS credits: 5 **Weekly classes:** 3lec+1sem+0labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Ivan Asenov Mitev, PhD, tel.: 888-701, e-mail: imitev@ru.acad.bg
2. Assoc.Prof. Plamen Kangalov, PhD, Dept. RRCT, tel.: 888-441, e-mail: kangalov@ru.acad.bg

Abstract:
The aim of the training in this course is students to acquire knowledge of the main management problems in the conditions of transition to market economy.

Course content:
Nature, role objectives, tasks of service management. Service strategies. Service organization and execution. Management of logistic processes in service activity. Sale management. Equipment management. Servicing of clients in service-dealer business. Application of modern information technologies in service management.

Teaching and assessment:
Lectures provide consistent information needed for practice classes. Lectures are illustrated with head projector slides. At practice classes lecture material is consolidated by means of tasks and casuses. Continuous assessment is made as the average of two written tests at the beginning and end of course training.

1380 Methods and Means of Service Diagnostics

ECTS credits: 7 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. Plamen Kangalov, PhD, Dept. RRCT, tel.: 888-441, e-mail: kangalov@ru.acad.bg
2. Assoc.Prof. Todor Delikostov, PhD, Dept. RRCT, tel.: 888-441, e-mail: delikostov@ru.acad.bg

Abstract:
The course aims at giving students certain theoretical and applicable knowledge in the sphere of methods and technical means for diagnostics of technical defects. In compliance with the conditions for execution of this activity, course material is based on modern tendencies for development of technical diagnostics, there are treated modern methods and means of diagnosing and management of technical objects aiming at attaining the maximum effect in diagnostics.

Course content:
Subject matter of the course ”Methods and means of service diagnostics”. Condition and tendencies of development of the methods and means for diagnostics of technical objects. Method classification for diagnosing technical objects. Methods and means for diagnosing combustion engines. Methods and means of diagnosing electric equipment. Methods and means of diagnosing hydraulic and pneumatic systems. Methods and means of diagnosing mechanic systems.

Teaching and assessment:
When teaching students schemes, posters, real machines and units of them are used. Lectures are given in the standard way. Course material is illustrated with slides, transparencies, posters and multi- media presentations. Laboratory classes are conducted at separate working places with 5- 6 students each. Certain elements of theoretical and application character are included in them.

1377 Utilization of Operation Materials

ECTS credits: 4 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Dimitar Jordanov Pavlov, PhD, Dept. RRCT, tel.: 888-733, e-mail: chimia@ru.acad.bg
Abstract:
The course gets students acquainted with physical and chemical processes leading to a change in fuel properties. There are treated he main causes for property modification of oil products with chemical admixtures, formation of resins and sediments as a result of corrosion processes, as well as the main methods of prognosticating the properties of fuel and lubricants.
Course content:
Condition, problems, tendencies and significance of fuel and lubricants for internal combustion engines. Subject matter and tasks of tribology as a science of friction, abrasion and rational use of fuel and lubricants. Physical and chemical processes leading to a change in fuel properties. Toxicity of fuel and the gasses in their combustion. Reasons for the loss of oil. Collection of exhaustion oils. Economic aspect of the problem of collection and utilization of exhaustion oils. Change prognosis of oil product properties through action and modeling. Restoring oil product properties. Universal super tractor oils STOU and UTTO. Evaluation methods for fuel and regenerated oil properties. Bio- destructing synthetic and semi synthetic oils. Shock absorber, brake and preserving oils. Oils for two- stroke engines. Polymer action materials- plastics, paints, varnishes and raw rubber.
Teaching and assessment:
Lectures are given in the standard way. Laboratory classes are conducted in the department and the course material is illustrated with schemes, transparencies, posters and others. Laboratory classes take place in the department and each student is provided with a working place. Experiments and analyses are made by students who fill in a report with the results .

1378 Design of Repairing and Dealer Enterprises

ECTS credits: 4 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc.Prof. Plamen Kangalov, PhD, Dept. RRCT, tel.: 888-441, e-mail: kangalov@ru.acad.bg
Abstract:
The course objective is to specialize students in organizational and technological design of repairing and dealer enterprises. Such a design is carried out in all cases of modernization, reconstruction, expansion, restoration and (or) new construction of repairing or repairing and dealer enterprises in farming.
Course content:
General matters in the design of repairing and dealer enterprises. Structure and organization of investment process and design. Designing production and technological processes in repairing and dealer enterprises. Designing technological equipment for repairing service processes. Drafting a business plan for a repairing and dealer enterprise.
Teaching and assessment:
Lecture material provides knowledge in content and sequence necessary for practice classes. Lectures are illustrated with transparencies for head- projector. Practice classes are conducted with real appliances for the corresponding processes and with students' direct participation.

1379 Service Automation

ECTS credits: 4 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. Mitko Nikolov, PhD, tel.: 888-458, e-mail: mnikolov@ru.acad.bg
2. Assoc.Prof. Daniel Bekana, PhD, tel.: 888-701, e-mail: dbekana@ru.acad.bg

Abstract:
The aim of the course is students to acquire knowledge about the main principles of automatic management, regulation and control, to get acquainted with existing apparatuses and systems of process automation used in service. Alongside with theoretical fundamentals, facilities used and application fields, students acquire knowledge and skills for their manipulation which enables them to design mechanisms and systems for automation in service and their adjustment to real conditions.

Course content:
Basic concepts and definitions. Nature, tasks and structure of service automation. Theoretical bases of automatic systems. Appliances and technical devices for service automation. Automation of dismantling-assembly operations and cleansing of details. Automated diagnostic systems. Automation of restoring processes. Automated systems of service management. Automated systems for development and testing of repaired machinery.

Teaching and assessment:
Lecture material provides knowledge in content and sequence needed for practice classes. Lectures are illustrated with transparencies for head- projector. Practice classes are conducted with real appliances for the relevant processes and with students' direct participation. The number of students at one working place does not exceed four. Preliminary preparation for practice classes is checked with tests

1078 Diploma Practice

ECTS credits: 3 **Weekly classes:** 0lec+0sem+0labs+30ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors.

Abstract:
The diploma practice aims at giving the students the opportunity to get acquainted with contemporary scientific and technical achievements in the sphere, in which they develop a diploma project and with the existing condition of the problem in the organization, which has suggested the topic for the diploma project.

Course content:
In relation to the topic of the diploma project, the students get acquainted with literature sources, patents, inventions etc., with methods for theoretical and experimental investigations and the results from them; with constructive and technological solutions; with laboratory equipment, measurement devices, tools patterns, machines for mechanical treatment, casting, welding, plastic deformation and thermal treatment; with methodology for constructive and technological calculations; with software packages for solving engineering problems; with quality management systems, etc.

Teaching and assessment:
The diploma practice is carried out in the department laboratories, mechanical and mechanical-mounting workshops, constructive and technological offices or divisions of machine-building companies, libraries, etc. in relation to the topic of the diploma project and the organization, which has suggested it. The tasks of the practice are determined by the tutor of the diploma project and are reported to him. The results from the practice are used in forming the literature reference of the diploma project and the development of its specific sections.

1404 Diploma Project

ECTS credits: 15 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors.
Abstract:
The diploma project aims at giving to the students the opportunity to apply the obtained knowledge and skills in self-independent and entire development of engineering projects. The students who have excellent achievements are given topics with research character. The Final Year project gives the students practical skills and experience for the future engineering practice or for continuing their study in a Master degree course.
Course content:
Review of the information regarding the diploma project topic. Formulating the aim and the tasks. Analysis of the output and the work conditions. Idea project or methodology of the research. Design of the necessary equipment and devices. Running of tests and processing of the results. Technical and economical analysis of the developed variants. Development of technical documentation and graphical representation of the results from the research.
Teaching and assessment:
The diploma project is developed following a given routine. The students work individually, using paper or electronically based information, the equipment of the department or other departments, and their instructor's help. The diploma project instructor assesses the degree of involvement, the public and moral qualities of the student. The assessor evaluates the diploma project. The student defends the diploma project in front of the State Exam Committee and the open public. The State Exam Committee evaluates both the diploma project and the way it is defended.

POSTGRADUATE STUDIES IN HYDRAULIC AND PNEUMATIC ENGINEERING

PROFESSIONAL STANDARDS
OF A MASTER IN

HYDRAULIC AND PNEUMATIC ENGINEERING

DEGREE COURSE: Hydraulic and Pneumatic Engineering
Degree: Master
Qualifications: Mechanical Engineer
Duration: 2 years (3 semesters)

The Master's course trains highly qualified engineers who are capable of designing, analyzing and testing sophisticated hydraulic and pneumatic equipment, widely used in power engineering, farming, machine engineering, transport, food industry and other spheres.

Engineers with Master's degree in Hydraulic and Pneumatic engineering can be employed as experts and counselors of high rank, consultants and managers in firms and agencies. Furthermore, they can carry out research, development and distribution work in the sphere of power equipment and technology.

Education aims are achieved through profound and specialized training in the following courses: Theory of positive-displacement machines, Theory of grates and turbomachines, Dynamic processes in hydraulic and pneumatic drive systems, Hydraulic and pneumatic system modeling and simulation, Heat and mass transfer. To enhance opportunities for research and analytical work the following courses are included: Theory of the experiment, Analysis of operations, Bases of the marketing and management, Management of the quality and reliability. These courses are conducted parallel with the master's degree course for students in the study course Farming equipment and technology.

Training is full time and day release and takes three terms.

CURRICULUM

of the Master's degree course in

HYDRAULIC AND PNEUMATIC ENGINEERING

First year

Code	*First semester*	*ECTS*	*Code*	*Second semester*	*ECTS*
0510	Theory of maintenance of equipment	7	0621	Resource-rehabilitating technologies	6
0593	Theory of the experiment	6	0622	Drying and refrigeratory techniques	5
0609	Bases of the marketing end management	4	0628	Theory of grids and turbomachines	7
			0629	Dynamic processes in hydraulic and pneumatic systems	7
0610	Non- traditional energy sources	6			
0611	Theory of positive-displacement machines	7		***Elective courses - students elect a course***	
			0612	Analysis of operations	5
			0613	Polyphase flows	5
	Total:	***30***		***Total:***	***30***

Second year

Code	*Third semester*	*ECTS*
0623	Management of the quality and reliability	5
0624	Heat and mass transfer	4
0630	Hydraulic and pneumatic system modeling and simulationects	4
0307	Diploma practice	2
0308	Diploma project	15
	Total:	***30***

Total for the training course: 90 ECTS credits

0510 Theory of Maintenance of Equipment

ECTS credits: 7 **Weekly classes:** 4lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Plamen Kangalov, PhD, Dept. RRCT, tel.: 888-441, e-mail: kangalov@ru.acad.bg
Abstract:
The course aims to enhance the theoretical and practical knowledge necessary for the realization of specialists in practice for maintaining equipment in working condition. Course material is based on studying the processes of various types of wear, determining technical condition of machine, examining the scientific basis of technological processes in repair and maintenance of equipment and management in order to obtain maximum impact.
Course content:
Production and technological process of repair and maintenance of machinery and equipment. General questions of physics deficiencies. Failure of power and contact effects. Methods for increasing the sustainability of details on the appearance of failure, basic requirements for construction machinery and their diagnosis. Diagnostic tests and diagnostic algorithms. Structure of operating properties and repair the machines. Factors leading to the need to conduct repair different effects of complexity.
Teaching and assessment:
Training schemes are used, laboratory equipment, real machines and modern measuring equipment. Lectures follow the classical method. The workshops are held in groups of 3-4 students and certain problems of scientific and practical character are discussed.

0593 Theory of the Experiment

ECTS credits: 6 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Atanas Leshkov Mitkov, PhD
2. Assoc.Prof. Todor Tsanev Todorov, PhD
Abstract:
The course comprises basic organization methods, experiment planning method in the sphere of engineering and processing and analysis of results attained. In view of that, objects are classified into three groups according to the number of control factors - without control factors, with one control factor and with more than one control factors. For the first object group methods of statistical assessment and methods of statistical hypothesis test are discussed. For the second and third group methods of single factor and multi factor regressive and dispersive analysis are discussed. The courses Mathematics I, II and III are a prerequisite for the course. Mathematical Bases of Engineering Experiment is a prerequisite for Analysis and Test of Various Objects, Management and Quality, etc.
Course content:
General (cybernetic) approach in the study of objects in an experimental way. The role of experiments in scientific tests. Kinds of experiments. Study of objects without forced, external impacts. Study of single factor objects. Single factor regressive analysis. Single factor dispersive analysis. Study of multi factor objects. Multi factor regressive analysis. Multi factor dispersive analysis. Planning of regressive experiments. Plans of I order. Plans of II order. Processing of multi factor objects. Statistical optimization. Software of experiment data processing
Teaching and assessment:
Lectures are given in the traditional way. At seminars relevant problems are solved with partial use of PCs. Laboratory classes have research nature. The exam is written on two questions with one assignment

0609 Bases of the Marketing end Management

ECTS credits: 4 **Weekly classes:** 3lec+1sem+0labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department Economics, Faculty of Business and Management
Lecturers:
1. Assoc.Prof. Lyubomir Dimitrov Lyubenov, PhD
2. Assoc.Prof. Nickolai Stefanov Naidenov, PhD

Abstract:
The course is aimed at getting students acquainted with the main marketing theoretical and methodological issues. It is elaborated on the basis of fundamental knowledge in economic theory and world economy problems. The course enables further study in other subjects the methods and approaches for realization of marketing concept in business management. Training is aimed at students acquiring knowledge about business management and necessary resources in small and medium - range industrial firms under market economy conditions. Entry links are with the course “Economics”, and exit links- with diploma project.

