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| Znak univerziteta | UNIVERSITY OF NOVI SADFACULTY OF AGRICULTURE 21000 NOVI SAD, TRG DOSITEJA OBRADOVIĆA 8 | Znak fakulteta2 |
| Study Programme AccreditationUNDERGRADUATE ACADEMIC STUDIES *AGROINDUSTRIAL ENGINEERING*  |

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| **Table 5.2c Course specification - Mandatory** |

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| Course: | **Mathematics**  |
| Course id: 3ОАИ1О01; |
| Number of ECTS: 7 |
| Teacher: | Snežana J. Matić-Kekić, Nebojša M. Dedović |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 3 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Mastering the skills and knowledge of subject content, which provides the basis for mathematical modeling of agro-economic phenomena and their exploitation in practice. |
| 1. Educational outcomes

Student qualifies for mathematical modeling of agro-economic phenomena and actively pursuing them. |
| 1. Course content

Real functions. Linear, quadratic, exponential, logarithmic, trigonometric functions and degrees. Sequences and limit values. The limit values and the asymptote function. The first copy and performs higher-order functions of one independent variable. Domen, zero growth, decline, extreme values, inflection points, concavity, convexity of real functions of one real variable. The conditional extremes of functions of two independent variables. Economic function: interval of profitability, profits, demand, supply, revenues, costs, flexibility in the point and its interpretation. Integral calculus: defined and indefinite integrals, primitive functions, integral characteristics, the shift method, the method of partial integration and the integration of rational functions. Application of definite integrals. Uncharacteristically integrals. Polynomials. ODE first order: linear, homogeneous, Bernoulli, total differential and separated variables. Homogeneous and non-homogeneous linear ODE second order with constant coefficients . |
| 1. Teaching methods: Lectures
 |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | No | 5 | *Oral part of the exam* | Yes | 40 |
| Test | Yes | 40 |  |
| Exercise attendance | No | 5 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Konjik S., Dedović N. | Mathematics - a collection of tasks for the students of Faculty of Agriculture (in Serbian) | Faculty of Agriculture, University of Novi Sad | 2011. |
|  | Hadzić O., Takači Đ. | Mathematics for students of natural sciences (in Serbian) | University of Novi Sad, university textbooks - Edition 76 | 1998. |
|  | Matić-Kekić S. | Economic mathematics for students of biological directions (in Serbian) | Faculty of Agriculture, University of Novi Sad | 2006. |

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| Course: | **Mechanics 1** |
| Course id: |
| Number of ECTS: 6 |
| Teacher: | Dragi M. Radomirović |
| Course status: | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 3 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Introducing students to the basic concepts and principles of statics. |
| 1. Educational outcomes

Student’s ability in solving statics problems. |
| 1. Course content
* Fundamentals of static
* Coplanar and non-coplanar concurrent force system (equilibrium and resultant)
* System of couples (equilibrium and resultant couple)
* Coplanar non concurrent force system (equilibrium and resultant)
* System of bodies (free body diagrams and equilibrium conditions)
* Structures (plane trusses, methods for solving)
* Beams. Internal forces (shear and axial forces, bending moment)
* Three-dimensional force systems (moments and couples in three dimensions, equilibrium and simpler equivalent systems)
* Dry friction (Coulomb’s law)
* Rolling friction
* Center of gravity
 |
| 1. Teaching methods

Lectures, Practical classes, Consultations.  |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Written part of the exam-tasks and theory* | Yes | 30 |
| Test | Yes | 50 |  |
| Exercise attendance | Yes | 5 |
| *Term paper* | Yes/No | 10 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
| 1. | Radomirović Dragi | Mechanics-part 1 (in Serbian) | Faculty of Agriculture, Novi Sad | 2001 |
| 2. | Kovačić IvanaZvonko Rakarić | Collection of Problems in Statics I (in Serbian) | Faculty of Technical Sciences, Novi Sad | 2006 |
| 3. | Kovačić IvanaZvonko Rakarić | Collection of Problems in Statics II (in Serbian) | Faculty of Technical Sciences, Novi Sad | 2006 |

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| Course: | **Engineering Communication** |
| Course id: 3ОАИ1О03 |
| Number of ECTS: 6 |
| Teacher: | Mirko Simikić PhD, Assistant professor |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: | Practical classes: | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| **Educational goal**The objective of the course is for students to learn how to draw and use technical documentation, and that they develop the ability of graphical representation of ideas and concepts, as well as technical accuracy, propriety and consistency in the application of technical regulations and standards in this area. |
| **Educational outcomes**Upon passing the course the students will be able to: Draw and use technical structural documentation; Draw and use blueprints; Visualize objects in space based on technical drawings and to use this knowledge when studying other professionally applicable subjects and to learn the basics of drawing 2D and 3D drawings using AutoCAD software.  |
| **Course content***Theoretical lessons*. Oblique and orthogonal projection of the point and line. Axonometric (3D) and orthogonal (2D) drawings. Sections in technical drawings. Dimensioning. Drawing mechanical elements. Marking the quality of surface roughness. Tolerances for measurement form and position. Workshop drawings. Schematic drawings. Graphic symbols for machine parts, for installations, for working operations and safety measures when working with machines. Use of computers for technical drawings. Applying CAD software to produce 2D and 3D drawings.*Practical teaching: Exercises, Other methods of teaching, Research work* Tasks related to the fields of study analyzed in lectures. Drawing using a computer. Independent production of graphic works and other assignments. Review and editing of graphic works.  |
| **Teaching methods**The method of oral presentations and discussions. The method of drawing, presentations, demonstrations, simulations and illustrations on the board and by using video presentations. Drawing methods with use of computers. Individual consultations during the preparation of presentations and graphic works. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes | 6 | *Written part of the exam-tasks and theory* | Yes | 32 |
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| Exercise attendance | Yes | 30 |
| Test | Yes | 32 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Gligorić R, Milojević Z, | Technical drawings – Engineering communication | University of Novi Sad | 2004 |
|  | Gligorić R,  | Descriptive geometry – application | Faculty of agriculture Novi Sad | 2006 |
|  | Dovniković L. | Technical drawings | University of Novi Sad | 1994 |
|  | Instructions for AutoCad software |

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| Course: | **Chemistry** |
| Course id:3ОУВ1О04 |
| Number of ECTS: 6 |
| Teacher: | Prof. dr Boris Popović,  |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Providing the basis for the formation of a certain view of the world, getting to know the most important principles, theories and laws of chemistry, providing theoretical basis for acquiring other skills, mastering specific skills related to the application of theoretical knowledge, the development of creative skills and practical skills necessary for the exercise of the profession. |
| 1. Educational outcomes

After completing the course of chemistry, students will train the application of theoretical and practical knowledge of chemistry both in life and in the acquisition of other knowledge (e.g., biochemistry, agro-chemistry, microbiology, physiology, etc.). In terms of practical knowledge and skills students will be able to compute in chemistry, handling basic laboratory equipment, perform basic volumetric determinations and basic instrumental measurements. In addition to this, students should be able to continue their studies or to apply their knowledge and understanding of the profession and to convey it to others. |
| 1. Course content

Theoretical classes:Introduction. Basic concepts and laws of chemistry. Chemical formulas and equations. The structure of the atom. The distribution of electrons in the atom. The structure of atoms and the periodic table of elements. The structure of the molecule. Electron theory of chemical bonding. Intermolecular interactions and states. Fundamentals of chemical thermodynamics. Fundamentals of chemical kinetics. Chemical equilibrium. Chemistry of water. The solutions. Electrolytic dissociation and equilibrium in electrolyte solutions. Acids and bases. Hydrolysis and buffers. Solubility and solubility product. Oxidation-reduction processes. Fundamentals of electrochemistry. Corrosion. Colligative properties. Colloid. The chemical characteristics of natural and waste waters. Water purification. Structure and classification of organic compounds. Hydrocarbons. The chemical composition of the oil. Organic compounds with oxygen and nitrogen. Chemistry fuels and lubricants.Practical teaching: The stoichiometry. Quantifying the composition of the solution. Quantitative analysis. Acid-base titration. Permanganometrija. Electrolytic dissociation and pH. Potentiometric titration. Determination of total hardness of water. Spectrophotometry. Hydrocarbons and for all their reaction. The organic compounds with oxygen (alcohols, carbonyl compounds and acid). The acid number of the fuel. |
| 1. Teaching methods

Theoretical classes and practical exercises. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 3 | *Theoretical part of the exam/Oral part of the exam/Written part of the exam-tasks and theory* | Yes | 55 |
| Test | Yes | 20 |  |
| Exercise attendance | Yes | 2 |
| colloquium | Yes | 20 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Gorzynski Smith, J. | General, Organic &Biological Chemistry | Published by McGraw-Hill, New York. | 2010. |
|  | Štajner, D., Kevrešan, S. | Chemistry | Faculty of Agriculture, Novi Sad | 2006. |

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| Course: | **Physics** |
| Course id: 3ОАИ1О05 |
| Number of ECTS: 6 |
| Teacher: | Ilija Arsenić, Branislava Lalić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Students introduction with basis of Mechanics, Thermodynamics, Electrostatics and Electromagnetism. |
| 1. Educational outcomes

Acquired knowledge, in this course, should enable the students easier mastering the professional courses at higher years of study and to solve practical problems relating to the functioning principles of different devices and measuring equipment which will meet during the study, but also in practical work after study. |
| 1. Course content