Course content:
Introduction into the course “Marketing”. Definition of marketing Types and kinds of marketing. Marketing environment. Consumer behavior. Marketing information system. Market segmentation. Strategic marketing planning and types of strategies. Factors determining the choice of marketing strategy. Product and innovation policy. Life cycle concept. Nature, range and principles of price policy. Price research in marketing. Realization of firm’s price strategy. Corporate distribution policy. Marketing logistics. Business communications in modern marketing. Advertising and kinds of advertising policy means. Organization and launching advertising campaign
Nature and problems of management. Organization forms of business and corporate management structures. Business planning. Capital and capital investment analysis. Corporate staff management. Management of technical and material resources. Information basis of management in industrial firms

Teaching and assessment:
Lectures provide necessary knowledge for practice, giving concrete examples. Lectures are visualized with head- projectors or multimedia. At some practice classes management applied programmes are used. Final continuous assessment is made from the results of 2 written tests on the term information

0610 Non-traditional Energy Sources

ECTS credits: 6 **Weekly classes:** 3lec+2sem+0labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Yassen Dochev Georgiev, PhD
2. Princ. Assistsnt Krasimir Tuzharov, PhD

Abstract:
The course comprises basic organization methods, experiment planning method in the sphere of engineering and processing and analysis of results attained. In view of that, objects are classified into three groups according to the number of control factors - without control factors, with one control factor and with more than one control factors. For the first object group methods of statistical assessment and methods of statistical hypothesis test are discussed. For the second and third group methods of single factor and multi factor regressive and dispersive analysis are discussed. The courses Mathematics I, II and III are a prerequisite for the course. Mathematical Bases of Engineering Experiment is a prerequisite for Analysis and Test of Various Objects, Management and Quality, etc.

Course content:
General (cybernetic) approach in the study of objects in an experimental way. The role of experiments in scientific tests. Kinds of experiments. Study of objects without forced, external impacts. Study of single factor objects. Single factor regressive analysis. Single factor dispersive analysis. Study of multi factor objects. Multi factor regressive analysis. Multi factor dispersive analysis. Planning of regressive experiments. Plans of I order. Plans of II order. Processing of multi factor objects. Statistical optimization. Software of experiment data processing.

Teaching and assessment:
Lectures are given in the traditional way. At seminars relevant problems are solved with partial use of PCs. Laboratory classes have research nature. The exam is written on two questions with one assignment.

0611 Theory of Positive-displacement Machines

ECTS credits: 7 **Weekly classes:** 3lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Gencho Popov, PhD
Abstract:
The course “Theory of positive-displacement machines" proves to be one of the principal courses in the master’s programme for the study course “Hydraulic and Pneumatic Engineering”. It comprises entirely theoretical matters connected with non-rotary and rotary positive displacement hydraulic and pneumatic machines (piston pumps and compressors, gear-type, screw-type, sliding vane, radial rotary and axial pumps, hydromotors and compressors).
Course content:
Piston pumps-flow variation, fluid suction and delivery, valve theory. Air pumps- basic dimensions and parameters of single - step compressor, valves of piston compressors. Gear-type hydraulic machines- theoretical flow and variation flow with gear - type pumps with straight teeth, with screw teeth and with internal gearing, theoretical assessment of internal energy losses and gear- wheel load. Elements of the theory of planetary hydraulic machines. Screw pumps- forces and moments working on the screw of the one- screw pump, shaping of a cycloid gearing of three- screw pumps. Sliding-vane hydraulic machines- theoretical flow and flow variation, moment, rotation and forces on the vanes. Rotary radial piston hydraulic machines - kinematics and displacement, forces and moments of multi- motion hydromotors, liquid distributing. Hydraulic machines with rotary axial pumps- kinematics, forces and moments of a machine with a sloping cylinder block and with a sloping disk, frontal distributor geometry. Other rotary pumps- theory of pumps with rotary pistons and pumps with eccentric ejector. Theory of similarity with positive- displacement hydro and pneumatic machines.
Teaching and assessment:
The lecture material is presented in the conventional way- using technical devices and visual aids. At laboratory classes students can carry out experiments individually in conditions good for research. Students get their students’ markbooks certified for the term provided they attend classes regularly.

0621 Resource-rehabilitating Technologies

ECTS credits: 6 **Weekly classes:** 4lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. Mitko Ivanov Nikolov, PhD
2. Assoc.Prof. Vasil Antonov Stojanov, PhD
Abstract:
The propose of “Resource-rehabilitating technologies” branch of science is that the students gain eruditions about basic processes used in recovering of the details efficiency off hydraulic and pneumatic machines. In conjunction with the theoretical aspects, used machines, working conditions and application spheres, the students will gain knowleges and abilities for their control which gave a possibility for design of technological processes and their adaptation to detail’s real construction and respective restrictions according the final results.
Course content:
Indinspensability of detail’s repearing. Arc welding processes for repearing of the details. Defect elimination with arc welding. Other electrical processes for detail’s repearing. Hot processes for details repearing. Repearing of worn out details with electrochemical coatings. Application of the electrochemical coatings for repearing of worn out details. Details repearing with plastic deformation. Electrosparkled treatment. Electrohydraulic treatment. Laser treatment. Characteristics of the thermic and thermic-chemical treatments in details repearing. Forms of organizations in details repearing. Ration of the repearing processes. Iconomical aspects in details repearing.
Teaching and assessment:
The tuition is taken by lections and laboratorial exercises. The exam is in written form with two question points off lections and one point off laboratorial exercises. The final rate is reached by exam in written form and term project.

0622 Drying and Refrigeratory Techniques

ECTS credits: 5 **Weekly classes:** 3lec+2sem+0labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Valentin Bobilov, PhD
Abstract:
The teaching program includes two individual but with common term technique base disciplines – refrigeratory technique and drying technique. In the first part of the lecture course some common questions from the theory of the artificial cold receiving, the thermodynamically bases of some refrigeratory machines, different refrigeratory work substances (refrigeratory agents) used in the refrigeratory machines and some refrigeratory aggregates are examined. The second part is devoted on the drying technique – thermodynamically methods for thermal computations and elements of the most widespread type of drying machines - the convection drying machines. The unconventional methods for the drying agent preparation and the using of unconventional energy sources have been took notice of.
Course content:
Refrigeratory technique. Methods for refrygeration. Physical principals of the cold receiving. Cooling fluids. Thermodynamically bases of the refrigeratory machines. Karno's reverse cycle. Valuation of the cycle energy effectiveness. Thermo-pump. Cold-air refrigeratory machine. Absorption refrigeratory machine. Processes in the absorption refrigeratory machine. Laval's nozzle. Elements of the refrigeratory installations. Systems for automatic regulation and protection.
Drying technique. Methods for artificial drying. Equilibrium humidity. Isotherms of sorption and resorption. Kinetics of the drying process. Periods of drying. Velocity of drying. Humid air. Thermodynamically properties of the humid air. Material and thermal balance of the drying machines. Schemes of the material and thermal flows. Thermodynamically circle of convectional drying process. Constructional special features of the real installations. Choice of the basic elements of convectional drying installation.
Teaching and assessment:
The students receive theoretical knowledge from the lectures. The carrying out of the seminars is with the use of visual and subsidiary materials and appliances. The evaluation has been accomplished according to the students activity on the time of seminars and the student's preparation on the lecture material. The final evaluation on the discipline has been finalized after the exam carrying out which is separated onto two parts – written exam and oral conversation with the lecturer.

0628 Theory of Grids and Turbomachines

ECTS credits: 7 **Weekly classes:** 3lec+0sem+1labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Roussev, PhD
Abstract:
The course aims at acquainting students with the theory of grids and turbomachines. Geometrical and hydrodynamic characteristics of blade sections and blade grids are explained. The solution of direct problem is dealt with helping to find theoretically the distribution of speed at different units of the sections. The solution of the converse problem is also dealt with, helping to find the proper section in given speed distribution. It is also envisaged to present the peculiarities of inlet and outlet elements of different turbomachines.
Course content:
Geometrical and hydrodynamic characteristics of blade section. Blade grids- rectilinear and circular blade grid. Zhukovski's theorem. Thin blade- eddy type, direct and converse problem. Blade section- direct and converse problem. Direct and converse problem of blade grid. Conformal transformation of a circular into rectilinear grid. Direct and converse problem for a grid in a current layer with constant thickness. Concept of direct and converse problem for a grid in a current layer with variable thickness, Section losses in blade grid- grid resistance, separation of boundary layer and impact of roughness. Power losses and methods for their assessment. Mathematical presentation of conformal mapping- mapping on a cylinder and cone, mapping of a warped grid. Design peculiarities of inlet and outlet elements of centrifugal pumps, axial pumps, centrifugal and axial ventilators. Predicting characteristics of newly designed turbomachines.
Teaching and assessment:
Lecture material is presented in the conventional way- using technical devices and visual aids. At practice classes independent work is provided for students who can carry out experiments in conditions suitable for research. Students have their term certified provided they attend classes regularly.

0629 Dynamic Processes in Hydraulic and Pneumatic Systems

ECTS credits: 7 **Weekly classes:** 3lec+0sem+1labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Ivanov, PhD
Abstract:
The course Dynamic processes in hydraulic and pneumatics driving systems gets the HPE students acquainted with the basic methods of study of the dynamics of driving hydraulic systems. Some automatic driving systems and approaches for achieving preliminary fixed quantity and accuracy of work are treated as well.
Course content:
The main topics treated are the following: Dynamic characteristics of hydraulic and pneumatic pipes. Follow-up hydraulic systems throttle control. Schemes and equations of hydraulic systems with throttle control- structure schemes, stability and methods for improvement of system work stability. Fluctuation in the oil pipe. Equation and transfer functions of pneumatic follow- up systems. Follow- up systems with displacement control. Equation and structure scheme of the force section of hydraulic drive system. Stability of a hydraulic drive system with displacement control in the presence of a feed- back. Electrohydraulic follow- up systems. Schemes and dynamics of hydraulic amplifier. Proportional hydraulic elements. Automated hydraulic systems for control of various technological processes. Systems dynamics. Transient process quality. Types of hydraulic controls-classification, transfer functions.Transient response. Equations and transient processes of systems for transformation of wind power into electric and hydraulic power. Collaboration of turbo pumps with an electric motor- forming equations of the turbo pump unit reading the characteristics of the intake reservoir.
Teaching and assessment:
The lecture material is presented in the conventional way- using technical devices and visual aids.

0612 Analysis of Operations

ECTS credits: 5 **Weekly classes:** 2lec+2sem+0labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Ivanka Mitkova Zheleva, PhD
Abstract:
he course is of applied nature, however it constitutes a basic part of the mathematical training. The syllabus reflects the training requirements in mathematics for the master's degree of engineering study courses and complies with the syllabus of the other courses in the curriculum. Adequate acquisition of the course syllabus enables advances in the theoretical sphere of a number of contemporary trends in science and practice. Three sections of the science "Analysis of operations" are treated: Determinated models of operations- optimal planning under limited resources; Probable models of operations- Making decisions considering accidental factors; Game models of operations. Rational conduct in conflict situations
Course content:
Concepts, principles and means for analysis of operations-odeling of operations, mathematical apparatus for analysis of operations, analysis of the bearing of systems, finical approach, applied aspects of the analysis of operations. Determinated models of operations, optimal planning under limited resources, linear optimization-general task, classification of mathematical optimization tasks, linear optimization - simplex method, method of artificial basis, dualism in linear optimization, transport task. Probable models of operations, decision making considering accidental factors. Theory of mass services - accidental processes, streams of events. Single - channel system with rejection - the simplest model of service. Single - channel system with a queue - waiting time for service. Multichannel system with rejections - admission capacity. Multichannel system with a queue - impact of interaction among channels. Game models of operations, rational conduct in conflict situations-choice of strategies in antagonistic games, an antagonistic game in a normal form, minimax theorem, search ways for optimal strategies, games answers, 2 x 2, m x 2, m x n.
Teaching and assessment:
At lectures theoretical information is presented with minimum demonstration, focusing on abundance of examples and tasks. At seminars skills are gained for solving tasks on the relevant material. Individual assignments are recommended whose fulfillment is monitored. The term exam is a pass when both its written and oral parts are taken

0613 Polyphase Flows

ECTS credits: 5 **Weekly classes:** 2lec+2sem+0labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Ivanka Mitkova Zheleva, PhD
Abstract:
The course Polyphase flows is designed for master's degree students in the study course Hydraulic and Pneumatic Equipment. The main accent is placed on issues related to transfer processes in doublephase flows. Students get acquainted with the achievements of Bulgarian and foreign specialists in the sphrere of double phase flow application. The lecture course is based on the preceding Fluid Mechanics and Heat Transfer.
Course content:
Heterogeneous fluid mechanics - basic notions of the phenomenological theory. Mechanics of multispeeed continuum. Description peculiarities of homogeneous and heterogeneous media Diffusional approximation. Equations of heterogeneous medium. Classification and structure of doublephase flow in pipes. Methods of analysis. Basic equations of doublephase flows- exceptions. Homogeneous flow. Split and drift flow in a doublephase medium. Some of the practice topics are the following: Designation maps of doublephase flow modes, computation of friction coefficient in homogeneous flow. Martinelli's method, Quatt's doublephase flow, flow of steam water mixture in straight pipes.
Teaching and assessment:
Lecture information is presented in the conventional way- using technical devices and visual aids. The course finishes with continuous assessment based on 3 tests throughout the term and students' performance at laboratory practice.