Lectures:Role of physics in contemporary technical disciplines. Basics of measurement in physics, physical units and etalons. International system of units. (1) Mechanics, Kinematics and Dinamics, Work and Energy. Conservation of mass and energy. Mechanics of solid body, Statics. Elastic deformation. Harmonic oscillation. Wave motion. Vibration problems in engineering. Acoustics. Acoustic waves in soild, liquid and gaseous medium. Sound intensity. Noise. Noise measurement. Dynamics and statics of fluids.(6) Thermodynamics. Preasure. Viscosity of fluids. Heat and temperature. Kinetic theory of heat. Kinetic theory of gasses. Energy distribution and degrees of of freedom. Units and instruments for measuring temperature, preassure and flow rate of liquids and gasses. Thermal (IR) radiaton. Law of radiation. Nature of light. Units and instruments for measuring EM radiation.(7) Electric charge of matter. Elementary charge. Electric field. Electric interaction. Coulomb law (2). Electrical work and voltage. Voltage within homogenous electric field. Atmospheric electricity phenomena. (3) Electric current (alternating and direct). Electric current sources. Units and instruments for measuring electric current and voltage (3). Electrical resistivity and conductivity. Electrical conductors and insulators. Ohm’s law. Types of resistor connection (4). Electric current in electrolytes and gasses.(1) Magnetic field. Magnetic field of permanent magnet. Earth’s magnetic field.(1) Magnetic field of electric current. Electric conductor within magnetic field. (2)Practical classes:Calculus and practical exercises which goal is student introduction in principles of measuring and measuring devices. |
| 1. Teaching methods

Lectures, Practical classes and Consultations. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 0 | *Theoretical part of the exam/Oral part of the exam/Written part of the exam-tasks and theory* | Yes | 50 |
| Test | Yes | 20 |  |
| Exercise attendance | Yes | 0 |
| Test | Yes | 30 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Janjić, J., Bikit, I., Cindro, N. | General Physics Course I (in Serbian) | Scienece Book, Belgarde | 1984 |
|  | Janjić, J., Bikit, I., Cindro, N. | General Physics Course II (in Serbian) | Scienece Book, Belgarde | 1985 |

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| Course: | **Mathematics 2** |
| Course id: 3ОАИ2О06; |
| Number of ECTS: 6 |
| Teacher: | Snežana J. Matić-Kekić, Nebojša M. Dedović |
| Course status | Mandatory  |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Mastering the skills and knowledge of subject content, which provides the basis for mathematical modeling of agro-economic phenomena and their exploitation in practice. |
| 1. Educational outcomes

Student qualifies for mathematical modeling of agro-economic phenomena and actively pursuing them. |
| 1. Course content

Financial mathematics: percentage and promil calculus, compounded interest rate, fixed-term and continuous savings, loans payment. Matrix calculus: operations on matrices, determinant of matrices, elementary transformation, regular matrices. Gaussian elimination method, Cramér's theorem, inverse matrix. Formulation and solution of mathematical models. Geometric transformation in space: translation, rotation and scaling. Vectors: inner, vector and mixed product, collinearity, orthogonality, coplanarity. Analytic geometry: algebraic and vector equations of line and plane, mutual relation. |
| 1. Teaching methods: Lectures
 |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Oral part of the exam* | Yes | 45 |
| Test | Yes | 45 |  |
| Exercise attendance | Yes | 5 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Konjik S., Dedović N. | Mathematics - a collection of tasks for the students of Faculty of Agriculture (in Serbian) | Faculty of Agriculture, University of Novi Sad | 2011. |
|  | Hadzić O., Takači Đ. | Mathematics for students of natural sciences (in Serbian) | University of Novi Sad, university textbooks - Edition 76 | 1998. |
|  | Matić-Kekić S. | Economic mathematics for students of biological sciences (in Serbian) | Faculty of Agriculture, University of Novi Sad | 2006. |

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| Course: | **Mechanics 2** |
| Course id: |
| Number of ECTS: 7 |
| Teacher: | Dragi M. Radomirović |
| Course status: | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 3 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None/navesti ako ima |
| 1. Educational goal

Introducing students to the basic concepts and principles of kinematics and dynamics. |
| 1. Educational outcomes

Student’s ability in solving kinematics and dynamics problems. |
| 1. Course content
* Kinematics of a particles (trajectory, velocity, acceleration and the radius of curvature of the path) Kinematics of rigid bodies (rotation about a fixed axis, translational motion and general plane motion)
* Kinematics of relative motion
* Newton's second law
* Kinetic energy, linear momentum and angular momentum
* Work, energy and power
* Work-energy principle for a particle
* Dynamics of a system of particles
* Momentum and energy principles
* Work-energy principle for a system of particles
* Dynamics of rigid bodies
 |
| 1. Teaching methods

Lectures, Practical classes, Consultations.  |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Written part of the exam-tasks and theory* | Yes | 30 |
| Test | Yes | 60 |  |
| Exercise attendance | Yes | 5 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
| 1. | Đukić ĐorđeCvetićanin Livija | Kinematics (in Serbian) | Faculty of Technical Sciences, Novi Sad | 2005 |
| 2. | Maretić Ratko | Collection of solved Problems in Kinematics (in Serbian) | Faculty of Technical Sciences, Novi Sad | 2007 |
| 3. | Đukić ĐorđeCvetićanin LivijaZuković Miodrag | Dynamics (in Serbian) | Faculty of Technical Sciences, Novi Sad | 2014 |

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| Course: | **Mechanical Materials and Processing Technology** |
| Course id: 3ОАИ2О08 |
| Number of ECTS:7 |
| Teacher: | Prof. Dr. Milan Tomić, assistant: Milivoj Radojčin, MSc |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4x15=60 | Practical classes: 3x15=45 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None/navesti ako ima |
| 1. Educational goal

Introducing the theoretical basis, characteristics and practical application of various metallic and non-metallic materials in engineering, especially in mechanical engineering. |
| 1. Educational outcomes

Training students for the evaluation of materials and material selection for installation on agricultural machines and devices. |
| 1. Course content

*Theory lessons*The importance of mechanical materials in terms of exploitation of agricultural techniques. Structure metals and alloys, the crystallization process. The crystal lattice. Deformation. The formation of alloys: mechanical mixtures, solid solutions and chemical compounds. The state diagram multi-component alloys. Iron and its alloys. The state diagram iron-carbon. The classification of steels. Fundamentals of heat treatment of carbon steel. Classification and properties of cast iron. Non-ferrous and light metals. Non-metallic materials mechanical engineering. Properties and material testing. Corrosion of metals and metal protection against corrosion (corrosion inhibitors, inorganic protective coatings, organic coatings, types of inorganic coatings and methods of application, errors coatings); Measurement and measuring equipment (rules of measurement, measurement errors, measurement of length, measuring angles, measuring profile, measuring instruments); Metal processing chip removal (cutting theory, elements of machines for metal removing work machines for metal chip removal, lathes, milling machines, planers, sanders, drills); Processing of metal without chips removing (metal deformation, stamping, cutting, bending, molding); Metal joining techniques (techniques of welding, arc welding, gas welding, resistance welding, welding in a protective atmosphere, mechanical coupling, separable and inseparable connections).*Practical teaching: Exercise, Other modes of teaching*Mechanical Materials: State diagram Fe-Fe3C. Marking metals and alloys by JUS. Crystallographic observation. Introduction to the principles of testing properties of metals and alloys. Diagram strain deformations. Introduction to the thermal treatment in practice - visit the factory. Introducing and the work with surface protection of metal from corrosion and realization of specific parts of the machine with organic material; Introducing the measuring equipment and work on machine tools and manufacturing of workpieces by drawing. Implementation of the work is performed on a lathe, milling machine, planer unit and drill; Introducing the devices for arc and gas welding and working with them in the realization of making the set of parts. |
| 1. Teaching methods

Lectures with the use of video presentations, demonstration exercises in laboratory and field conditions, assignments, lab and seminar work, testing under laboratory and field conditions and consultation within the lectures and exercises. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Oral part of the exam* | Yes | 30 |
| Test | Yes | 30 |  |
| Exercise attendance | Yes |  |
|  *Test, Term paper, practical classes* | Yes | 35 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
| 1. | Furman Timofej | Knowledge of overhaul machines | Faculty of Agriculture, Novi Sad | 1994 |
| 2. | Stanković, P.  | Machine tools | Technical book, Belgrade | 1995 |
| 3. | Vitomir Đorđević | Mechanical materials (some chapters) ) | Faculty of Mechanical Engineering, Belgrade | 1999 |
| 4. |  | IP Manual (translated from Russian) | Scientific Book, Belgrade | 1988 |

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| Course: | **Strength of Materials** |
| Course id: 3ОАИ2О09 |
| Number of ECTS: 6 |
| Teacher: | Dragi M. Radomirović |
| Course status: | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 3 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Introducing students to the basic concepts and principles of strength of materials. |
| 1. Educational outcomes

Student’s ability in solving strength of material problems. |
| 1. Course content
* Stress and strain in tension and compression
* Statically determinate and indeterminate problems in tension and compression
* Linear thermal expansion
* Stresses and strains in pure shear.
* Working stresses in shear
* Geometrical properties of plane figures
* Stress and strain in torsion
* Statically determinate and indeterminate problems in torsion
* Stress and strain in bending
* Statically determinate and indeterminate problems in bending
* Buckling (Euler’s column formula, critical stress)
 |
| 1. Teaching methods

Lectures, Practical classes, Consultations.  |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | Written part of the exam-tasks and theory | Yes | 30 |
| Test | Yes | 60 |  |
| Exercise attendance | Yes | 5 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
| 1. | Mandić Jovan | Strength of materials (in Serbian) | Scientific book, Belgrade | 1987 |
| 2. | Mandić JovanTatić Nedeljko | Collection of solved problems in strength of materials (in Serbian) | Scientific book, Belgrade | 1974 |
| 3. | Maretić Ratko | Collection of solved problems in strength of materials (in Serbian) | Faculty of Technical Sciences, Novi Sad | 2012 |