0623 Heat and Mass Transfer

ECTS credits: 5 **Weekly classes:** 3lec+2sem+0labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. Yassen Dochev Georgiev, PhD
2. Assoc.Prof. Veselka Kamburova, PhD
Abstract:
The course Heat and oil transfer is elective according th the master's degree curriculum for the study course Hydraulic and Pneumatic Equipment. Its aim is to give students within their basic multiprofile training specialized knowledge about physical principles and objective laws of heat transfer which is basically due to conduction, convection and radiation and transfer of substance through molecular diffusion and oil transmission. The related information is directed mainly at technical application of heat and oil transfer processes when computing and dimensioning the exchangers where they flow.
Course content:
Conduction, temperature field, Furie's law, differential equation, conduction equation. Convection- basic principles, convection heat transfer, convection differential equation.. Theory of generalized variables. Stationary conduction in boundary conditions of I type, stationary conduction in internal thermal source. Stationary conduction in boundary conditions of III type. Analysis of thermal conductivity coefficient. Heat transfer through ribs. Heat transfer in homogeneous medium. Heat transfer in forced flows in pipes and channels, pipe streaming and gas flows at great velocity. Heat transfer in non- homogeneous medium, in liquid boiling and steam condensation. Unstationary heat transfer. Molecular diffusion. Differential equation of molecular diffusion. Oil transfer - differential equations of oil transfer. Heat and oil exchangers. Computation of recuperators, regenerators and oil exchangers.
Teaching and assessment:
Training is organized in two forms- lectures and practice. Lecture theses enable students to get theoretically familiar with the main issues studied preceding practice.
The course finishes with assessment marks based on the results of two tests.

0624 Hydraulic and Pneumatic System Modelling and Simulationects

ECTS credits: 5 **Weekly classes:** 3lec+ sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc.Prof. Hristo Hristov, PhD
Abstract:
The course Hydraulic system modelling and simulation informs students about modern methods and mathematical principles of modelling and simulation the bearing of dynamic systems Basic concepts of systems are dealt with, as well as modelling principles, computer simulation, theory of systems, model samples and application..
Course content:
The main topics treated are: Basic tasks and application of dynamic models for simulation. Stages in dynamic system modelling and simulations. Concept of mathematical and simulation model. Main properties of dynamic systems. System bearing. Dynamic system models. Linear and non linear models. Dimentional analysis and its usage. Dynamic system models presented in a classical basis. Models presented with differential equations. Operational methods. System models presented in a modern basis. Model transformations. Simulation technique. Software. Model simulation and real model bearing. Validity of models and simulation results. Parameter evaluation. Adjacency integral criteria. Model verification.
Teaching and assessment:
Lecture information is presented in the conventional way - using technical devices and visual aids. Laboratory practice is carried out on PC with applied sortware - MATLAB. It provides independent students' performance at classes. There are conditions for research and individual assignments.

0630 Management of the Quality and Reliability

ECTS credits: 4 **Weekly classes:** 4lec+0sem+1labs+0ps+0
Assessment: exam **Type of exam:** oral
Departments involved: Department RRCT, Agrarian and Industrial Faculty
Lecturers:
Assoc.Prof. Mitko Ivanov Nikolov, PhD
Abstract:
The propose of this subject is meeting of the students with the basic periods and tendencies in the management of the quality, to obtain of science-practical knowleges about the methods for securing of the quality and reliability of the agriculture machines in the process of their design, elaboration and exploitation. The students receives knowleges and abilities about preparing and realizing of projects about improving the quality and reliability of the agriculture machines.
Course content:
Essense and content of the quality as a term. Development of the quality and reliability. Management and control of the quality upon ISO 9000 standards. Management of the total quality. Quality, life cycle and market cycle of the merchandises. Objects of the quality and reliability. Conceptual theory about management of the quality and reliability. Principles, methods and strategies about management of the quality and reliability. Demonstrating the truth of necessity about improving of the quality. Identification of projects about improving of the quality. Project about improving the foods sales. Project about improving the technical products sales. General regularities in the projects about improving the quality. General characteristics of the projects about improvements. Factors, controlled from the operator and guidance.
Teaching and assessment:
The tuition is taken by lections and laboratorial exercises. The exam is in written form including 2 question points from lections and one question point from laboratorial exercises.

0307 Diploma Practice

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+30ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors.
Abstract:
The diploma practice aims at giving the students the opportunity to get acquainted with contemporary scientific and technical achievements in the sphere, in which they develop a diploma project and with the existing condition of the problem in the organization, which has suggested the topic for the diploma project.
Course content:
In relation to the topic of the diploma project, the students get acquainted with literature sources, patents, inventions etc., with methods for theoretical and experimental investigations and the results from them; with constructive and technological solutions; with laboratory equipment, measurement devices, tools patterns, machines for mechanical treatment, casting, welding, plastic deformation and thermal treatment; with methodology for constructive and technological calculations; with software packages for solving engineering problems; with quality management systems, etc.
Teaching and assessment:
The diploma practice is carried out in the department laboratories, mechanical and mechanical-mounting workshops, constructive and technological offices or divisions of machine-building companies, libraries, etc. in relation to the topic of the diploma project and the organization, which has suggested it. The tasks of the practice are determined by the tutor of the diploma project and are reported to him. The results from the practice are used in forming the literature reference of the diploma project and the development of its specific sections.

0308 Diploma Project

ECTS credits: 15 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors.
Abstract:
The diploma project aims at giving to the students the opportunity to apply the obtained knowledge and skills in self-independent and entire development of engineering projects. The students who have excellent achievements are given topics with research character. The Final Year project gives the students practical skills and experience for the future engineering practice or for continuing their study in a Master degree course.
Course content:
Review of the information regarding the diploma project topic. Formulating the aim and the tasks. Analysis of the output and the work conditions. Idea project or methodology of the research. Design of the necessary equipment and devices. Running of tests and processing of the results. Technical and economical analysis of the developed variants. Development of technical documentation and graphical representation of the results from the research.
Teaching and assessment:
The diploma project is developed following a given routine. The students work individually, using paper or electronically based information, the equipment of the department or other departments, and their instructor's help. The diploma project instructor assesses the degree of involvement, the public and moral qualities of the student. The assessor evaluates the diploma project. The student defends the diploma project in front of the State Exam Committee and the open public. The State Exam Committee evaluates both the diploma project and the way it is defended.

POSTGRADUATE STUDIES IN THERMAL AND GAS SUPPLIES

PROFESSIONAL STANDARDS
OF A MASTER IN

THERMAL AND GAS SUPPLIES

DEGREE COURSE: Thermal and gas supplies
Degree: Master
Qualifications: Mechanical Engineer
Duration: 1 year (2 semesters)

The course is with modern requirements for training highly qualified specialists who work in the design, installation and operation of thermal systems, thermal and gas systems, systems for use and consumption of heat and efficient use of energy resources.

Theoretical and specialized training is obtained by studying the compulsory courses - heat transportation, research and optimization in energy, fuel systems and technologies, heat, gas and others. During the training students acquire the necessary knowledge and skills for more efficient use of energy and learn how to carry out the design work.

The received qualification Master of Engineering enbles the students to work in the shere of heat and gas supply in research institutions, in design offices and energy departments, as consultancy and technical managers in companies involved in such implementation activities. They can also work as entrepreneurs, investors and managers of small and medium-sized companies to build plants and look after their maintenance.

The duration of training comprises two full semesters for the full-time students and three semesters for the part-time. The course ends with the development and defence of a graduation project.

CURRICULUM

of the Master's degree course in

THERMAL AND GAS SUPPLIES

First year

Code	*First semester*	*ECTS*	*Code*	*Second semester*	*ECTS*
0504	Fuel Technique and Technologies	4	0719	Gas Supplies	3
0708	Thermalsupplies	6	0721	Design for Thermal and Gas Sistems	2
0709	Energy Systems for Transportation and Use of Fluids	5 4	0722	Energy Efficiency of Hot and Cold Supplies	3
0711	Information and Control Systems in Energy	5 6	0723	Legislation for Thermal and Gas Supplies	2
0715	Research and Optimizing Energy		0724	Pumps, Compressors and Fans	2
1608	Heat and Mass Transfer		0718	Renewables Energy Sources	3
			0728	Diploma Project	15
	Total:	***30***		***Total:***	***30***

Total for the training course: 60 ECTS credits

0504 Fuel Technique and Technologies

ECTS credits: 4 **Weekly classes:** 2lec+0sem+1labs+1ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Ilia Iliev, PhD
Abstract:
The main energy fuels with their characteristics. Tracks are developing fuel technology, the main technological schemes for training and technology for combustion of fuel.
Course content:
Energy fuels. Combustion of solid, liquid and gaseous fuels. Fuel heavy equipment units. Hot water boilers. Current co-generation plants. Protecting the environment from pollution. Pollution of air basin from combustion plants.
Teaching and assessment:
Lectures are presented to the audience through multimedia. The workshops are held in specialized laboratories. Two tests are carried out with the aim of forming the assessment.

0708 Thermalsupplies

ECTS credits: 6 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Valentin Bobilov, PhD
Abstract:
Thermalsupplies is a technical discipline, studying ways of transportation, distribution and accumulation of heat. It is practically oriented and covers the whole technological cycle from production to final consumers of energy resources.
Course content:
Consumption of heat. Thermal energy for heating, ventilation and technology. Major systems of heat. Central regulate the heating load. Modern methods laying a heat-and cold-transmission networks. Operation of thermal systems. Service and repair. Dispatching control.
Teaching and assessment:
Lectures are given by charts, tables, graphs, multimedia. Workshops are conducted at industrial sites or in the classroom. When processing data in class tables, graphs and reference materials are applied. In some exercises computers are also used.

0709 Energy Systems for Transportation and Use of Fluids

ECTS credits: 5 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Kondio Andonov, DSc
2. Assoc. Prof. Gencho Popov, PhD
Abstract:
The course provides the necessary knowledge of the inducement for energy efficiency and ventilatory pumping units, pumps and fans systems, networks and systems, providing manufacturing processes, water supply to villages, irrigation systems.
Course content:
Transportation systems fluids. Principles of security arrangements energy efficiency pumping and fans aggregates. Stages, content and features of surveys for the energy efficiency of pneumatic-hydraulic systems installations, equipment companies, companies.
Teaching and assessment:
The material is delivered in the traditional manner and using technical means. Laboratory exercises are conducted in groups by a report form.

0711 Information and Control Systems in Energy

ECTS credits: 4 **Weekly classes:** 2lec+1sem+0labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Valentin Stoyanov, PhD
2. Assoc. Prof. Ivan Evstatiev, PhD

Abstract:
The course teaches the nature and specifics of information technology in the energy sector. Special attention is paid to the development of modern information exchange.

Course content:
General structure and main functions of information and control systems in energy. Transmission of signals through the liaison. Organization of channels for exchanging information. Electronic signal processing in measuring technological parameters for the assessment of energy efficiency. Automatic regulators management processes. Industrial controllers management processesл

Teaching and assessment:
The material is delivered in the traditional manner and using technical means. Laboratory exercises are conducted in groups by a report form. Check Students are made at the beginning of any occupation.

0715 Research and Optimizing Energy

ECTS credits: 5 **Weekly classes:** 3lec+1sem+0labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Kondio Andonov, DSc
2. Assoc. Prof. Veselka Kamburova, PhD
3. Assoc. Prof. L. Mihailov, PhD

Abstract:
The course is designed to provide knowledge for organizing and conducting engineering studies in energy. The course allows students to learn and acquire the basic principles and methods for organizing and conducting engineering studies in energy.

Course content:
Planning, organization and conduct research in energy. Study of objects with one parameter. Regression analysis and variances. Study of objects with two parameters. Fundamentals of similarity and modeling. Optimization in tthermal energy.

Teaching and assessment:
Lectures are held in pre-announced schedule by topic. The topics of all seminars are related to the results of experimental studies. Practical exercises are based on research established experimental models.

1608 Heat and Mass Transfer

ECTS credits: 6 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc.Prof. Yassen Dochev Georgiev, PhD
2. Assoc.Prof. Veselka Kamburova, PhD

Abstract:
The course Heat and oil transfer is elective according th the master's degree curriculum for the study course Hydraulic and Pneumatic Equipment. Its aim is to give students within their basic multiprofile training specialized knowledge about physical principles and objective laws of heat transfer which is basically due to conduction, convection and radiation and transfer of substance through molecular diffusion and oil transmission. The related information is directed mainly at technical application of heat and oil transfer processes when computing and dimensioning the exchangers where they flow.

Course content:
Conduction, temperature field, Furie's law, differential equation, conduction equation. Convection- basic principles, convection heat transfer, convection differential equation. Theory of generalized variables. Stationary conduction in boundary conditions of I type, stationary conduction in internal thermal source. Stationary conduction in boundary conditions of III type. Analysis of thermal conductivity coefficient. Heat transfer through ribs. Heat transfer in homogeneous medium. Heat transfer in forced flows in pipes and channels, pipe streaming and gas flows at great velocity. Heat transfer in non- homogeneous medium, in liquid boiling and steam condensation. Unstationary heat transfer. Molecular diffusion. Differential equation of molecular diffusion. Oil transfer- differential equations of oil transfer. Heat and oil exchangers. Computation of recuperators, regenerators and oil exchangers

Teaching and assessment:
Training is organized in two forms- lectures and practice. Lecture theses enable students to get theoretically familiar with the main issues studied preceding practice.
The course finishes with assessment marks based on the results of two tests.

0718 Renewables Energy Sources

ECTS credits: 3 **Weekly classes:** 3lec+2sem+0labs+1ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Yassen Dochev, PhD
2. Senior Assistant Krasimir Tujarov, PhD

Abstract:
The course aims to introduce students to the thermal technical equipment used for the rational use of alternative energy sources.

Course content:
Solar radiation. Elements of solar installations. Active solar heating systems. Passive solar heating. Wind energy. Wind energy. Water power. Geothermal energy. Biomass and biofuels. Biogas and biogas plants. Storing biogas.

Teaching and assessment:
For the visualization of lectures the necessary multimedia is used. In seminars a head- projector, posters, models and two tables with the basic relationships needed to solve problems are employed. Students are required to prepare a course assignment for the seminars.

0719 Gas Supplies

ECTS credits: 3 **Weekly classes:** 4lec+1sem+0labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Georgi Nikolov, PhD
Abstract:
The aim of the course is to introduce students to the methods and tools for the design and operation of gas-supplied systems and the regulations to achieve higher energy efficiency of the technological processes.
Course content:
Basic physics - chemical, energy and thermodynamic properties of hydrocarbons gases. Mining and primary processing of natural gas. Transportation of natural gas in gaseous and liquid form. Compressor stations. Transport of liquefied hydrocarbon gases by auto, railway transmission and water containers. Exploitation of underground and overground lines. Control and maintenance. Industrial gas plants for liquefied natural gas and hydrocarbon gases. Methods of burning gas fuels. Removal of the products of combustion.
Teaching and assessment:
Students receive theoretical knowledge from lectures. In each exercise the student analyze the results.

0721 Design for Thermal and Gas Sistems

ECTS credits: 2 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Georgi Nikolov, PhD
2. Assoc. Prof. Valentin Bobilov, PhD
Abstract:
The aim of the course is to introduce students to the methods and tools for the design in order to comply with regulatory requirements of the inspection bodies and institutions.
Course content:
Basic requirements for the process of investment projects. Structure, contents and stages of the investment project. Coordination of technical documentation. Supervision. Basic requirements for the design of thermal supplies networks and systems. Basic requirements for the design of heat and power stations. Basic requirements for the design of natural gas networks and systems. Basic requirements for the design of objects with facilities and equipment for natural gas. Basic requirements for the design of objects with facilities and equipment for liquefied hydrocarbon gases.
Teaching and assessment:
Students receive theoretical knowledge from lectures. Workshops are conducted for the acquisition of practical skills. In each exercise the students analyze the results.

0722 Energy Efficiency of Hot and Cold Supplies

ECTS credits: 3 **Weekly classes:** 3lec+1sem+1labs+0ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Valentin Bobilov, PhD
Abstract:
The aim of the course is to introduce students to the methods and tools for the design and operation of systems for hot and cold supply, to achieve higher efficiency in comfort and energy technology processes.
Course content:
Weather - weather parameters of the environment. Microclimate and physiological favor. Temperature sensation. Heat loss. Conventional heating systems. Central area and air conditioning systems. Elements of climate plants. Reliability, efficiency and regulation of climate systems.
Teaching and assessment:
Students receive theoretical knowledge from lectures. The seminars create the necessary computing habits and workshops are held for the acquisition of practical skills in the use installations. In each exercise the students analyze the results.

0723 Legislation for Thermal and Gas Supplies

ECTS credits: 2 **Weekly classes:** 3lec+0sem+0labs+0ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Principal lecturer Ivan Savov, PhD
Abstract:
The aim of the course is to introduce students to the legal requirements in the design, installation, operation and maintenance of pipelines and facilities in the area of heat and gas supply business and residential consumers.
Course content:
Basic requirements of regulations for management of the territory. Legislation regarding the study design, construction, the introduction into service, renovate and surveillance systems for local heat Legislation concerning the operation and supervision of gas transmission and distribution networks. Legislation concerning the operation and supervision of facilities, installations and equipment for natural gas. Legislation regarding the design of objects of natural gas. Legislation regulating the rules for safe operation of gas facilities for liquefied hydrocarbon gases.
Teaching and assessment:
Students receive theoretical knowledge from lectures. A comparison with the legislation in the developed countries is made. The assessment is done based on the results of both tests and the activity of students during lectures.

0724 Pumps, Compressors and Fans

ECTS credits: 2 **Weekly classes:** 2lec+0sem+2labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Rusev, PhD
Abstract:
The course aims to acquaint students with basic theoretical questions, construction and operation of various types of pumps, fans and compressors used in various systems for heat and gas.
Course content:
General information and performance of hydraulic and pneumatic equipment. Main equation work turbomashines. Axial and centrifugal pumps. Volume pumps. Piston pumps. Gears, and rotors piston machines. Compressors. Turbokompresors. Fan. Automatic control of hydraulic and pneumatic machinery.
Teaching and assessment:
The material from the lectures is displayed in the traditional way and using technical means. During the laboratory exercises, students are introduced to the pattern of experimental systems, methods for experiments and experimental data. For all laboratory classes reports are formed.

0728 Diploma Project

ECTS credits: 15 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors.
Abstract: The diploma project aims at giving the students the opportunity to apply the obtained knowledge and skills in self-independent and entire development of engineering projects. The students who have excellent achievements are given topics with research character. The Final Year project gives the students practical skills and experience for the future engineering practice or for continuing their study in a Master degree course.
Course content: Review of the information regarding the diploma project topic. Formulating the aim and the tasks. Analysis of the output and the work conditions. Idea project or methodology of the research. Design of the necessary equipment and devices. Running of tests and processing of the results. Technical and economical analysis of the developed variants. Development of technical documentation and graphical representation of the results from the research.
Teaching and assessment:
The diploma project is developed following a given routine. The students work individually, using paper or electronically based information, the equipment of the department or other departments, and their instructor's help. The diploma project instructor assesses the degree of involvement, the public and moral qualities of the student. The assessor evaluates the diploma project. The student defends the diploma project in front of the State Exam Committee and the open public. The State Exam Committee evaluates both the diploma project and the way it is defended.

POSTGRADUATE STUDIES IN INDUSTRIAL DESIGN

PROFESSIONAL STANDARDS
OF A MASTER IN

INDUSTRIAL DESIGN

DEGREE COURSE: Industrial Design
Degree: Master
Qualifications: Engineer-designer
Duration: 1 year (2 semesters)

The main objective of the study: Development of modern and widely profiled qualified specialists in the design of industrial products and devices.

General and specific training:
Common training is conducted within 1st semester, including a learning process courses which help to build a research-level knowledge and skills in solving technical, artistic and ergonomic problems in the shape, colour, graphics and technology.
Special training is done during the 2nd semester, including a learning process disciplines to contribute to building a professional culture of design in solving complex compositional problems in the industrial and art products and solutions.

General and special skills:
General professional skills find expression in shaping career in industrial design and artistic decisions - industrial products, art solutions, new concepts for products, services and marketing outlets.
Special skills are formed in accordance with individual characteristics and preferences of students in several areas: design of industrial products and forms, artistic spatial layout, graphic design and industrial graphics, visual communications, advertising decisions, and others.

Job opportunities:
Graduates are highly adaptable due to the wide and interdisciplinary nature of their preparation and can find application in various professional fields.
General description and features of the curriculum:
The curriculum was developed by advanced methodological interpretation of the main ideas and essence of contemporary design. It meets all the requirements of the Unified Ordinance Training 8.16.03. "Industrial Design".

CURRICULUM

of the Master's degree course in

INDUSTRIAL DESIGN

First year

Code	*First semester*	*ECTS*	*Code*	*Second semester*	*ECTS*
2283	Contemporary Concepts in the Design I	5	0644	Marketing Philosophy of Design II	2
2284	Basics of Scientific Research	5	0643	Presentation Techniques II	2
2285	Presentation Techniques I	4	2291	Contemporary Concepts in the Design II	2
2286	Individual Scientific Research I		2292	Individual Research II	3
2287	Marketing Philosophy of Design I	4	2293	Fundamentals of Experimental Research	2
0642	English I	3	2298	Englis II	
	Elective courses - students elect a course		2307	Diploma Project	2
0633	Web-design I	4		***Elective courses - students elect a course***	15
0639	Pictorial Techniques I	4	2299	Web-design II	2
0640	Optimal Project of Design I	4	2300	Pictorial Techniques II	2
			2301	Optimal Project in Design II	2
	Total:	***30***		***Total:***	***30***

Total for the training course: 60 ECTS credits

2283 Contemporary Concepts in the Design I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Dancho Gunev, tel.: 888-426, e-mail: dgunev@ru.acad.bg
Abstract:
Course "Modern concepts in design - aims to curb a series of knowledge, skills and technology as a methodical basis for designing new products considered as multi-problematic structures.
Course content:
Major types of design problems. Links between social organization, development of science and public needs as a basis for creating new products. The concept of system object. Modeling product system object. Structure of the design process. Starting bases for innovative design. Dynamics of the design process. Stages in the development of the product. Current trends in design as a method of design. Future directions in design. Trends.
Teaching and assessment:
The lecture course is done in the traditional manner using rich illustrative material, practical work of the Department of Industrial Design and actual samples of leading international companies. Practical exercises are assigned by project or topic of diploma project.
Continuous assessment is at the end of the semester in depth reporting work during the semester, and the quality of implementation of practical tasks.

2284 Basics of Scientific Research

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Prof. Nikola Orloev, PhD, tel.: 888-554, e-mail: norloev@ru.acad.bg
Abstract:
The course covers basic concepts, approaches, principles and recommendations relating to two major countries of the methodology of creativity in research in the field of knowledge, science, techniques, technology and art: the organization of effective creative thinking in the preparation and implementation of system research. Prerequisites arsenal of ideas, techniques and means of presentation (presentation), visualization and verbal justification and protection of authors' research results. The main purpose of discipline is to propose an arsenal of methodological knowledge and skills needed in the formulation, research, research and offering support results in solving the independent scientific research topics, tasks and projects.
Course content:
Creative thinking as a fundamental prerequisite for research. Technology to solve problems. Mentation of errors in the creative process. Key factors strait analysis / synthesis in solving tasks/problems and making decisions. Descriptive-sistematization characteristics of research. Nature of research. Forms, techniques and methods of research. Principles and techniques of scientific language and scientific proof and remarks. Presentation (presentation and presentation equipment) of research results.
Teaching and assessment:
Training is done through lectures, seminars, individual work of students and intensive individual counseling. Each trained elected as creative interests scientific problem, which does research, custom research and develop original scientific article. Term assessment is based on the performance of individual term tasks to be carried out necessarily in a prestigious writing.

2285 Presentation Techniques I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Cetomir Konov, tel.: 888-558, e-mail: ckonov@abv.bg
Abstract:
The purpose of the discipline is the formation of professional qualities for use in original design projects, the obtaining of knowledge and skills of synthesis, various solutions and the acquisition of appropriate technology to implement projects uniquely bearing aesthetic concepts.
Course content:
Drawing as a means of illustration or equipment for presentation of conceptual decisions. Visual tools and materials. Organization of work. Composition of the picture, organization of the fine plane. Basic composition techniques. Sequence of imaging of objects. Choose appropriate visual techniques. Combine techniques. Major volumes in space and development through various techniques depending on the material. Colour variations. Optical changes tonnes in the picture.
Teaching and assessment:
Lectures are presented as an organic combination of factual material, richly displayed and implemented in major theoretical and practical performances under the direction of the lecturer. Practical exercises contribute to the lecture performances and help the student achieve the necessary professional level. Continuous assessment is carried out throughout the semester.