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| Course: | **Sociology** |
| Course id: 3ОАИ2О10 |
| Number of ECTS: 4 |
| Teacher: | Assistant professor: Dejan R. Janković, Ph.D.Assitants: M.Sci. Marica D. Petrović, M.A. Marina D. Novakov |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 1 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

The sociology course will introduce students to the basic theoretical and methodological standpoints in relation to agriculture and rural areas, social changes that affect rural areas, as well as the interaction between rural and urban social phenomena. Changes of traditional social structures and patterns of behaviour are the starting point for the analysis of social change of peasantry and rural areas, agriculture and its functions, as well as various functions and transformations of social groups and institutions in the process of rural development. |
| 1. Educational outcomes

This course will provide students with: knowledge of the basic sociological categories and methods of research in (rural) sociology; ability to analyze social phenomena in terms of social (agrarian and rural) structure and social relations; understanding of the basic principles of traditional peasant economy and transformation of traditional structures in relation to social groups, institutions, cultural patterns; understanding of complexity of rural development process. |
| 1. Course content

Meaning and tasks of the sociology as a discipline. Development of sociology and rural sociology. Methods in (rural) sociology. Basic theoretical and methodological approaches in rural sociology. Meaning, dimensions and elements of social structure. Meaning and types of social change. Global development processes as agents of change of agrarian and rural structures. Ecological problems of agriculture and rural areas. Peasant economy and changes in the agrarian structure. The old agrarian relations in Europe and Balkans and recent changes in the agrarian structure in Balkans. Family farms and features of rural areas in Serbia in present time. Rural settlements and rural population. Rural development and rural policy. The peasantry as a social class and as a political-historical factor. The social organization of local rural communities. Social groups in rural areas. Social institutions and organizations in rural areas. Rural culture - between tradition and innovation. Diffusion of innovation in agriculture and rural areas. |
| 1. Teaching methods: Lectures, Discussions, Group work, Research work, Consultations
 |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 10 | *Theoretical part of the exam/Oral part of the exam/Written part of the exam-tasks and theory* | Yes | 30 |
| Test | Yes | 40 |  |
| Exercise attendance | Yes | 10 |
| *Term paper and students’ involvement in classroom activities* | Yes | 5 + 5 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Šljukić, S i M. Šljukić | Land and People. The peasantry and social structure. (In Serbian Zemlja i ljudi. Seljaštvo i društvena struktura) | Mediterran Publishing. Novi Sad | 2012 |
|  | Stojanov M | Sociology of rural collectives (In Serbian Sociologija seoskih kolektiva) | Matica srpska. Novi Sad | 2004 |
|  | Mitrović, M.  | Rural Sociology (In Serbian Sociologija sela) | SDS. Beograd | 1998 |
|  | M. Haralambos i M. Holborn.  | Sociology: themes and perspectives (In Serbian Sociologija: teme i perspektive)Internet sources; scientific journals | Golden marketing. Zagreb | 2002 |

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| Course: | **Mechinе elements** |
| Course id: |
| Number of ECTS:6 |
| Teacher: | Dr.Radojka Gligorić, assistant: Milivoj Radojčin, MSc |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 3 | Other teaching types:2 | Study research work: | Other classes: |
| Precondition courses | None/navesti ako ima |
| 1. Educational goal

The aim of the course is that students learn: the role, function, structural shapes, materials and calculation in order to select or verify the basic machine elements. |
| 1. Educational outcomes

Students will have the necessary knowledge of machine elements and will be able to more accurately, more reliable and more efficient to select, use and maintain machines. After passing the course, students will be able to monitor and study other subjects. |
| 1. Course content

*Theory lessons*Analyzed machine elements: elements for the connection: bolts, springs, pins, fuses and welded forms; Shafts and pins; Gear, chain, belt and gearing forces. Variates; Beds; Couplings (rigid, elastic, expansion, on - off, joint, special and security. For all of these structural elements will analyze the following aspects: Application, roles and division; loads and stresses; standard label; Basic parameters and indicators of work; Calculation of in order to select or check the selected standard types, monitoring and verification work during use; Tests during operation in order to determine the useful life period of replacement, types of damage, maintenance and protection procedures in order to long life and protection measures for the security of use.*Practical teaching: Exercise, Other modes of teaching, Study research work*Calculation tasks in the area covered by the lectures. Independent production of graphic works. View and defense graphic works. |
| 1. Teaching methods

The method of oral presentations and discussions. Method of presentations, demonstrations, simulations and illustrations on the board and using the computer. Method simulation work using computers. The method of practical work (computation and computational methods). |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 6 | *Oral part of the exam* | Yes | 30 |
| Test | Yes | 30 |  |
| Exercise attendance | Yes |  |
|  *Test, Term paper,* | Yes/No | 34 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Gligorić Radojka | Mechanical elements, Handout (In Serbian Mašinski elementi, autorizovana skripta) | Poljoprivredni fakultet Novi Sad | 2010 |
|  | Kuzmanović S | Mechanical elements, (In Serbian Mašinski elementi) | Univerzitet u Novom Sadu, Fakultet tehničkih nauka | 2005 |
|  | Kuzmanović S, Trbojević R, Rackov M | Zbirka zadataka iz mašinskih elementa (In Serbian Zbirka zadataka iz mašinskih elementa) | Univerzitet u Novom Sadu, Fakultet tehničkih nauka  | 2005 |
|  | Ognjanović M, Plavšić N, Janković M | The theory of machine elements (In Serbian Teorija mašinskih elemenata) | Mašinski fakultet Beograd | 1991 |
|  | Ercegović Đ | Mechanical elements, (In Serbian Mašinski elementi) | Nauka, Beograd | 1994 |
|  | Ognjanović M., Miltenović V | Mechanical elements I, II and III (In Serbian Mašinski elementi I, II i III) | Mašinski fakultet, Beograd | 1996 |

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| Course: | **Тhermotechnics and renewable energy** |
| Course id: 3ОAI3О12 |
| Number of ECTS: 6 |
| Teacher: | Todor V. Janić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 3 | Other teaching types: - | Study research work: - | Other classes: 2 |
| Precondition courses | None |
| 1. Educational goal

To familiarize students with the specifics of the theoretical and practical requirements in the field of thermodynamics, thermotechnics and the use of renewable energy sources, and systematization of the same application specific methods. |
| 1. Educational outcomes

Mastering the professional and scientific methods of solving specific problems in the field of thermodynamics, thermotechnics and the use of renewable energy sources. |
| 1. Course content

Introduction to Thermodynamics. Thermodynamic state properties, state changes. The equation of state of ideal gases. The equation of state of ideal gas mixtures. External influences. The first law of thermodynamics. The enthalpy. The second law of thermodynamics. Polytropic change of state of ideal gases. Halfideal gases. Real gases and vapors. The water vapor. Converting thermal energy into mechanical work (cyclic processes). Cycles of cooling. Apparatus and equipment for cooling. The two-component mixtures (binary solutions). The absorption cooling machine. Transport of heat. Heat transfer (conduction). Heat transfer (convection). The passage of heat. Radiation heat (radiation). Calculation of heat loss. Power consumption, diagrams consumption and consumer characteristics. Energy efficiency of buildings. Renewable energy sources. Biomass. Biogas. Solar energy. Geothermal energy. Wind energy. The combustion of fuel. Furnaces for combustion of fuel. Burners for liquid and gaseous fuels. Heat exchangers. Thermal plant. Furnaces. Boilers. The choice of type and concept of the energy plant. The criteria to be met by thermal energy plants. The choice of thermal schemes and parameters of thermal power plants, technological systems of thermal power plants in the fuel supply, environmental protection from harmful influences, for taking the ash and slag; for the supply and treatment of water. Energy efficiency of thermal power plants. The pipes and pipe fittings. Heating and air conditioning. Cooling devices. The moist air. Air conditioners. Heat pumps. Energy efficiency HVAC equipment. |
| 1. Teaching methods

Tasks of thermodynamics. Laboratory and field exercises in thermal devices and renewable energy sources. Seminar or project works from the aforementioned lessons. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Oral part of the exam/Written part of the exam-tasks and theory* | Yes |  |
| Test | Yes/No | - | *Written part: 40**Oral part of the exam: 51* |
| Exercise attendance | Yes | 4 |
|  |  | - |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | M. Brkić  | Thermal engineering in agriculture (In Serbian Termotehnika u poljoprivredi) | Faculty of Agriculture, Novi Sad | 2004. |
|  | M. Brkić, T. Janić, D. Somer:  | Thermal engineering in agriculture - Part II, Process Engineering and Energy (In Serbian Termotehnika u poljoprivredi – II deo, Procesna tehnika i energetika) | Faculty of Agriculture, Novi Sad | 2006. |
|  | D. Voronjec | Problems in Technical Thermodynamics (In Serbian Zbirka zadataka iz tehničke termodinamike) | Mašinski fakultet, Beograd | 2001. |

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| Course: | **Agricultural Products in Agro Industry** |
| Course id: 3AI3013 |
| Number of ECTS: 6 |
| Teacher: | Aleksandar D. Sedlar |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Course goal is that students learn about agricultural products; analyze their market, physical and chemical characteristics and markets values.  |
| 1. Educational outcomes

Through the lectures and practical classes students will make knowledge about agricultural products market and ways of their use in agro industry. |
| 1. Course content