2286 Individual Scientific Research I

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+5ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Prof. Nikola Orloev, PhD, tel.: 888-554, e-mail: norloev@ru.acad.bg
Abstract:
The main objective of the discipline is to provide young specialist with the necessary research knowledge, skills, techniques, methods and tools for solving copyright research tasks and projects, distinguished by a particular usefulness, efficiency and making a clear contribution to art and science.
Course content:
Objective analysis of its creative potential of individuals. Election of adequate scientific research fields. Preliminary studies. Formulation of purpose, tasks, priorities, offering efficiency and usefulness of the study. Developing a structured plan of research.
Teaching and assessment:
Training is conducted in seminars involving intensive work done by the students who fulfil their tasks by individual consultations with experts and leaders.
Each student chooses the subject field of his or her scientific research and develops a plan for implementing it. Continuous assessment is based on the active participation in the research and creative performance of the course assignments described in writing.

2287 Marketing Philosophy of Design I

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Prof. Nikola Orloev, PhD, tel.: 888-554, e-mail: norloev@ru.acad.bg
Abstract:
The main objective of the discipline is to provide students with reliable and immediately applicable knowledge and skills necessary for the formation of market thinking, behavior and action realistic approach towards the objective market laws, rules and principles.
Course content:
Trahseologichna philosophy of business. Laws of marketing. Laws of brendinga (trademark). Laws brendinga Internet. Technology successful marketing.
Teaching and assessment:
Training is done through lectures, seminars, individual work of students and intensive individual counseling. Each student chooses according to his or her specific career interests and preferences a task, which he or she carries out through research, analysis, scanning and strategy having in mind the prospective application of the results in his or her planned personal business venture. The examination assessment is based on active research, practical implementation of practical term issues and problems in writing and creative discussion of the individual author's project.

0633 Web-design I

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
1. assoc. Prof. Angel Smrikarov, PhD, tel.: 888-743, e-mail: asmrikarov@ecs.ru.acad.bg
2. senior assistant Kamen Uzunov, tel.: 888-845, e-mail: kamenuzunov@ru.acad.bg
Abstract:
The course introduces students to the main directions of modern web design, as it gives them extensive knowledge of interactive visual communications and multimedia. Different concepts of active and successful interaction between Web product and recipient.
Course content:
Nature and objectives of modern web design. Characteristics of communication process. Key concepts in web design and features. Specificity of graphic images in Web design. General information about HTML-tongue. Basic tools for viewing Web-publishing (browsers). HTML-editors and utilities funds. Flash-technology - a means to create attractive web and multimedia solutions.
Teaching and assessment:
The theoretical input of the course is presented in lectures, and their creative analysis and implementation is achieved through practical exercises, which are organized on solving various practical problems, the complexity of which increases towards the end of semester. The more complex tasks are discussed by all students.

0639 Pictorial techniques I

ECTS credits: 0 **Weekly classes:** 0lec+0sem+0labs+3ps+0
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Antoniy Sofev, tel.: 888-845, e-mail: sofev@nbis.net
2. Milen Minkov, MA in Arts, tel.: 888-845, e-mail: mminchev@ecs.ru.acad.bg

Abstract:
The purpose of the discipline is to form professional qualities applied in creating original design projects and to build knowledge and skills of synthesis, to give various solutions and acquire appropriate technology to implement projects uniquely bearing aesthetic concepts.

Course content:
Drawing as a means of illustration and equipment for presentation conceptual solutions. Plastic characteristics of the object. Space of the conventional white sheet. Visual tools and materials. Types of materials, templates, masks, adhesives, copying techniques. Types of paper and selection of bases. Organization of work Sequence of imaging of objects. lustrating the subject area. Sketches and drawings. Combine techniques. Linear and volumetric display of geometric bodies and volumes. Detail and structure. The creation of new forms and structures brainchild. Specificity of artistic assimilation of reality. Structuring the display object. Pencil drawings. Sketch of geometric shapes in space industry. Major volumes in space. Development of different techniques.

Teaching and assessment:
Lectures are presented as an organic combination of factual material, richly displayed and implemented by major theoretical and practical performances under the guidance of the lecturer. Practical exercises enrich the student's performance and help him or her reach the necessary professional level. Continuous assessment grade is given at the end of the semester and includes the successful implementation of the course assignment and the fulfillment of the contract term task.

0640 Optimal Project of Design I

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1. Assoc. Prof. Venko Vitleemov, PhD, tel.: 888-572
2. Assoc. Prof. Petar Koev, PhD, tel.: 888-486

Abstract:
The course combines two aspects of optimal design - engineering and design. Students obtain the conceptual capacity to formulate and discuss the decisions of optimization problems for the design elements of machines and equipment with MATLAB software systems. Different methods of some cross-optimal design.

Course content:
Introduction to the optimal design. Models of design object. Formulation of optimization task. Types of tasks for optimal design. Optimization program MATLAB system. Graphic optimization in MATLAB. One local optimization methods. Multi-mer methods of local optimization.

Teaching and assessment:
The lectures present the nature and properties of the methods of optimization. In practical applications are dealt selected optimization problems in the middle of MATLAB. It is necessary for each student to decide on an assignment as a problem for optimum design, which passes through all stages of the optimization process. The training ends with an informal discussion on issues of the discipline and the rezults of the assignment, which is presented in writing.

0642 English

ECTS credits: 3 **Weekly classes:** 0lec+0sem+0labs+3ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department FL, Faculty of Law
Lecturers:
Sr. lecturer Sevda Cvetanova, tel.: 888-230
Abstract:
Teaching of English aims to expand language and rechev practice of previous levels of education, an emphasis on specialty-specific terminology. To consolidate and further develop skills of students while working on integrating skills for reading, writing, listening and speaking.
Course content:
Unusual hobbies, unusual animal phobia, unexpected, prejudices, art and artists, crafts, architecture and design
Teaching and assessment:
Topics include both general English, and English for Specific Purposes. These objectives are achieved on the basis of various texts as fundamental for the training course textbooks, and the authentic materials for general and specialized language: texts of scientific and popular articles, advertising materials, prospectuses, manuals and instructions. The grammar and lectures are presented in accordance with the requirements, which puts each topic considered, the aim is to achieve a balance between the language of daily communication and specialized language.

2291 Contemporary Concepts in the Design II

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+4ps+0
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Dancho Gunev, tel.: 888-426, e-mail: dgunev@ru.acad.bg
Abstract:
The course aims to curb a series of knowledge, skills and technology as a methodical basis for designing new products considered as multi-problematic structures.
Course content:
Market research related to the establishment of the diploma project. Description of the site as problematic structure. Options for the project modeling. Innovative niches. Development of research sketches, diagrams, drawings, comic scenarios associated with the diploma project. Practical implementation stages of the process of designing a new product.
Teaching and assessment:
Practical tasks are assigned to each student as a diploma project. Continuous assessment grade is given at the end of the semester for the depth of the reporting work during the semester, and the quality of the implemented practical tasks.

2293 Fundamentals of experimental research

ECTS credits: 2 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Prof. Atanas Mitkov, PhD, tel.: 888-553, e-mail: atmitкov@ru.acad.bg
Abstract:
The course includes basic methods of organization (planning) experiment in the field of engineering and processing and analysis of results. In this connection the objects are classified according to number of factors steered into three groups - no control factor, with one control factor and with more than one control factor. For the first group the methods of statistical methods for assessment and verification of statistical assumptions. For the second and third group the methods of single-and multi-regression analysis and variances.
Course content:
Total (cybernetic) approach in studying objects experimentally. The role of experiment in research. Types of experiments. Studying objects without external influence. Studying single objects. Regression analysis. Multi-factor regression analysis. Studying multi objects. Analysis. Multi-factor regression analysis. Planning regression experiments. First degree plans. Second degree plans. Data processing in planned experiments. Planning variances experiments. Optimization.
Teaching and assessment:
The lectures are presented in the traditional ways. In the seminars relevant problems with partial use of personal computers are solved. Laboratory exercises involve research. It is done by answering two questions and solving a problem.

0643 Presentation Techniques II

ECTS credits: 2 **Weekly classes:** 0lec+0sem+0labs+3ps+0
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Cetomir Konov, tel.: 888-558, e-mail: ckonov@abv.bg
Abstract:
The purpose of discipline is to form professional qualities used in creating original design projects, to build knowledge and skills of synthesis, various solutions and to acquire appropriate technology to implement projects uniquely bearing aesthetic concepts.
Course content:
Plastic characteristics of the object. Ways to convert one form to sign. How to watch the form inside. Space of the conventional white sheet. The creation of new forms and structures brainchild. Specificity of artistic assimilation of reality. Creative imagination, artistic thinking, the synthesis of the overall image of the future. Remedial techniques retushi. Graduates effects. Specificity of the methods of graphic performance. Aerograf. Templates, masks, adhesives. Fundamentals and selection of materials. Composition and organization of fine plane. Emphasis characteristic radiation. Entry into detail.
Teaching and assessment:
Lectures are presented as an organic combination of factual material, richly displayed and implemented by major theoretical and practical performances under the guidance of the lecturer. Practical exercises enrich the student's performance and help him or her reach the necessary professional level. Continuous assessment grade is given at the end of the semester and includes the successful implementation of the course assignment and the fulfillment of the contract term task.

2292 Individual Research II

ECTS credits: 3 **Weekly classes:** 0lec+0sem+0labs+7ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Prof. Nikola Orloev, PhD, tel.: 888-554, e-mail: norloev@ru.acad.bg
Abstract:
The main objective of discipline is to provide young specialist with research knowledge, skills, methods and tools for solving copyright research tasks and projects, distinguished by particular usefulness, efficiency and contribution to science and art.
Course content:
Methods of research. Organization of specific research. Design and preliminary observations, surveys, tests and studies. Formation of offerings, results, conclusions and recommendations of the study author. Planning presentation of research results. Technique word interpretation of research results. Development, publication and implementation of research results.
Teaching and assessment:
Training is conducted in seminars through intensive work of students, individual consultations with experts and leaders. Continuous assessment is based on active participation in the practical research process and creative execution of the scientific project tasks in writing.

0644 Marketing Philosophy of Design II

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers: Prof. Nikola Orloev, PhD, tel.: 888-554, e-mail: norloev@ru.acad.bg
Abstract:
The main objective of the subject is to introduce students to the essential theory, practice and experience of leading international marketing schools and markets to present the designer as an artist, professionalist and subject to traditional ideas of strategy and tactics and adequate marketing tools.
Course content:
Marketing. Marketing process. Business as generalship. Contemporary business on the principles of Sun Dzu from "The Art of War". Pragmatism in business strategies. Systematic approach in marketing strategies. Special problems of marketing strategies.
Teaching and assessment:
Training is done through lectures, seminars, individual work of students and individual consultations with trainers and experts from practice. Each student chooses according to his or her as creative attitude, professional interests, competencies and preferences a practical task of establishing a new conventional or high-tech product or service. Thorough studies of global pattern and trend legal research they formulate their individual task, their author's designed product / service based on patent applications and develop a plan for the practical realization of the idea for the product or project for a specific marketing event. Continuous assessment is based on the fulfilment of the individual term assignment in writing, in full compliance with the requirements of the law on intellectual property.

2299 Web-design II

ECTS credits: 2 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Angel Smrikarov, PhD, tel.: 888-743, e-mail: asmrikarov@ecs.ru.acad.bg
2. Senior assistant Kamen Uzunov, tel.: 888-845, e-mail: kamenuzunov@ru.acad.bg
Abstract:
The course deepens students' knowledge in the field of modern web design, as it gives them additional theoretical and practical knowledge in the field of interactive visual communications and multimedia, having worked with powerful modern software, providing tremendous opportunities for creative expression. A parallel between web design and multimedia.
Course content:
Flash-technology-tool to create attractive web and multimedia solutions. Animation in Flash. Macromedia Director - a tool for powerful multimedia solutions. Integrating 3DMax sites in Director and and their possibilities management by means of the editor.
Teaching and assessment:
Web design course Part II relies primarily on creative interpretation of real and practical oriented project by means of web design and multimedia. The final assessment has a complex nature and place of presentation performance of the project

2300 Pictorial Techniques II

ECTS credits: 2 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** practical
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Antoniy Sofev, tel.: 888-845, e-mail: sofev@nbis.net
2. Milen Minkov, MA in Arts, tel.: 888-845, e-mail: mminchev@ecs.ru.acad.bg
Abstract:
The purpose of the discipline is to form professional qualities for use in original design projects, build knowledge and skills of synthesis, various solutions and acquire appropriate technology to implement projects uniquely bearing aesthetic concepts.
Course content:
Creative imagination, artistic thinking, the synthesis of the overall image of the future. Drawing on diverse forms of movement enshrined in them, directions and movements. Emphasis characteristic radiation. Entry into detail. Specificity of the methods of graphic performance. The technique of painting, reflecting the vehicle's own thinking.
Teaching and assessment: Lectures are presented as an organic combination of factual material, richly displaying and implementing major theoretical and practical performances. Practical exercises develop the lecture performances in order to help students reach the necessary professional level.