LecturesAnalyze of agricultural products market. Analyzes of use possibility for cereals, industry crops, vegetables, grape and fruit in agro industry. Influence of harvesting and storage on chemical characteristics of agricultural products. Importance of harvesting good time for storage and post harvesting technology with agricultural products. Protection of agricultural products in aim of remains them in good shape for post harvesting technology and agro industry.Practical classesLaboratory experiment. Measuring and analyze of agricultural products (dry material content, volume, color…). Laboratory experiment in aim of mechanical characteristics measurement (resistant to cutting, pressure, deformation..). |
| 1. Teaching methods

 Lectures, Practical classes |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Theoretical part of the exam/Oral part of the exam/* | Yes | 60 |
| Exercise attendance | Yes | 5 |  |
| *Test and term paper* | Yes | 30 |
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| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Wills R.B.H, McGlasson W.B, Graham D, Joyce D.C. | Postharvest (5th edition) | University of South Wales, Sydney and CABI | 2007. |
|  | Vlahović B. | The market of agricultural products (In Serbian Tržište agroindustrijskih proizvoda) | Poljoprivredni fakultet Novi Sad | 2010. |

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| Course: | **Information and Communication Technologies in Agricultural Engineering** |
| Course id: 3ОАИ3О14 |
| Number of ECTS: 6 |
| Teacher: | Branislav A. Karadžić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | Mathematics |
| 1. Educational goal

Introducing students to the principles of functioning of information and communication systems used in agricultural engineering. |
| 1. Educational outcomes

Students will be able to effectively use information and communication technologies applied in agricultural technology. |
| 1. Course content

Computer systems. Technical computer system. Programming a computer system. Computer networks. Internet and Internet services. Web technology. Databases. Sensors, classification, types. Biosensors, classification, application in agriculture. Remote data collection using satellites and aircraft. Standards for data transfer (ISOBUS). Precision agriculture. Information and communication technologies in the management of agricultural machinery and technological processes of production, finishing and processing of agricultural products. Using a web for remote servicing and maintenance of agricultural machinery and equipment. |
| 1. Teaching methods

Na primer: Lectures, Practical classes. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | Theoretical part of the exam | Yes | 40 |
| Test | Yes | 30 |  |
| Exercise attendance | Yes | 5 |
| Term paper | Yes | 20 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Munack A. | Information Technology (CIGR Handbook of Agricultural Engineering) | ASABE, MI, USA | 2006. |

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| Course: | **Hydropneumatic Engineering** |
| Course id: 3ОАИ3О15 |
| Number of ECTS: 6 |
| Teacher: | Professor Mirko Babić, PhD |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures:3 | Practical classes:3 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Introduction to the basics of fluid mechanics and clarification of concepts and phenomena in the statics and fluid flow. The second part of the subject is devoted to the pipelines and hydraulic machines. |
| 1. Educational outcomes

Training students to solve simple hydraulic problems. In addition, the student is trained to recognize and complex problems, and that he may project tasks to specialists in the field of hydraulics. |
| 1. Course content

Theory lessonsBasic physical properties of the fluid. Hydrostatics. The relative balance. Fluid flow. Euler equation. The equation of continuity. Bernoulli's principle. Flow regimes. Energy loss through pipelines. The complex pipelines. Hydraulic machines. Turbomachines. Characteristics of turbo machines. The work of several hydraulic machines. Volumetric machines. The flow machines. Motor hydraulic machines. Transmission, management and utilization of hydraulic and pneumatic energy. Hydraulic and pneumatic components and devices. Maintenance.Practical teaching: Exercise, Other modes of teaching, Study research workTasks of the basic properties of fluids. Tasks of fluid statics. The tasks of the movement of fluids. Tasks of energy loss of flow. Showing instruments in the laboratory. Tasks of the pipeline. Tasks of turbo machines. The seminar work. Showing hydraulic machines and equipment in the lab. Laboratory exercises - determination of QH characteristic of turbo machine . |
| 1. Teaching methods

Lectures of theory, Training of solving tasks. Practical classes in laboratory. Seminar. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 10 | Oral part of the exam | Yes | 35 |
| Test | Yes | 35 |  |
| Laboratory practice | Yes | 5 |
| Seminar | Yes | 15 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Mirko Babić  | Hidropneumatics engineering, authorized lectures (in Serbian),  | Faculty of Agriculture, Novi Sad, Serbia | 2012. |
|  | Vuković B, Tašin S. | Introduction to Hydropneumatic engineering (in Serbian) | Faculty of technical Science, Novi Sad  | 2006. |

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| Course: | **Drying Biomaterials** |
| Course id: 3ОАИ4О16 |
| Number of ECTS: 5 |
| Teacher: | Ivan Pavkov, PhD Asistant Professor |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 5 | Practical classes: 5 | Other teaching types: - | Study research work: - | Other classes: - |
| Precondition courses | None |
| 1. Educational goal

Introduction students with basics technical and technological solutions for drying of biomaterials. Drying is operation found in almost all industrial sectors, ranging from agriculture to pharmaceuticals. It is the oldest, most diverse and most energy intensive operation. Drying technology is lied down on transport phenomena of thermal energy and moisture in materials. This process in not only the removal of liquid from agricultural materials, but also with the extent to which the dried product meets the necessary quality criteria. Drying of materials is first step to prevent spoilage, next step is storage. Educational goal is the knowledge of drying process for agricultural products and technical equipment which are on disposal. |
| 1. Educational outcomes

On successful completion of this subject, the students should: a) to assemble mastery of the knowledge, techniques, skills and tools related to drying of biomaterials materials, grain, fruits, vegetables, hop, medicinal plants and herbs, b) be able to identify, analyze and solve drying facilities problems, c) the knowledge gather in this subject will provoke creativity in design and management of agricultural material drying systems. |
| 1. Course content

Lectures:History of drying biomaterials. Moisture content of agricultural products. Drying process of agricultural products. Types of dryers. Grain drying technologies. Anti fire and anti explosions measures. Drying and processing of: corn seed, white seed, sugar beet seed. Drying of forage crops. Drying of fruits and vegetables. Technical and technological solutions for tobacco drying, hop drying, medicinal plants and herbs drying. Drying on small scale farms. Practice:Measuring of agricultural materials physical properties. Drying kinetics of thick grain layer. Calculation exercises: Change of state humid air, classical drying, stepwise drying, and drying with recirculation. Material bilans of biomaerials during drying process. Calculations of thermal and material bilans for air during drying processes. Term paper. |
| 1. Teaching methods

Lectures – oral presentations with power point softer, Practical classes- calculations and practical work in laboratory, Consultations and Term paper |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 5 | Oral part of the exam | Yes | 20 |
| Tests | Yes | 60 |  |
| Exercise attendance | Yes | 5 |
| Term paper | Yes | 10 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Arun, M. Mujundar | Handbook of Industrial Drying, Third edition | Taylor and fracis Froup, CRC Press Book | 2012 |
|  | Babić, Ljiljana, Babić Mirko | Drying and Storage (in Serbian) | Faculty of Agriculture, Novi Sad, Serbia | 2012 |
|  | Babić, Ljiljana, Babić Mirko | Drying and Storage – Practicum (in Serbian) | Faculty of Agriculture, Novi Sad, Serbia | 2000 |

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| --- | --- |
| Course: | **Тechnological Operations in Agroindustry** |
| Course id: |
| Number of ECTS:6 |
| Teacher: 3ОАИ4О17 | Dr Ivan Pavkov, professor asisstant |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 3 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None/navesti ako ima |
| 1. Educational goal

Introduce students to basic technological operations that are applied during technological processes of biomaterials. |
| 1. Educational outcomes

Training students for knowledge and understanding of problems of basic technological operations of processing of biomaterials. Acquired knowledge on this subject are the basis for understanding the specific engineering process of processing biomaterials which are studied on next years of studies. Knowing the essence of appropriate technological operations is essential in defining the flow of technological processes and design appropriate apparatus and devices. |
| 1. Course content

*Theory lessons*Introduction to the subject, the definition and classification of technological operations. Mechanical operations, introduction to basic mechanical operations: grinding, grading, classification (sorting), stirring. Hydro-mechanical operations: sedimentation, filtration, centrifugation, the creation of liquid heterogeneous systems, separation of gaseous heterogeneous systems, precipitators, inertial separators dust, gas purification filtration, wet purification. Diffusion operations, the study of the mass transport of two-phase systems, the conditions of thermodynamic equilibrium of multicomponent and multiphase systems, the equilibrium state of the two-phase system, the system gas - liquid, gas - solid, solid - liquid. The mass balance of the process of mass exchange, distillation, rectification, absorption, extraction, crystallization, adsorption.*Practical teaching: Exercise, Other modes of teaching, Study research work*Practical teaching is in accordance with theoretical classes. In the exercisesstudents are doing methods for the calculation the examined technological operations in the form of material balance and method of calculation certain technological devices. At the the chosen topic student writes a seminar paper that consists of excerpts from the analized technological operations and its calculation with concrete data. |
| 1. Teaching methods

Teaching is an oral with the help of Power Point presentations and practical training is done through calculation exercises and seminar work. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Oral part of the exam* | Yes | 40 |
| Test | Yes | 40 |  |
| Exercise attendance | Yes | 5 |
|  *Test, Term paper,* | Yes/No | 10 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Voronjec, D | Technological operations | Faculty of Mechanical Engineering, University of Belgrade | 1988 |
|  | Sovilj, M | Diffusion operations | Faculty of Technology, University of Novi Sad | 2004 |
|  | Stanišić, S | Technological operations I | Faculty of Technology, University of Novi Sad | 1987 |
|  | Stanišić, S | Technological operations II | Faculty of Technology, University of Novi Sad | 1987 |