2301 Optimal Project in Design II

ECTS credits: 2 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written and practical
Departments involved: Department TM, Faculty of Mechanical and Manufacturing Engineerin
Lecturers:
1. Assoc. Prof. Venko Vitleemov, PhD, tel.: 888-572
2. Assoc. Prof. Petar Koev, PhD, tel.: 888-486

Abstract:
The main aim of this particular course is to acquire knowledge and skills necessary for the active involvement of designers in the process of cross-optimal design of diversified products. Students learn the conceptual options for solving major optimizatsion problems and making compromised design solutions.
Course content:
Key ideas in modern methods of global optimization. A lots of criterias optimization. Design criterias. optimization on incomplete information.
Teaching and assessment:
The lectures present the nature and properties of the methods of optimization. In seminars practical tasks are solved. Each student decides on his or her course assignment.

2293 English II

ECTS credits: 3 **Weekly classes:** 0lec+0sem+0labs+3ps+0
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved: Department FL, Faculty of Law
Lecturers:
Sr. lecturer Sevda Cvetanova, Dept FL, tel.: 888-230
Abstract:
Key objectives of training in this module are: to reinforce skills of students, as emphasis is placed on listening comprehension skills, reading comprehension and speaking without being ignored and writing skills, handling free reading of all kinds.
Course content:
Signs and prophecies of the future houses, hotels and restaurants, money, eccentric people, food and health in the fancy, scientific facts and devices.
Teaching and assessment:
Teaching of English is held in the previous levels in the form of seminars. Four academic units is a written test for performance feedback.

2307 Diploma Project

ECTS credits: 10 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: exam **Type of exam:**
Departments involved: Department ID, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors
Abstract:
The diploma project aims at giving the students the opportunity to apply the obtained knowledge and skills in self-independent and entire development of engineering projects.The students who have excellent achievements are given topics with research character. The Final Year project gives the students practical skills and experience for the future engineering practice or for continuing their study in a Master degree course.
Course content:
Review of the information regarding the diploma project topic. Formulating the aim and the tasks. Analysis of the output and the work conditions. Idea project or methodology of the research. Design of repair technologies. Design of the necessary equipment and devices. Running of tests and processing of the results. Technical and economical analysis of the developed variants. Development of technical documentation and graphical representation of the results from the research.
Teaching and assessment:
The diploma project is developed following a given routine. The students work individually, using paper or electronically based information, the equipment of the department or other departments, and their instructor's help. The diploma project instructor assesses the degree of involvement, the public and moral qualities of the student. The assessor evaluates the diploma project. The student defends the diploma project in front of the State Exam Committee and the open public. The State Exam Committee evaluates both the diploma project and the way it is defended.

POSTGRADUATE STUDIES IN ECOLOGY AND TECHNIQUES FOR ENVIRONMENTAL PROTECTION

PROFESSIONAL STANDARDS
OF A MASTER IN

ECOLOGY AND TECHNIQUES FOR ENVIRONMENTAL PROTECTION

DEGREE COURSE: Ecology and techniques for environmental protection
Degree: Master
Qualifications: Engineer of environmental protection
Duration: 2 years (3 semesters)

The graduates who receive the Master's degree have a profound and thorough training in environmental protection, which is based on the relevant theoretical basis.

The training occurs in three phases in which students acquire specialized knowledge and skills.
The first phase of training is fundamental. It is built on studying and mastering the basics of environmental protection, ecology, environmental analysis and risk assessment. Furthermore students are acquainted with the environmental laws and regulations as a legal prerequisite for the conservation of the environment.

The second phase covers the acquisition of knowledge by studying the subjects who view technology and equipment for environmental protection. It includes courses such as Soil Protection, Conservation of energy, Pollution, Water cleaning techniques, Gas cleaning equipment, Energy saving technologies, Waste treatment, etc.

The third phase involves the management of the environment. It gives the students the opportunity to choose studying environmental management or managing projects.
The subject of scientific research is a kind of transition to further development and studying for a PhD degree.

The graduates who receive the Master's degree on major Engineering Ecology can find placements as engineers in facilities and systems for recovery and waste treatment, as designers, managers in public administrations, local governments, enterprises and companies, as experts and analysists in Evaluation of environmental and industrial risk departments, as experts on risk management in manufacturing labor inspectorates, in businesses, public and private organizations.

CURRICULUM

of the Master's degree course in

ECOLOGY AND TECHNIQUES FOR ENVIRONMENTAL PROTECTION

First year

Code	*First semester*	*ECTS*	*Code*	*Second semester*	*ECTS*
0310	Environmental Economy	8	0335	Agricultural Chemical Technologies	5
0329	Ecological Industrial Design	5	0336	Ecological Risk	10
0332	Antierosion Technologies	5	0339	Bases of Research Investigations	5
0333	Financial Risk	6	0341	Information Technologies	6
0334	Assessment of the Influence Upon the Environment	6	0342	Pollution Prediction	4
	Total:	***30***		***Total:***	***30***

Second year

Code	*Third semester*	*ECTS*
0347	Sustainable Development	6
0348	Bioindications	3
0350	Company Risk Management	6
0354	Diploma Project	15
	Total:	***30***

Total for the training course: 90 ECTS credits

0310 Environmental Economy

ECTS credits: 8 **Weekly classes:** 3lec+0sem+0labs+3ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Nedialko Panchev, PhD
Abstract:
The aim of the course is to give knowledge to the students for economy methods applying in environment.
Main topics are: main definitions acquire; expense-usefulness analysis; evaluation of the exhaustible resource and the renewable resources; sustainable development тheory; ecological politics bases.
Course content:
Introduce to Environmental Economy. Usefulness and Environment. Economy equilibrium and Environment. Ecological behavior of the companies. Market structure and Environment. Economy of the exhaustible resources. Economy of the renewable resources.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

0329 Ecological Industrial Design

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Mihail Karshakov, PhD, tel.: 888-309, e-mail: mkarshakov@ru.acad.bg
2. Senior Assistant Kalin Karadjov, tel.: 888-561, e-mail: kkaradjov@ru.acad.bg
Abstract:
The course is general with economic importance. The main goal h is giving knowledge and skills for legislation applying in ecological design. The incoming links are with all the disciplines giving technological knowledge for environmental design. The outgoing links are with post graduation project, control and practice.
Course content:
Main definitions in investigation modeling, Topographical design and maps, General plan, Main terms when designing industrial plant, Characteristics when modeling industrial equipment from risk point of view. General definitions in industrial design.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

0332 Antierosion Technologies

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** oral
Departments involved: Department AM Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Petar Dimitrov, PhD, tel.: 888-542, e-mail: pdimitrov@ru.acad.bg
Abstract:
The discipline forms in the students skills and knowledge for applying and regulation of the processes of soil erosion, using different methods and technologies. The discipline has incoming links with “Soil knowledge” and “Soil defense” and outgoing with different practice in soil treatment.
Course content:
Main types of soil erosion, factors, theoretical bases and parameters in development of the water, wind and irrigation erosion. Methods for soil defense.
Teaching and assessment:
The lections are presented, visualized with multimedia. The practical exercises are lead on groups in laboratory conditions and in the open.

0333 Financial Risk

ECTS credits: 6 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Vladimir Tomov, DSc, tel.: 888-481, e-mail: vtomov@ru.acad.bg
Abstract:
The course aims to give knowledge for assessment and analysis of the financial risks in environmental and other government activities and projects. The tasks to solve are:
1.Usefulness and risk;
2.Contractor risk;
3.Investments Risk;
4.Commercial risks and risk based on the purchasing power;
Course content:
Theoretical bases; Economical risk; Usefulness; Attitude to the Risk; Contractor risk; Solutions under indefiniteness conditions; Subjective risk; Environmental risk; Environmental indefiniteness risk; Investment risk; Methods for risk measurements; Commercial risk; Purchasing power risk;
Teaching and assessment:
The teaching is held on lectures and practical exercises. A multimedia, including DVD films, posters and etc are used for visualization during the teaching.
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice is connected with lectures. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results, allowing practical conclusions.

0334 Assessment of the Influence Upon the Environment

ECTS credits: 6 **Weekly classes:** 2lec+0sem+0labs+3ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Vladimir Vladimirov, DSc, tel: 888-481; e-mail: vtomov@ru.acad.bg
Abstract:
The course of “Assessment of the influence upon the Environment” aims to give knowledge for different environmental assessments applying.
The main topics are: Main definitions about the environmental control and legislation; Methodic base of the legislation in the EU; The essentials of the Assessment of the influence upon the Environment and preventive control; Main principles goals and methodic for applying the complex license and prevent from pollution
Course content:
EU legislation applying in national legislation in the sphere of the prevention and control. Ecological assessment, Investigation proposals evaluation, Range of the Assessment of the influence upon the Environment, Reading of the paper for Assessment of the influence upon the Environment, Complex proposals and preventions.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

0335 Agricultural Chemical Technologies

ECTS credits: 7 **Weekly classes:** 2lec+0sem+0labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Georgi Mitev, PhD, tel.: 888-610, e-mail: gmitev@ru.acad.bg
Abstract:
The aim is to reveal the conditions on agriculture technologies, as a base for synchrony between environment and the agronomy. The link between Agronomy-Environment-sustainable development in the regions Is very close.
The lectures have to develop the skills of the students to evaluate the problems with agrochemical technologies applying and the consequences from it.
Applying the technologies in agriculture they have to know about the main principles in plant feeding, soil chemicals, water and climate conditions in given region.
In this disciplines some knowledge and skills about the topography and geography from the bachelor course are useful.
Course content:
Agriculture chemistry; Feed of the plant theory; Strikes characteristics, connected with feeding; Soil as a source of feed elements; Feeding with Ph; Chemical defense of the plant-advantages and disadvantages; Methodic for develop of a program for ecological management of the agriculture.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

0336 Ecological Risk

ECTS credits: 1 **Weekly classes:** 3lec+0sem+0labs+3ps+0
Assessment: exam **Type of exam:** oral
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Dragol Dragolov, DSc, tel.: 888-446, e-mail: ddragolov@abv.bg
Abstract:
The programme aims at equipping students with knowledge and skills in the theory of hazardous events, analysis and evaluation of the probable risk. This requires an in-depth knowledge in the subjects studied so far which enables the students to develop and implement various techniques and approaches to limiting risks or even risk prevention. The accent focuses on the health and hygienic problems, Risk assessment and prevention, risk from pollution of the air, water and soil. Food contamination and deceases both for human and animals.
Course content:
Hazardous situations and events and their ecological consequences (incidents, accidents, damage, crises). Risks (probability and improbability, dangers and safety). Risk analysis and investigation (different methods of analysis and investigation). Terrorism. Ecological safety. National security. Subjective risk. Financial risk. Insurance risk. General and detailed analysis. Logical analysis. Deviation analysis. Danger and safety.Risk taxonomy. Dow analysis. Inspection lists and questioneers. Pre-analysis of dangers. Danger predictions. Energy analysis. Danger analysis and work efficiency. Semiotic analysis. Conventional risk assessment. Private risk assessment. Food contamination and deceases both for human and animals. Expert analysis, etc.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

0339 Bases of Research Investigations

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+1ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Vladimir Tomov, DSc, tel.: 888-481, e-mail: vtomov@ru.acad.bg
Abstract:
The aim of the course is to represent the situations, methods and ways, necessary in research work. An information modeling and physical experiments methods are shown. The bases of planning, modeling and design on the different stage from the project are learned. In the course students acquire master degrees. It has links with all the disciplines.
Course content:
The science in today's society. Science organizations. Methodic of the research investigations. Information base of the research investigations. Mathematical modeling pf research investigations. Physical experiment. Error Theory in the experiments. Experimental planning. Data processing. Computer in the research investigations.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. During the semester 2 test controls are carried out.
The valuation from the examination is formed from the written examination.

0341 Information Technologies

ECTS credits: 6 **Weekly classes:** 1lec+0sem+0labs+3ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Margarita Tedosieva, PhD, tel.: 888-490, e-mail: mst@ami.ru.acad.bg
2. Senior Assistant Kalin Karadjov, tel.: 888-561, e-mail: kkaradjov@ru.acad.bg
Abstract:
The course is general with economic importance. The main goal is giving knowledge and skills for legislation applying in Information technologies. Database constructing and system for ruling of database.
The incoming links are with all the disciplines giving technological knowledge for environmental design. The outgoing links are with post graduation project, control and practice.
Course content:
Main definitions in Information technologies; Main definitions in Database; Database organizing; Database independence; File system and database; Database examples; Database models; Logical model; Relation model; Relation model scheme; Physical organization and accesses; Information systems; Principals of creation and functionality of the databases;
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. During the semester 2 test controls are carried out.
The valuation from the examination is formed from the written examination.