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| Course: | Base of Design |
| Course id: 3ОАИ4О18 |
| Number of ECTS: 6 |
| Teacher: | Ondrej O. Ponjičan, PhD, Assistant professorMSc Milivoj Radojčin |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 3 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Training for self-design of machines. |
| 1. Educational outcomes

The acquired knowledge will be used in further education within vocational subjects. |
| 1. Course content

*Theoretical classes:* Design, construction and product development. The main tasks and computer applications in designing and constructing. Defining the basic technical characteristics of the product, concept design and working life and the life of the structure. Determining the type and size of the load. Critical stresses in the material. The destruction of mechanical parts in the work. The choice of materials. Weight of machine design. Measuring chains. Dimensioning and definition of tolerance. The selection process of making. Welded construction. Soldered joints. Pressure vessels. Pressed compounds. Glued joints. Bearing. Lubrication of mechanical structures. Sealing. The influence of external factors on the mechanical construction. The effect of temperature changes on the operation of mechanical structures. Vibrations and shocks. Noise. Balancing. The quality in the construction. Tests defining. Installation, commissioning and running. Monitoring of construction during exploitation. Structural analysis of the disaster. The possibilities and ways of remediation of damage.*Practical classes:* Exercise, other modes of teaching, tasks, computational and graphical exercises in the aforementioned teaching units. |
| 1. Teaching methods

Lectures, Practical classes, Consultations, study,  |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 5  | *Written part of the exam-tasks and theory* | Yes | 30 |
| Graphics work | Yes | 30 |  |
| Exercise attendance | Yes | 5 |
| Term paper | Yes | 30 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Kuzmanović S.  | Construction, shaping and design-1 (in Serbian) | University of Novi Sad,Faculty of Technical Sciences, Novi Sad, | 2005. |
|  | Kuzmanović S.  | Exercises in construction, shaping and design-1 (in Serbian) | University of Novi Sad,Faculty of Technical Sciences, Novi Sad, | 2006 |

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| Course: | Electrical Engineering and Electrical Machines |
| Course id: 3ОАИ4О19 |
| Number of ECTS: 5 |
| Teacher: | Branislav A. Karadžić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 3 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | Mathematics |
| 1. Educational goal

Introducing students to the basic concepts of electrical engineering and application of electrical and electronic devices, machines and systems in agriculture. |
| 1. Educational outcomes

Students will be able to understand the working principles and operation of electrical devices and systems used in agricultural production and to be able to exercise choice of appropriate electrical equipment. |
| 1. Course content

Electrostatics. Time constant electric current. Magnetism. Time-varying electric and magnetic field. Time-varying electrical current. Electrical measurements. Fundamentals of electronics. Electrical measurements of non-electrical quantities. Transformers. Types of rotary machines. DC Machines. Asynchronous machines. Synchronous machines. Power electronic devices. Electromotor drives and electric traction in agriculture. Electrical installations, electric lighting and heating in agriculture. Alternative sources of electricity in agriculture. Electrical and electronic devices at agricultural machines. |
| 1. Teaching methods

Lectures, Practical classes |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | Written part of the exam-tasks and theory | Yes | 40 |
| Test | Yes | 30 |  |
| Exercise attendance | Yes | 5 |
| Term paper | Yes | 20 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Gustafson J.R, Morgan T.M | Fundamentals of Electricity for Agriculture | ASAE, USA | 2011 |

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| Course: | *Agricultural Transportation Means* |
| Course id: 3ОАИ4О20 |
| Number of ECTS: 5 |
| Teacher: | Lazar Đ Savin, Mladen S Ivanisevic |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Lectures:  | Practical classes:  | Lectures:  |
| Precondition courses | None |
| 1. Educational goal

The aim of the course is to introduce students with the basic structures of transportation in agriculture, adjustment and economical use, and choice according to purpose and application conditions. Then the trained in the development, design, as well as the choice and use of safe food production. |
| 1. Educational outcomes

After taking the course, students acquire knowledge and skills that enable him to:- A thorough understanding some technical basis of means of transport in agriculture,- Development and design of transport means in agriculture,- Proper selection according to purpose, the structure of sowing and conditions of use- Proper handling, maintenance and storage of the economical and ecological use of the means of transport in agriculture. |
| 1. Course content

Theory lessonsThe significance and purpose of transportation in agriculture. Definition and structure of the transport process. charged inagricultural transport. Mobile transport unit. Tractor transport unit. Resistance and driving use of traction tractor. Trailers. Braking equipment on trailers, cargo accommodation on trailers, cargo unloading system, control devices on trailers and other equipment trailer. Use trucks in agriculture. Container transport in agriculture, palletizing machines. loading and reloading means of transportation in agriculture. Tractor and self-propelled loaders, conveyors, elevators. The free-reloading means of transportation.Practical teaching: Exercise, Other modes of teaching, Study research workThe structure of the transport process in agriculture. Tractor transport aggregates. The effect of forces on one – and two axles trailer. Systems connecting or trailer. Braking equipment on trailers. Loading and reloading means of transportation in agriculture (demonstration and tasks). The calculation of basic parameters conveyors and elevators, productivity and power to drive  |
| 1. Teaching methods

The method of oral presentations and discussions. Methods of presentations, demonstrations, simulations, drawing and illustration.Consultations and seminars. Displays the equipment in service. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes/No | 5 | *Oral part of the exam* | Yes | 60 |
| Test | Yes/No |  |  |
| Exercise attendance | Yes/No | 5 |
| *Term paper* | Yes/No | 30 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Becker, WJ. | Farm equipment on the highway. | Cooperative Extension Service, University of Florida, Gainesville, FL. | 1991 |
|  | Ellen M. Welbyand Brian McGregor | Agricultural ExportTransportation Handbook | United States Department of Agriculture,Agricultural Marketing Service | 2004 |

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| Course: | **Process Technique** |
| Course id: 3ОAI5О22 |
| Number of ECTS: 6 |
| Teacher: | Todor V. Janić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 2 | Practical classes: 2 | Other teaching types: - | Study research work: - | Other classes: 2 |
| Precondition courses | None |
| 1. Educational goal

To familiarize students with the specifics of the theoretical and practical constraint in the field of process engineering, in agro-industry, the systematization of the same application of concrete methods for solving them. |
| 1. Educational outcomes

Mastering the professional and scientific methods of choice and use of process equipment, construction and operation of process plants, and resolving specific problems in the field of process engineering in the agro-industry. |
| 1. Course content

Mechanical processes and devices. Hydrodynamic processes and devices. Thermal processes and devices. Diffusion processes and devices. Termodiffusive processes and devices. Apparatus for heat and mass transfer. Apparatus and equipment for offal and waste incineration. Apparatus and equipment for the processing of animal feed. Apparatus and equipment for preparing fodder. Apparatus and equipment for detoxification product. Apparatus and equipment for extrusion products. Apparatus and equipment for briquetting and pelleting biomass. Apparatus and equipment for the distillation of essential oils from plants. Apparatus and equipment for cold pressing oil. Apparatus and equipment for the extraction of essential oils. Apparatus and equipment for the production of biodiesel. Apparatus and equipment for the production of biogas from waste materials. Devices and equipment for gas purification. Apparatus and equipment for water purification for technological applications and wastewater. Apparatus and equipment for separating solid from the liquid phase. Apparatus and equipment for internal transportation. Apparatus and equipment for the production of compost and soil. Facilities with a controlled climate (warehouses and refrigerators). Apparatus and equipment for cooling products. Devices and equipment for measuring and packaging products. Apply integrated organizational and technical measures for process systems in the agro-industry in order to preserve the quality of production scopes, increase environmental protection. The selection process plants. Design of process systems for product finishing. Project Technical Documentation and measures of environmental and labor protection. Engineering process systems for product finishing. Costs in the exploitation of the system. Techno-economic feasibility analysis of investment. Conceptual design. Planning documentation. Investment-technical documentation. The construction site. Supervision of construction. The test operation. Scrutineering. The quality of the works and guarantees. Standards, regulations and standards. |
| 1. Teaching methods

The tasks in process engineering. Laboratory and field exercises in process equipment. Seminar or project works from the aforementioned lessons. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Oral part of the exam/Written part of the exam-tasks and theory* | Yes |  |
| Test | Yes/No | - | *Written part: 40**Oral part of the exam: 51* |
| Exercise attendance | Yes | 4 |
|  |  | - |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | D. Tolmač  | Machinery and apparatus (In Serbian Mašine i aparati) | Tehnički fakultet "Mihajlo Pupin", Zrenjanin | 2006. |
|  | M. Brkić, T. Janić, D. Somer | Thermal engineering in agriculture - Part II, Process Engineering and Energy (In Serbian Termotehnika u poljoprivredi – II deo, Procesna tehnika i energetika) | Poljoprivredni fakultet, Novi Sad | 1998. |
|  | D. Voronjec | Technological Operations (In Serbian Tehnološke operacije) | Mašinski fakultet, Beograd | 1983. |

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| Course: | Biotechnological Systems for Processing Agricultural Products |
| Course id:3ОАИ5О23 |
| Number of ECTS:6 |
| Teacher: | Associate professor Mihal O. Meši |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures:4 | Practical classes:4 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Acquiring knowledge about the methods and procedures of seed processing of basic agricultural crops . |
| 1. Educational outcomes

Knowledge of seed processing related to basic principles and methods of processing, seed characteristics, the classification process technology, equipment and procedures. Knowledge of basic processing of agricultural crops . |
| 1. Course content