0342 Pollution Prediction

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Staycho Kolev, PhD, tel.: 02/4624511, e-mail: stayko.kolev@meteo.bg
2. Senior Assistant Plamen Manev, tel.: 888-485, e-mail: pmanev@ru.acad.bg
Abstract:
The aim of the course is to give multi profile preparation in the field of environmental pollution, its prediction and solutions for efficiency purification (air, water and soil).
Course content:
Methods for pollution investigation. Types of air movements. General equation of the pollution spreading. Spreading around the origins. Mathematical modeling. Spreading around heterogeneous regions and water reservoirs. Trans boundary pollution. Prediction of the pollution in the rivers.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. During the semester 2 test controls are carried out.
The valuation from the examination is formed from the written examination.

0347 Sustainable Development

ECTS credits: 6 **Weekly classes:** 3lec+0sem+0labs+3ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Vladimir Tomov, DSc, tel.: 888-481, e-mail: vtomov@ru.acad.bg
Abstract:
The course aims to acquire the main principles of the sustainable development philosophy. The tasks to solve are connected with:
1.Sustainable development fundamentals;
2.Sustainable development categories;
3.Sustainable development motivation;
4.Ethical standards in environmental solutions;
5.Discount rate for ecological and other project definig;
Course content:
Sustainable development theoretical basis; Sustainable development factors; Sustainable development three-component system; Parameters; Sustainability and Ethics; Society discount rate; Strategy; International collaboration.
Teaching and assessment:
The teaching is held on lectures and practical exercises. A multimedia, including DVD films, posters and etc are used for visualization during the teaching.
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice is connected with lectures. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results, allowing practical conclusions.

0348 Bioindications

ECTS credits: 3 **Weekly classes:** 2lec+0sem+0labs+1ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Stojan Vlahov PhD tel: . 082/888 418
Abstract:
The general aim of the course in Bioindications is to introduce students with the typical organisms used for indications. Main parameters for fast register of the changes in environmental components concentration are shown in the course. Modern scientific information on the influence of the environmental factors upon the growth of the microorganisms is introduced.
The discipline has incoming links with the courses in Ecology, Microbiology, and outgoing links with Biochemistry, Pollution prediction and etc.
Course content:
Ecological bases of the indications. Relationships of the indications on the different stages on the ecosystems. Air pollution bioindicators. Water pollution bioindicators. Soil pollution bioindicators. Bioindicators in industrial, agriculture, geology. Bioindicators showing the presence of ores and minerals.
Teaching and assessment:
The teaching on the course is made with lectures and practical exercises. In the end of each exercise a report's defense is made (then is given up to 2 points for a paper). The presence of the lectures and exercises is evaluated with points also. To acquire a certification the student has to reach minimum 40 points. The overall valuation on the discipline is forming after test control in the end of semester, including 2 theoretical topics. The correctional exam is written also.

0350 Company Risk Management

ECTS credits: 6 **Weekly classes:** 3lec+0sem+0labs+3ps+0
Assessment: exam **Type of exam:** oral
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Vladimir Tomov, PhD, tel.: 888-481, e-mail: vtomov@ru.acad.bg
Abstract:
The course is appropriate for anyone in interest from the scientific analysis of the business risk of the contactor. The business risk will be ever in the light of each economy activity. That is because the sphere we are active characterizes with uncertainly and unidentifiedness, which are the bases of the risk in society and nature. That's why the contractors are acquiring risk provocations. The discipline consists of two parts: the first one is on the base of theoretical fundamentals, including the essentials of the business risk; the second one is the assessment of business risk. Some methods are presented for risk modeling. The theory is approved with some practical postulations. The material is presented intelligibly, some questions have been missed, but some rules for their learning are shown in the course.
Course content:
Introduction to "COMPANY RISK MANAGEMENT"; Safety and Dangers; Unidentifiedness; Risk taxonomy; Management-Theory and Practice; Management, functions and structure; Management technology; General methods in management and development of rules; Strategy management; The human factor in management; Management of the investments in environmental protection; Risk metric;
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

0354 Diploma Project

ECTS credits: 15 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors.
Abstract:
The diploma project aims at giving the students the opportunity to apply the obtained knowledge and skills in self-independent and entire development of engineering projects. The students who have excellent achievements are given topics with research character. The Final Year project gives the students practical skills and experience for the future engineering practice or for continuing their study in a Master degree course.
Course content:
Review of the information regarding the diploma project topic. Formulating the aim and the tasks. Analysis of the output and the work conditions. Idea project or methodology of the research. Design of the necessary equipment and devices. Running of tests and processing of the results. Technical and economical analysis of the developed variants. Development of technical documentation and graphical representation of the results from the research.
Teaching and assessment:
The diploma project is developed following a given routine. The students work individually, using paper or electronically based information, the equipment of the department or other departments, and their instructor's help. The diploma project instructor assesses the degree of involvement, the public and moral qualities of the student. The assessor evaluates the diploma project. The student defends the diploma project in front of the State Exam Committee and the open public. The State Exam Committee evaluates both the diploma project and the way it is defended.

POSTGRADUATE STUDIES IN ENGINEERING ECOLOGY

PROFESSIONAL STANDARDS
OF A MASTER IN

ENGINEERING ECOLOGY

DEGREE COURSE: Engineering ecology
Degree: Master
Qualifications: Engineer of environmental protection
Duration: 2 years (3 semesters)

The graduates who receive the Master's degree have a profound and thorough training in environmental protection, which is based on the relevant theoretical basis.

The training occurs in three phases in which students acquire specialized knowledge and skills.
The first phase of training is fundamental. It is built on studying and mastering the basics of environmental protection, ecology, environmental analysis and risk assessment. Furthermore students are acquainted with the environmental laws and regulations as a legal prerequisite for the conservation of the environment.

The second phase covers the acquisition of knowledge by studying the subjects who view technology and equipment for environmental protection. It includes courses such as Soil Protection, Conservation of energy, Pollution, Water cleaning techniques, Gas cleaning equipment, Energy saving technologies, Waste treatment, etc.

The third phase involves the management of the environment. It gives the students the opportunity to choose studying environmental management or managing projects.
The subject of scientific research is a kind of transition to further development and studying for a PhD degree.

The graduates who receive the Master's degree on major Engineering Ecology can find placements as engineers in facilities and systems for recovery and waste treatment, as designers, managers in public administrations, local governments, enterprises and companies, as experts and analysists in Evaluation of environmental and industrial risk departments, as experts on risk management in manufacturing labor inspectorates, in businesses, public and private organizations.

CURRICULUM

of the Master's degree course in

ENGINEERING ECOLOGY

First year

Code	*First semester*	*ECTS*	*Code*	*Second semester*	*ECTS*
1552	Ecology	5	1753	Equipment for Water Purification	5
1560	Environmental Protection	6	1794	Equipment for Gas Purification	5
1563	Risk Assessment and Analysis	4	1810	Energy Saving Technoliges	5
1568	Conservation of Energy Pollution	5	1816	Waste Treatment	5
1580	Soil Protection	5	1850	Environmental Biotehnique	5
1598	Ecological Legislation and Standards	5	1855	Ecological Safety in Transport	5
	Total:	***30***		***Total:***	***30***

Second year

Code	*Third semester*	*ECTS*
1856	Bases of research investigations	5
1857	Environmental management	5
1858	Ecological Projects Management	5
1859	Diploma project	20
	Total for the semester:	***30***

Total for the training course: 90 ECTS credits

1552 Ecology

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Faculty of Natural Science and Education
Lecturers:
Assoc. Prof. Nesho Chipev, PhD, tel.: 02/873-61-37
Abstract:
This is a fundamental discipline. It aims to equip students with knowledge and expertise in analysing and classifying the specific characteristics of organisms (populations, communities, the biosphere) which are studied and examined in close relationship with environments. The aimed themes throughout the course are: methods of analysis – examination and investigation of established parameters (abiotic ecological factors) of ecotypes (biotypes); structure and composition of populations, communities and the biosphere; productivity and other characteristics of ecosystems; theoretical knowledge of different environments and interrelations between them and organisms; composition and structure of populations; structure and functioning of biocenosis (plant associations) ecosystems and the biosphere.
The studied discipline is very closely related to Biology and Pedology, Soil contamination and Impact on the ecosystems etc.
Course content:
The programme includes 16 global topics like: modern ecology as an interrelated science; the lithosphere and organisms; sun radiation and organisms; ecology of populations; ecology of communities; ecosystems; global ecology etc.
Teaching and assessment:
The studies are performed in the combination of lectures, seminars and practice sessions. The practice sessions are carried out both in laboratories and in the open. They aim to provide students with practical experience and ability of analysing particular organisms. The course assignment is on investigating and presenting the current state of natural ecosystems on the territory of Bulgaria.
The final assessment is based on reports, course assignment defence and exam.

1560 Environmental Protection

ECTS credits: 6 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Vladimir Tomov Vladimirov, DSc, tel.: 888-481
Abstract:
The main aim of the discipline is to develop a methodoligal transition from natural science disciplines to those related to the sources, kinds and characteristics of pollution and its impact on ecosystems with emphasis on various environmental measurement techniques relevant to environmental problems during the further levels of education. The learning approach promotes deeper understanding of the global strategies for environmental protection.
Course content:
Aims and objectives of the discipline. Basic principles of environmental protection. Environmental database. Evaluation of the impact on the environment and its relevant reaction. Methods of making preventive decisions. Technological methods and means for dealing with the increasingly complex enironmental issues. How to reduce pollution of industrial origin. No-waste and low-waste technologies. Methods of making corrective-reducing decisions for environmental protection. Methods of making compensating decisions. Preservation of biological diversity. Ecological understanding, ethics and education accompanying environmental protection activities. The importance and placement of environmental protection in the national economy management.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice and multimedia, posters and etc are used during the teaching reflecting some critical situations with natural and human origin. For subject visualization lots of information is used.
During the practical exercises an incoming control is carried out. During the semester 2 test controls are carried out, including the theory and practice and problems from the exercises.
The overall valuation on the discipline is formed after written exam.

1563 Risk Assessment and Analysis

ECTS credits: 2 **Weekly classes:** 3lec+0sem+0labs+1ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Prof. Vladimir Tomov, DSc, tel.: 888-481, e-mail: vtomov@ru.acad.bg
2. Assistant Liubomir Vladimiriv, tel.: 888-418, e-mail: lvladimirov@ru.acad.bg

Abstract:
The program aims at equipping students with knowledge and skills in the theory of hazardous events, analysis and evaluation of the probable risk. This requires an in-depth knowledge in the subjects studied so far which enables the students to develop and implement various techniques and approaches to limiting risks or even risk prevention.

Course content:
Hazardous situations and events and their ecological consequences(incidents, accidents, damage, crises). Risks (probability and improbability, dangers and safety). Risk analysis and investigation (different methods of analysis and investigation). Terrorism. Ecological safety. National security. Subjective risk. Financial risk. Insurance risk. General and detailed analysis. Logical analysis. Deviation analysis. Danger and safety. Risk taxonomy. Dow analysis. Inspection lists and questioners. Pre-analysis of dangers. Danger predictions. Energy analysis. Danger analysis and work efficiency. Semiotic analysis. Conventional risk assessment. Private risk assessment. Expert analysis, etc.

Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming controlis carried out. During the semester 2 test controls are carried out.
The overall valuation on the discipline is formed after written exam.

1568 Conservation of Energy Pollution

ECTS credits: 5 **Weekly classes:** 3lec+0sem+0labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Faculty of Mechanical and Manufacturing Engineering
Lecturers:
Assoc. Prof. Tamara Pencheva, PhD, tel.: 888-218 e-mail: tgp@ru.acad.bg
Assist. Lyobomir Vladimirov Vladimirov, Dept. EEP, tel.: 888-546, e-mail: lvladimirov@ru.acad.bg.

Abstract:
The main objective of the course is to provide students with learning methods and means of protection from electromagnetic, infrared, ultraviolet, laser and ionizing radiation.

Course content:
Electromagnetic fields with industrial, radio and svrahvisoka rate. Infrared radiation. Ultraviolet radiation. Ionizing radiation. Laser radiation. Heat pollution.

Teaching and assessment:
For visualization lectures are illustrated with lots of information. Labs finish by practical results that allow lessons to be learned effectively. In the process of learning multimedia projector, posters and other teaching tools are used. During the term two tests are conducted.

1580 Soil Protection

ECTS credits: 5 **Weekly classes:** 3lec+0sem+0labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Georgi Mitev, PhD, tel.: 888-610, e-mail: gmitev@ru.acad.bg
Abstract:
Today's industrial society lives in a dynamic cycle. Often the people pay with the resources that are going down in quality for the next generations. The soil is an important part of this process.
This is a course for the students of ecology and it aims at providing them with knowledge and practical skills in understanding soil protection technologies. To achieve this aim we set the tasks listed below: basic terms, definitions and normative documentation on soil protection; the importance of planning, predicting and assessment of soil; meliorative, chemical, agro-technical and anti-erosion methods and technologies.
Course content:
Aims and objectives of soil protection. Main terms and legislation; main characteristics of the soil; Physical and chemical characteristics; Biological characteristics; The soil as a main component for organisms development-structure, influence upon the development, waste storage, water filtration; methods for soil protection; main methods for sustainable soil development; Meliorative methods of protection – removing the surface layer, deep plough soil treatment. Chemical methods – diluting and localisation of contaminants, neutralising substances. Agro-technical methods - adding organic substances, mineral fertilizers,etc.; Erosion soil protection methods - agro-technical, forest-meliorative, meliorative etc. Protection of the natural soil regions. Software and programs for efficiency manage with soil protection.
Teaching and assessment:
For subject visualization lots of information is used. The practice finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. During the semester a test work is carried out. The overall valuation on the discipline is formed after written exam.