Introduction to the basic principles of the seed processing: properties of natural seed material, limited and forbidden impurities and dirt, the separability of the components of seeds, the classification of process technology. Introducing the devices and technological processes in the technology of seed processing (devices for separation: magnetic and electromagnetic, gravitational, vibrating air, friction, devices for seed treatment). Methods and procedures in processing of seeds. Introduction to basic schemes of technological processes of separation...Practical teaching: Exercise, Other modes of teaching, Study research workIntroduction the equipment for testing of seed material related to sample preparation, testing purity, germination, moisture, mass of 1000 seeds and health. Introduction to basic devices in the technology of seed processing. Visiting the famous centers for seed processing of main field crops. |
| 1. Teaching methods

Na primer: Lectures, Practice/ Practical classes, Consultations, study, research work…  |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes/No | 5 | *Theoretical part of the exam* | Yes | 35 |
| Test 1 and Test 2 | Yes/No | 15+15 |  |
| Exercise attendance | Yes/No | 15 |
| *Term paper* | Yes/No | 15 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Mladen Mirić and Miladin Brkić | Seed Treatment (In Serbian Dorada semena) | Association of Plant Breeders & Seed Društvo selekcionera i semenara | 2002 |

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| Course: | **Biotechnical Systems of Fruit and Grape Postharvest Technology** |
| Course id: ZОАI5О24 |
| Number of ECTS: 6 |
| Teacher: | Aleksandar D. Sedlar |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 3 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Course goal is that students learn about agricultural postharvest technology, calibration and finishing process of fruit and grape. During this course student will learn how to use and aggregate equipment for postharvest technology, packaging, manipulations and storages. |
| 1. Educational outcomes

Through the lectures and practical classes students will be introduce with storage condition and calibration ways. Also they will learn how to choose and on proper way use equipment for postharvest technology and finishing process of fruit and grape. |
| 1. Course content

LecturesChanges during ripen process of agricultural products and there importance to preserve agro industry usability. Equipment and machines for fruit and grape harvesting. Postharvest treatments and storage conditions. Storage, wrapping material, sort and packaging of fruit. Adaptation of household rooms in refrigerated warehouse. Calibration process. Harvest and transport of grape. Wine cellar and wine dishes. Equipment and condition for making wine in household. Practical classesIntroducing with machines and equipment for fruit and grape harvesting. Analyze of equipment for wine production in wine cellar. Analyze and calculation for equipment procurement in aim of postharvest technology in agricultural household. |
| 1. Teaching methods

 Lectures, Practical classes |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Theoretical part of the exam/Oral part of the exam/* | Yes | 60 |
| Exercise attendance | Yes | 5 |  |
| *Test and term paper* | Yes | 30 |
|  |  |  |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Wills R.B.H, McGlasson W.B, Graham D, Joyce D.C. | Postharvest (5th edition) | University of South Wales, Sydney and CABI | 2007. |
|  | Burg P, Zemanek P. | Machinery and equipment for wineries (In Cech Stroje a zarizeni pro vinarstvi) | Mandela University, Brno | 2014. |

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| Course: | **Storagе of Agricultural Products** |
| Course id: 3ОАИ6О25 |
| Number of ECTS:5 |
| Teacher: | Dr Ivan Pavkov assistant professor |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 3 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None/ |
| 1. Educational goal

Introduce students with the basics of technical solutions and technological procedures storage of grain, vegetables, herbs and slightly alfalfa, fruits, vegetables, hops, tobacco, and other storage technologies for agricultural products on small holdings. |
| 1. Educational outcomes

Training for independent recognition of technological processes and of technical solutions of devices and equipment for the storage of farming, vegetable and fruit products. Gaining opportunities to solving needs of other storage products from agriculture, as well as herbs and spices, tobacco and hops. Exploring the possibilities of application controlled and modified atmosphere storage. |
| 1. Course content

*Theory lessons*Physical, chemical and biological properties of stored products. Storage Technology. The influence of microorganisms, mites, insects, rodents and stories. Self-heating of stored product weight. Technology and technical solutions for the storage of grain, plant and equipment (cleaning product weight, horizontal and vertical transport). Fire and explosion protection measures in warehouses. Special requirements during storage of fruits, vegetables, herbs and spices, hops and tobacco, as well as the technical solutions of special equipment. Structural requirements and equipment for warehouses with controlled and modified atmosphere. Storage technology fruits, vegetables and ornamental plants in warehouses using controlled and modified atmosphere.*Practical teaching: Exercise, Other modes of teaching, Study research work*Calculations of horizontal and vertical force loads in warehouses granular materials based on knowledge of the physical properties of the product. Research work of students at laboratory level in relation to the storage of fruits and vegetables in a controlled environment. Field outs: two field exiting semester: Introduction to the centers for storage of granular materials, seeds and other products. |
| 1. Teaching methods

Teaching is an oral with the help of Power Point presentations, exercises in laboratory and field conditions. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Oral part of the exam* | Yes | 20 |
| Test | Yes | 60 |  |
| Exercise attendance | Yes | 5 |
|  *Test, Term paper,* | Yes/No | 10 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Sauer, D.B. | Storage of Cereal Grains and Their Products | American Association of Cereal Chemists, Inc. St. Paul, Minnesota, USA | 1992 |
|  | Ljiljana Babić, Mirko Babić | Drying and storage | Faculty of Agriculture, Novi Sad | 2012 |
|  | Babić Ljiljana | Storing horticultural products - Internal script | Faculty of Agriculture, Novi Sad | 2011 |
|  | Kader Adel | Postharvest Technology of Hotricultural Crops | University of California, Agricultural and Natural Resources, Publication | 2004 |

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| Course: | Biotechnical Systems of Vegetable Fruits, Postharvest Technology |
| Course id: 3ОАИ6О26 |
| Number of ECTS: 5 |
| Teacher: | Anđelko M. Bajkin, PhD, Full professorOndrej O. Ponjičan, PhD, Assistant professor |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 3 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

The aim of the course is to introduce students with post harvesting technologies, devices and equipment in processing of vegetable products. |
| 1. Educational outcomes

Students will become familiar with the conditions and methods of storage, calibration and processing of vegetable products. |
| 1. Course content

*Theoretical classes:* The specificity of the chemical composition of vegetables. Impact agribiological factors during the growing season to keeping fresh vegetables. The importance of quality for safekeeping. Biology ripening. The harvest. Care and losses. Factors that affect the length and quality preservation. Physiology of storage. Technology before storage. The technology of storage. Refrigerators. Transport. Storage and distribution of fresh products.*Practical classes:* *exercise, other forms of instruction,*Introduction to the machinery, equipment and devices for harvesting vegetables. Review and analysis of equipment and devices for processing vegetables. Calculations and optimization of procurement of equipment for processing vegetables on family farms. Economic and energy calculations processing of vegetable products.  |
| 1. Teaching methods

Lectures, Practical classes, Consultations, study,  |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 5  | *Oral part of the exam* | Yes | 50 |
| Exercise attendance | Yes | 5 |  |
| Written test | Yes | 20 |
| Oral test | Yes | 20 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Bajkin A: | Mechanization in vegetable production (in Serbian: Mehanizacija u povrtarstvu)  | University of Novi Sad,Faculty of Agriculture, Novi Sad, | 1994. |
|  | Bajkin A, Ponjičan O, Orlović S, Somer D. | Mechanization in horticultural production  (in Serbian: Mašine u hortikulturi) | University of Novi Sad,Faculty of Agriculture, Novi Sad, | 2005. |
|  | Ilić Z, Falik E, Đurovka M, Martinovski Đ, Trajković R.  | Physiology and technology vegetables and fruit storage(in Serbian: Fiziologija i tehnologija čuvanja povrća i voća. | Tampograf, Novi Sad. | 2007. |

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| Course: | **Biotechnical Finishing Systems in Animal Husbandry** |
| Course id: 3OAI6O27 |
| Number of ECTS: 5 |
| Teacher: | Miodrag S Zoranović, Mladen S Ivanišević |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 3 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

Acquiring focused theoretical and practical knowledge of machines, devices and equipment processing and control: complex animal feed, water, air, complex finish and by-products breeding. |
| 1. Educational outcomes

Acquiring the status of licensed engineers for proper selection and use of machinery and process equipment in systems for processing: animal nutrition by species and their categories, water, air, complex finish and by-products of cultivation |
| 1. Course content

Theoretical classes: Alternative sources of electricity and heat in livestock. Fundamentals Automation in livestock. Machines and equipment for preparation and distribution of mixed feed. Dehydrator cells. Apparatus for mixing concentrated, mushy and liquid nutrients with adequate systems for mobile and stationary precise distribution. Farm supply nanotechnology the revised water. Devices for fine purification of air. Apparatus for cooling and reheating ambient air. Apparatus for sorting eggs. Facilities and equipment for the collection and processing of milk and meat. Refrigerated meat product. Facilities and equipment for forced drying meat. Facilities and equipment for nutritional, energy and organic manure processing.Practical teaching: Exercise, Other modes of teaching,Demonstrative, budgetary and planning procedures for the above mentioned areas. Active participation inLaboratory and practical elements of the development process equipment for the above-mentioned domains. Detoursmall, medium and large systems for the processing of the above mentioned products of animal production. |
| 1. Teaching methods