1598 Ecological Legislation and Standards

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Stefka Naumova, tel.: 888-434
Abstract:
The aim of this course is to provide students of the Department of Ecoligy and Environmental Protection with acceptable and easy to understand knowledge in relation to their future professional career as far as national environmental legislation is concerned. They should be acquainted with international acts with regard to the problem. The attention is focused on the intrinsic law regulations of the environmental protection - the basic law of environmental protection, specific public relations, particular nature-preservation regulations, including sub-legislation normative acts concerning various ecological problems.
Course content:
National legislation. International acts in the sphere of environmental protection. The studied matter is particularly related to Bulgarian legislation. Mutual, regional and global collaboration on environmental protection – international conferences Bulgaria has participated in and international agreements signed.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice is connected with lectures. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. During the semester a test work is carried out. The overall valuation on the discipline is formed after written exam.

1794 Equipment for Water Purification

ECTS credits: 5 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Nastya Vasileva Ivanova, PhD, tel.: 084/ 21553
2. Senior Assistant Plamen Manev, tel.: 888-485, e-mail: pmanev@ru.acad.bg

Abstract:
The aim of the course "Equipment water purification" is to give the students knowledge about the main methods for purification and their application in the technological schemes for industrial or natural water purification. Physical -chemical, and bacterial parameters of the water necessary for water evaluation.
Steeply acquiring of the mechanical, biological and physical and chemical methods for contamination and sediment treatment.

Course content:
Water as an element of the environment. Different kinds of rock waters, coefficient and filtration. Infiltrated, sedimentary and metamorphosed waters. Water in aeration and saturation zones. Interlayer karst waters. Water springs and underground water currents. Structure of water; physical and organoleptic features, solubility of solid substances. Active reaction. Chemical composition. Microcomponents and radioactive components. Natural-gas quantities in water. Organic substances in natural waters. Biological composition of water. Mechanical, chemical and radioactive water contamination. Migration of pollutants –distribution processes, self-purifying features. Impact of pollutants on ecosystems. Categorisation of water currents.

Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice is connected with lectures. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. During the semester a test work is carried out. The overall valuation on the discipline is formed after written exam.

1794 Equipment for Gas Purification

ECTS credits: 5 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Nastya Vasileva Ivanova, PhD, tel.: 084/ 21553
2. Senior Assistant Plamen Manev, tel.: 888-485, e-mail: pmanev@ru.acad.bg

Abstract:
The course aims to give knowledge to the students on atmosphere ecology, clearness of the air and reservation of its quality, meteorological aspects of wind and dynamics of the pollutants from natural and industrial origins. It is obligatory for the students to reach "Master" degree.

Course content:
Constant and variable ingredients of the air; Air pollution; Local and regional pollution; Global pollution of the atmosphere; Air pollution of the cities-influence of the climate characteristics; Pollution sources; Sources taxonomy; Main pollutants; Pollution from different activities-transport, agriculture, municipal and etc. Pollution investigation's methods; Experimental and statistic methods; Theoretical methods; Theory of the atmosphere diffusion; Dangerous meteorological conditions; Observation stations; Atmosphere monitoring; Inventory and control of the air pollutants; Balance equation; Mathematical modeling; Transforming of the pollutants; Absorption; Influence of the orography upon the moving and transport of the pollutants; Photochemical fog; Out border diffusion of the pollutants; Air pollution from the industry in Bulgaria; Air pollution from the transport in Bulgaria; Air pollution from the agriculture in Bulgaria;

Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice is connected with lectures. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. During the semester a test work is carried out. The overall valuation on the discipline is formed after written exam.

1810 Energy Saving Technoliges

ECTS credits: 6 **Weekly classes:** 2lec+0sem+0labs+1ps+1ca
Assessment: exam **Type of exam:** written
Departments involved: Department HTHPM, Agrarian and Industrial Faculty
Lecturers:
Assoc. Prof. Iliya Krastev Iliev, PhD, tel.: 888-303
Abstract:
The course “Energy saving technologies” aims at supplying students, within their main multirateral training, basic knowledge about energy problems and existing power sources in the world, as well as the impact of the earth’s energy balance on its climate.
Course content:
Heat exchangers. Energy fuels. Heat pumps. Fluidized bed boilers technology. The earth’s energy problem and energy balance, factors accounting for the earth’s energy problem. Solar energy- kinds of solar radiation, duration of sunshining and an estimate of the solar energy resources for Bulgaria. Radiation characteristics of materials. Thermal transformation of solar energy, concentrating solar systems. Solar installations for hot water. Solar energy heating of premises. Other methods for utilizing the solar energy. Wind power. Geothermal energy. Utilizing geothermal energy. Tide power. Modern cogeneration sysstems
Teaching and assessment:
Teaching process is organized in 2 forms- lectures and practice.
Lecture theses give students the opportunity to get theoretically familiar with the main issues studied, preceding practice. The course finishes with a written exam requiring elaboration of 2 questions followed by an oral test.

1816 Waste Treatment

ECTS credits: 5 **Weekly classes:** 3lec+0sem+0labs+2ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Nedialko Panchev, DSc, tel.:888 446
Abstract:
The course aims at mastering technology for the removal and recovery of solid waste from urban areas and hazardous wastes from various industries.
Course content:
Classification, composition and properties of solid household waste. Collection and temporary storage of solid household waste. Disposal of solid household waste. Composting waste. Hazardous waste. Transportation of hazardous waste. Sites, installations and equipment for temporary storage of waste Waste Management.
Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice is connected with lectures. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. During the semester a test work is carried out. The overall valuation on the discipline is formed after written exam.

1850 Environmental Biotehnique

ECTS credits: 5 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: continuous assessment **Type of exam:** written
Departments involved: Department AM, Agrarian and Industrial Faculty
Lecturers:
1. Assoc. Prof. Nastya Vasileva Ivanova, PhD, tel.: 084/ 21553
2. Senior Assistant Plamen Manev, tel.: 888-485, e-mail: pmanev@ru.acad.bg

Abstract:
The course taught the cultivation of biomass (substrates, structures of bioreactor systems for mixing and aeration, etc.)

Course content:
Substrates for cultivation of biomass. Systems for mixing and aeration. Exchange systems, penogasene and sterilization of the bioreactor. Biotechnological processes and equipment. Isolation and purification products. Concentration of products. Dehydration of products. Biotechnology and crop. Biotechnology and animal husbandry. Biotechnology and medicine. Biotechnology and food industry. Biogeotehnology. Biotechnology and ecology

Teaching and assessment:
The students are introduced with the theoretical base of the material, attended with appropriate tasks from the practice, suitable with their specialty. For subject visualization lots of information is used. The practice is connected with lectures. They are carried out on cycles with duration, responded to the volume of the made analysis. It finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
During the practical exercises an incoming control is carried out. During the semester a test work is carried out. The overall valuation on the discipline is formed after written exam.

1855 Ecological Safety in Transport

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Vladimir Vladimirov, DSc, tel.: 888-481, e-mail: vtomov@ru.acad.bg

Abstract:
The aim of the course is to give knowledge of the relationships between transport units, energy sources and environment, and the harmful consequences from it. Problems with beginning, measurement and legislation of the pollutants are introduced. Using modern devices in the laboratory some appliance of the methods are used.

Course content:
Consistency of the emitted gases from the transport. Global effects form the pollution in transport. Harmful emissions origin. Computation on the pollutants. Legislations. Control of the emissions. Conversion of the negative emissions in the motors and changing them with alternative fuels.

Teaching and assessment:
For subject visualization lots of information is used. The practice is connected with lectures. It finishes with results, allowing practical conclusions. A multimedia, posters and etc are used during the teaching.
As an out course works each student have to make a graduate work and to defend it until the end of the semester.
The overall valuation on the discipline is formed after written exam.

1856 Bases of Research Investigations

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Vladimir Tomov, DSc, tel.: 888-481, e-mail: vtomov@ru.acad.bg
Abstract:
The aim of the course is to represent the situations, methods and ways, necessary in research work. An information modeling and physical experiments methods are shown. The bases of planning, modeling and design on the different stage from the project are learned. In the course students acquire master degrees. It has links with all the disciplines.
Course content:
The science in today's society. Science organizations. Methodic of the research investigations. Information base of the research investigations. Mathematical modeling pf research investigations. Physical experiment. Error Theory in the experiments. Experimental planning. Data processing. Computer in the research investigations.
Teaching and assessment:
Lectures are illustrated with visual aids. In workshops students acquire knowledge how to choose the most suitable technologies for solid waste treatment. Students get individual tasks for their course assignment. The final grade comprises the marks from the tests during the semester, the mark from the course assignment and the mark from the examination itself.
During the practical exercises an incoming control is carried out. The students received their issue and work themselves under the observation of the teacher. In the end of the exercise each student develop his report. The valuation from the examination is formed from the written examination.

1857 Environmental Management

ECTS credits: 5 **Weekly classes:** 3lec+0sem+0labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Vladimir Vladimirov, DSc, tel.: 888-481, e-mail: vtomov@ru.acad.bg
Abstract:
The discipline is obligatory to study from the students in the discipline of Engineering Ecology. It takes into account the conditions in the market economy, actions and its complex relationships.
The aim of the course is to acquire the main principles of the Environmental management from the students.
Course content:
Introduce to the discipline. Management – theory, practice and structure. Management technology, General principles in environmental protection management and development of solution for management. Strategy solution. Human factor in management.
Teaching and assessment:
Lectures are illustrated with visual aids. In workshops students acquire knowledge how to choose the most suitable technologies for solid waste treatment. Students get individual tasks for their course assignment. The final grade comprises the marks from the tests during the semester, the mark from the course assignment and the mark from the examination itself.
During the practical exercises an incoming control is carried out. The students received their issue and work themselves under the observation of the teacher. In the end of the exercise each student develop his report. The valuation from the examination is formed from the written examination.

1858 Ecological Projects Management

ECTS credits: 5 **Weekly classes:** 3lec+0sem+0labs+1ps+0
Assessment: exam **Type of exam:** written
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Prof. Vladimir Tomov, DSc, tel.: 888-481, e-mail: vtomov@ru.acad.bg
Abstract:
This programme aims to provide students with the methods and means of efficient environmental projects management. In order to achieve the targets set students have to examine the importance and subject matter of eco-projects. The emphasis is laid both on the functions, structure and various ways of executing the separate parts of the projects and on the technologies of their development.
The discipline is taught during the eighth semester and has a lot in common with all the courses covered so far which provides students with specific technological knowledge. Economics and Environmental Protection are prerequisites for this course and in turn it is a prerequisite for environmental protection experience.
Course content:
Aims and objectives of eco-projects management. Eco-projects classification. Pre-projects research. Analytical part. Resource part. Organisation-managing part. Technology of development and realisation. Precursory phase – reasons and preparation. Condition analysis. Setting the main aim. Formulating minor aims and strategies. Resources provision and choice of an adequite strategy. Management, control and realisation.
Teaching and assessment:
Students learn the basic theoretical principles of eco-projects management during lectures. The practice sessions develop the students' skills of higher level thinking and understanding how to use methods and ways of developing projects. The course assignment is individual and each student has to deal with a specific problem on a pre-given task and make a presentation on it at the end of the course.
During the practical exercises an incoming control is carried out. The students received their issue and work themselves under the observation of the teacher. During the semester 2 test controls are carried out, including the theory and practice and problems from the exercises.

1859 Diploma Project

ECTS credits: 15 **Weekly classes:** 0lec+0sem+0labs+0ps+0
Assessment: exam **Type of exam:** written and oral
Departments involved: Department EEP, Agrarian and Industrial Faculty
Lecturers:
Diploma project instructors.
Abstract:
The diploma project aims at giving to the students the opportunity to apply the obtained knowledge and skills in self-independent and entire development of engineering projects. The students who have excellent achievements are given topics with research character. The Final Year project gives the students practical skills and experience for the future engineering practice or for continuing their study in a Master degree course.
Course content:
Review of the information regarding the diploma project topic. Formulating the aim and the tasks. Analysis of the output and the work conditions. Idea project or methodology of the research. Design of the necessary equipment and devices. Running of tests and processing of the results. Technical and economical analysis of the developed variants. Development of technical documentation and graphical representation of the results from the research.
Teaching and assessment:
The diploma project is developed following a given routine. The students work individually, using paper or electronically based information, the equipment of the department or other departments, and their instructor's help. The diploma project instructor assesses the degree of involvement, the public and moral qualities of the student. The assessor evaluates the diploma project. The student defends the diploma project in front of the State Exam Committee and the open public. The State Exam Committee evaluates both the diploma project and the way it is defended.

Erasmus

ECTS

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