Oral lectures with active participation of students, slides with animations originally formed, films formed by windows movie maker's. Visiting farms and facilities for primary and secondary refinement of basic and secondary products of farming, etc. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes | 10 | *Oral part of the exam* | Yes | 20 |
| Test | Yes | 30 |  |
| Exercise attendance | Yes | 20 |
| Colloquium | Yes | 20 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  |  | ASHRAE®HANDBOOK | Inch-Pound Edition. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. 1791 Tullie, N. E., Atlanta, GA 30329 (404) 636-8400 | 2009 |
|  | M. Navaratnasamy and J. J. R. Feddes | Odour Emissions from Poultry Manure/Litter and Barns. Final report submitted to Poultry Industry Council | Alberta Agriculture, Food and Rural Development, J. G. O'Donoghue Building, 7000-113 St., Edmonton, AB, T6H 5T6; Agricultural, Food and Nutritional Science, 4-10 Agriculture/Forestry Centre University of Alberta, Edmonton, AB, T6G 2P5 | 2004 |
|  | Osamu Kitani | Handbook of Agricultural Engineering | Volume V, Energy and Biomass Engineering. Engineering CIGR. Nihon University, Japan | 1999 |
|  |  | Technology for Pig Farms. Livestock Technology. | Bauer-Agromolk Group/CZ | 2012 |
|  | C. H. BURTON and C. TURNER | MANURE MENAGEMENT | Treatment Strategies for Sustainable Agriculture 2nd Edition. Silsoe Research Institute | 2003 |

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| Course: | **Enterprise Economics** |
| Course id: 3ОАИ7О29 |
| Number of ECTS: 6 |
| Teacher: | Vladislav, N., Zekić  |
| Assistant: | Stojan, B., Kostić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 | Tutorials: 4 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1.Educational goalIntroducing students to the concept and classification of costs, and characteristics of cost and income calculations in agricultural production. |
| 2.Educational outcomesUpon completion of the course, students will be capable of independent preparation of calculations in agricultural production, investment and differential calculations.  |
| 3.Course content*Theoretical Instruction*The concept of calculations. Business entities. Costs and classification of costs. Elements of costs. Fixed and variable costs. General and direct costs. Determining the market value of production. Cost of material. Cost of insurance. Cost of interests. Cost of depreciation. Labor cost. Legal and contractual obligations. Measuring and evaluating economical results of business operation. Annual production and financial plan. Differential calculations. Determining economic efficiency of investment. The importance of methods and conditions of financing investments. Evaluation of the means of production.*Practical Instruction*Tutorials. During tutorials students apply the knowledge gained at the lectures to solve practical examples. Calculation of the production value. Calculation of the material costs. Calculation of interest cost. Calculation of salaries cost. Calculation of other cost categories. Making analytical and differential calculations. Making investment calculations. |
| 4.Teaching methodsDuring theoretical instructions students are introduced to the theory. Theory is interpreted through demonstration and practical examples during tutorials.  |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Student’s participation in classroom activities | Yes/No | 15 | *Written exam* | Yes | 40 |
| *Oral part exam* |  | 30 |
| Practical work | Yes/No | 15 |  |
| Tests  | Yes/No |  |
| Seminar papers | Yes/No |  |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
| 1. | Marko, J., Jovanović, M., Tica, N. | Calculations in Agriculture (In Serbian Kalkulacije u poljoprivredi) | Poljoprivredni fakulteta, Novi Sad | 1998 |
| 2. | Andrić, J. | Costs and calculations in agricultural production (In Serbian Troškovi i kalkulacije u poljoprivrednoj proizvodnji) | Savremena administracija, Beograd | 1998 |
| 3. | Gogić. P. | The theory calculations of the costs (In Serbian Teorija troškova sa kalkulacijama) | Poljoprivredi fakulteta Beograd – Zemun | 2009 |
| 4. | Jakovčević Klara, Komazec Ljubica, Tomić Slavica  | Enterprise Economics - Practicum (In Serbian Ekonomika preduzeća – praktikum) | Ekonomski fakultet Subotica | 2011 |

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| Course: | **Automatic Control** |
| Course id: ZOAI7O30 |
| Number of ECTS: 6 |
| Teacher:  | Branislav A. Karadžić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 | Practical classes: 4 | Other teaching types: | Study research work: | Other classes: 2 |
| Precondition courses | Mathematics |
| 1. Educational goal

Introducing students to the principles of automatic control of processes in agricultural production. |
| 1. Educational outcomes

Students will be able to understand the working principles and operation of control systems and to independently manage automated processes in agriculture. |
| 1. Course content

Basic concepts and principles of automatic control. Types of control, classification of automatic control systems. The mathematical description of continuous linear and nonlinear systems. Analysis and synthesis of automatic control systems. Selecting and adjustment parameters of PID controller. Software packages for simulation, analysis and synthesis of automatic control systems. Digital control systems. Automation of technological processes in agriculture. Acquisition and control systems. Software packages for data acquisition and supervisory control of processes. The use of robots in agriculture. |
| 1. Teaching methods

Lectures, Practical classes: Exercise.Performing computing, computer and laboratory exercises. Introduction to software packages for analysis, synthesis and simulation of control systems. Demonstration of practical adjustment of control systems. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes | 5 | Written part of the exam-tasks and theory | Yes | 40 |
| Test | Yes | 30 |  |
| Exercise attendance | Yes | 5 |
| Term paper | Yes | 20 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Zhang Q, Pierce F.J. | Agricultural Automation – Fundamentals and Practice | CRC Press, Taylor & Francis Group | 2011 |
|  | Dorf R.C, Bishop R.H. | Modern Control Systems | Prentice Hall, New Jersey, USA | 2001. |
|  | Munack A. | Information Technology (CIGR Handbook of Agricultural Engineering),  | ASABE, MI, USA | 2006. |

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| Course: | **Technology Installation of Mechanical Structure and Equipment** |
| Course id:3OAI7O31 |
| Number of ECTS: 5 |
| Teacher: | Bugarin Rajko |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 3 | Other teaching types: | Study research work: | Other classes: 2 |
| Precondition courses | None/navesti ako ima |
| 1. Educational goal

Theoretical and practical knowledge related to the preparation, proper use of technical documentation, the assembly, meeting with the machines and devices for installation, mounting, commissioning of mechanical structures and equipment. |
| 1. Educational outcomes

The knowledge obtained in this course should enable proper preparation and use of technical documentation, optimal selection of devices and machines for assembling various mechanical structures and equipment, with an emphasis on cost-effective mounting and use with full respect for the legal regulations related to environmental protection. |
| 1. Course content

Preparing the ground for assembly elements of buildings and equipment, technical documentation installation work, fixed assets for the installation of concrete and mechanical elements, aids for the installation of concrete and mechanical elements, means of transport assembly elements, welding and other joining techniques mechanical assemblies, technology assembly of individual elements methods of installation of mechanical structures and equipment, performing assembly work and installation management. |
| 1. Teaching methods

Getting to know the technical documentation installation work, the process of installation, devices and machines for installation, basic parts, the principle of operation, configuration, maintenance, ongoing operation and protection measures at work mechanical constructions and equipment according to the curriculum of lectures.Lectures, PracticeNa primer: Lectures, Practice/ Practical classes, Consultations, study, research work… |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Theoretical part of the exam* | Yes | 60 |
| Test | Yes | 30 |  |
| Exercise attendance | Yes | 5 |
| Term paper | No |  |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Trivunić M | Installation of concrete building structures (In Serbian Montaža betonskih konstrukcija zgrada) | Univerzitet u Novom Sadu, Fakultet tehničkih nauka  | 2000 |
|  | Stanišić I | Technological operations (In Serbian Tehnološke operacije) | Univerzitet u Novom Sadu Tehnološki fakultet, Novi Sad | 1980 |
|  | Babin N. Brkljač N, Šostakov P | Metal Structures (In Serbian Metalne konstrukcije) | Univerzitet u Novom Sadu, Fakultet tehničkih nauka | 2006 |

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| Course:  | **Power machines** |
| Course id: 3ОАИ8О32 |
| Number of ECTS: 3 |
| Teacher: | Lazar Đ Savin, Mirko Đ Simikić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures:2 | Practical classes: 3 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

The aim of the course is to introduce students with combustion engines which are installed in agricultural tractors, combine harvesters and other mobile and stationary systems. Also, students should learn about with the tasks of individual engine system, structures, functioning, the basic setup, maintenance and storage. |
| 1. Educational outcomes

After taking the course, students acquire knowledge and skills that enable him in-depth understanding some technical basisIC engine, the design and testing IC engines, proper selection IC engines according to the purpose, structure and seedingTerms of Use, proper handling, maintenance and storage of IC engines and an economical and ecological use of motorinternal combustion. |
| 1. Course content

Theory lessonsPower generating machinery in agriculture, forestry and water management, importance, history, production, situation and needs. Classification, advantages and disadvantages of IC engines and other structures, basic concepts and operation of diesel and spark ignition engine. Structure of the IC engines, immovable and movable elements, valve train and engine balancing. The cooling system and engine lubrication, fueling and air and flue gases. Electronic devices and starting the engine,measuring and control devices. Cycles and cycle indicators, indicator of the effective parameters, mechanical losses,heat balance and budget cycles. The characteristics of the engine, application, engine options. Engine test - standards,methods, equipment, measurement procedure, the formation of the report. Development trends of IC engines and other engine structure. Practical teaching: Exercise, Other modes of teaching, Study research work Introduction to the design of engines and engine Internal combustion and other engines. System design, principles of operation, Setting the basis of the budget. The budget cycle and indicators of operation. Engine test - equipment, methods, Standards and interrogation techniques and the formation of the report. Application of motor tractors, combine harvesters, motor vehicles and stationary plants. |
| 1. Teaching methods

The method of oral presentations and discussions. Methods of presentations, demonstrations, simulations, drawing and illustration. Consultation and seminar papers. The method of practical work in laboratories and institutes. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam  | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Oral part of the exam* | Yes | 45 |
| Test | Yes | 20 |  |
| Exercise attendance | Yes | 5 |
| *Term paper* | Yes | 25 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | H.N. Gupta | Fundamentals of Internal Combustion Engines | PHI Learning Pvt. Ltd. | 2006. |
|  | Anthony John Wharton | Diesel Engines | Butterworth-Heinemann | 1991. |
|  | Liljedahl, J. B.; Turnquist, P. K.; Smith, D. W.; Hoki, M. | Tractors and their power units | Springer | 1996. |

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| Course: | **Exploatation of Production Systems** |
| Course id:3OAИ8O33 |
| Number of ECTS: |
| Teacher: | Jan, J, Turan |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 4 | Practical classes: 2 | Other teaching types: | Study research work: | Other classes: |
| Precondition courses | None |
| 1. Educational goal

The aim of the course is to familiarize students with the methods and ways of exploiting the production system and recognizing the problems of exploitation in the field. |
| 1. Educational outcomes

After taking the course, students acquire the knowledge which has enable proper exploitation and utilization of the production system in agricultural production. |
| 1. Course content

Classification and energy performance of business machines and aggregates; Basis for selection of operating speed; Types and characteristics of the machine-tractor assemblies; Calculation methods of composition machine-tractor assemblies; Kinematics of aggregates; Productivity machine aggregates; Labor productivity and efficiency of fuel consumption; Optimization of transport system in agriculture; Optimization reloading-transport systems in agriculture; Optimization of technological and production systems; Basics dealer system in agricultural engineering; The scaling operation with machine aggregates. Exploitation of aggregates of primary and tillage; Exploitation of aggregates for fertilization; Exploitation of aggregates for sowing and planting; Exploitation of aggregates for the care and protection of plants; Exploitation of aggregates for storing hay and silage; Exploitation of aggregates for harvesting and harvesting grain crops; Exploitation of aggregates extraction sugar beet and potatoes; Exploitation of aggregates for work in orchards and vineyards; Exploitation of aggregates to work in livestock production; Exploitation of facilities and plants on the farm. |
| 1. Teaching methods

Practical teaching: Exercise, Other modes of teaching, Study Research, Design of papers in the field of processed at the lecture, the application of a method of measuring the exploitation of the generating system. Troubleshooting optimization of the composition and functioning of individual production systems. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 10 | *Theoretical part of the exam* | Yes | 50 |
| Test | Yes | 15 |  |
| Exercise attendance | Yes | 10 |
| *Test, Term paper* | Yes | 15 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Turan, J. | Exploitation of production systems (In Serbian Eksploatacija proizvodnih sistema) | Poljoprivredni fakultet, Novi Sad | 2009 |
|  | Vojvodić, N., Malinović, N., i dr | Agricultural Machinery (In Serbian Poljoprivredne mašine) | Nevkoš Novi Sad | 1998 |
|  | Zelenović, D | Production systems design (In Serbian Projektovanje proizvodnih sistema) | Naučna knjiga, Beograd | 1987 |
|  | Kostić, S. | Psychology (In Serbian Psihologija rada) | Naučna knjiga, Beograd | 1986 |
|  | Lazić, V., Turan, J. | Exploitation of aggregates in tillage (In Serbian Eksploatacija agregata za osnovnu obradu zemljišta) | Poljoprivredni fakultet, Novi Sad | 1997 |

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| --- | --- |
| Course: | **Repair and Maintenance of Technical Systems** |
| Course id:3ОАИ8О34 |
| Number of ECTS:4 |
| Teacher: | Prof. Dr. Milan Tomić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures:3 | Practical classes:3 | Other teaching types: | Study research work: | Other classes:1 |
| Precondition courses | None/navesti ako ima |
| 1. Educational goal

The aim of the course is to introduce students with problems in the maintenance of proper working. To master the applied technology in the maintenance of working propriety. Finally, to be able to develop technologies maintenance of proper. |
| 1. Educational outcomes

The ability of the candidate-student to perceive the problem of maintenance of proper technical systems and the possibility of giving concrete solutions in order to improve performance anticipated operations. |
| 1. Course content

Theoretical classesBasic concepts of machine repairs, malfunction and reliability. Analysis of technical failures, testing, character effects, causes and consequences. Fundamentals of tribology, lubricants and lubrication. Corrosion. The role and task of system maintenance of proper techniques. The technological processes of repair parts for agricultural machinery, mechanical procedures, welding, plastification and metallization. Technical maintenance and diagnostics, agricultural techniques. Application of documentation and information systems. Inventory management of spare parts.Practical classes: Exercise, Other modes of teaching,The work on the disassembly-assembly activities (use of tools). Defect specific parts of agricultural machinery and analysis of wear (the use of measurement equipment). Practical work on the implementation of the operations of technical maintenance of agricultural machinery. Introducing the diagnostic equipment (brakes for the engines, tightness of piston cylinder assembly, compression, diagnostics high pressure pumps). Getting to know the equipment for the regeneration of machine parts. |
| 1. Teaching methods

Lectures with the use of video presentations, demonstration exercises in laboratory and field conditions, assignments, lab and seminar work, testing under laboratory and field conditions and consultation within the lectures and exercises. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam (izabrati) | Mandatory | Points |
| Lecture attendance | Yes | 5 | Oral part of the exam and Written part of the exam-tasks and theory | Yes | 50 |
| Test | No |  |  |
| Exercise attendance | Yes | 25 |
| Graphic work | Yes/No | 20 |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | Kobbacy, Khairy Ahmed Helmy, Murthy, D. N. Prabhakar (Eds.) | Complex System Maintenance Handbook | Springer | 2008 |
|  | Mónica Águila Martínez-Casariego, Kirsty Ormerod, Mark Liddle, Gediminas Vilkevicius, Ellen Schmitz-Felten | Maintenance in Agriculture -A Safety and Health Guide | Luxembourg: Publications Office of the European Union | 2011 |

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| Course: | **Design of Agro-industrial Plant** |
| Course id: 3ОAI8О35 |
| Number of ECTS: 4 |
| Teacher: | Todor V. Janić |
| Course status | Mandatory |
| Number of active teaching classes (weekly) |
| Lectures: 3 | Practical classes: 4 | Other teaching types: - | Study research work: - | Other classes: 2 |
| Precondition courses | None |
| 1. Educational goal

Provide students with the specifics of the theoretical and practical requirements in the field of drafting, technical control and audit of technological and mechanical design documentation. |
| 1. Educational outcomes

Competence can build and manage all kinds of technological and mechanical documentation agro-industrial plant. Development of technical control and audit of projects. |
| 1. Course content

Purpose and principles of design. Design of agro-industrial plant. Technical, economic and other conditions for the design. System approach to design. The system, subsystems and components of the system. System models. The selection and definition of system design. Methods for designing. Previous analyzes of agro-industrial system - general technological requirements (mode and preserve the quality of the product), program and scope of work, interpersonal influences work processes, availability and needs equipment, transport and movement of materials, the availability of energy. Determining the degree of automation. Requirements for environmental and working environment. The Terms of Reference. The scope, method of preparation and content of the project study. The choice of location for setting agroindustrujskih drives (micro and macro location). Layout plan. Infrastructure substrate. Specific technological and technical requirements. Subsystems agro- industrial drive. The design procedure. Technological solutions work. Making technological schemes of work agro-industrial plant. Method of making engineering calculation and selection of the required number and capacity of production and other equipment. Choice of standard equipment. Equipment layout - Intermittent, continuous and combined systems. Determine the number of jobs and workers. The basic principles of deployment of machines, jobs and land. Defining the need for manipulation of materials in the agro-industrial plants. Movement of materials. The movement of people. The interdependence of internal transport and deployment of equipment. Criteria for the selection of the transport system. The choice of the number and capacity of transportation equipment. The final calculation of the necessary surface - situational and dispositional plan layout of equipment. The type and extent of the energy needs for the operation of technological equipment (installed capacity). Production of building a base for making objects, platforms, access and manipulation of roads, infrastructure connections (water, atmospheric and internal sewerage, electricity supply, telecommunications connections, etc.) Defining the technological requirements for the microclimate conditions in certain areas of agro-industrial drives (temperature, air composition (humidity, dustiness, etc.), ie, the degree of ventilation / air conditioning, natural and artificial lighting, etc.). Design and methods of system analysis. Design in accordance with the Law on Planning and Construction. The concepts. Interpretation of the planning documents. Information about the location and the location permit. Content and type of technical documentation. Feasibility Study. General project. Preliminary design. Main project. Detailed design. General and technical conditions in the major technological and mechanical projects. Technical control. Construction of the plant. Fire, explosion and safety at work. Environmental impact assessment. Environmental precautions. Basic concepts related to investments. Design and planning of the drive. System analysis and system design and planning. Material management. Manage costs. Project Management. The realization of the project, project structuring, project organization, project implementation and control of the project closure. Computational tools for the creation and management of the project. Risks and determination of risk in the projects. |
| 1. Teaching methods

Practical work is focused on the design, ie. budgeting, equipment selection, graphical and textual description. |
| Knowledge evaluation (maximum 100 points) |
| Pre-examination obligations | Mandatory | Points | Final exam | Mandatory | Points |
| Lecture attendance | Yes | 5 | *Oral exam* | Yes | 51 |
| Test | Yes/No | - |  |
| Exercise attendance | Yes | 4 |
| Seminar | Yes | 40’ |
| Literature  |
| Ord. | Author | Title | Publisher | Year |
|  | T. Janić | Design-Agroind-industrial drives - the script (In Serbian Projektovanje agroindu-strijskih pogona – skripta) | Poljoprivredni fakultet, Novi Sad | 2012. |
|  | D. Tolmač  | Design of technological systems - production systems (In Serbian Projektovanje tehnoloških sistema – proizvodni sistemi) | Tehnički fakultet "Mihajlo Pupin", Zrenjanin | 2008. |
|  |  | Laws, regulations, ordinances, norms and standards |