SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING OF APPLIED STUDIES IN BELGRADE

The main goals of basic vocational studies “Environmental Engineering” is:

- to application of European and world standards, organizes high-quality studies in the field of Ecological engineering;
- to constantly innovated the teaching methods in accordance with the current world trends
- - to developing the knowledge and skills in the field of monitoring the environmental protection, sustainable energy, energy efficiency and ecological acquisition and rational energy consumption
- - to developing the knowledge of waste management, possibilities of waste use, ways of preventing and reducing the harmful effects on the environment;
- to trained professional staff of the adoption, implementation and control implementation of normative acts that define the field of environmental protection
- -to training students for team work on environmental issues

Syllabus of study program Environmental Engineering

No.	Course Title	Semester	ECTS
FIRST YEAR			
1.	Mathematics in Engineering	1.	7
2.	Electrical Engineering	1.	7
3.	English Language	1.	4
4.	German Language	1.	4
5.	Physics	1.	6
6.	Materials and Components in Electrical Engineering	1.	6
7.	Fundamentals of Manegements	1.	6
8.	Basics of Electric Power Engineering	2.	6
9.	Internet Services	2.	6
10.	Mechanics	2.	6
11.	Basics of Computer Science and Computing	2.	6
12.	Application Software	2.	6
13.	Ecological Regulations	2.	6
Total ECTS			60
SECOND YEAR			
1.	Physical and Chemical Processes in Recycling	3.	6
2.	Business Plan	3.	6
3.	Environmental Management	3.	6
4.	Electronic and Electrical Waste Management	3.	6
5.	New Energy Technologies	3.	6
6.	Sustainable Development	3.	6
7.	Measurments 1	4.	6
8	Protection Against Ionizing and Non-Ionizing Radiation	4.	6
9.	Modern Methods of Air Depuration in Industry	4.	6
10.	Discrete Mathematics	4.	6
11.	Protection Against Noise and Vibration	4.	6
12.	Waste-to-energy Production	4.	6
Total ECTS			60
THIRD YEAR			
1.	Projects Management	5.	6
2.	Real Time Control Systems	5.	6
3.	Probability and Statistics	5.	6
4.	Database Systems	5.	6
5.	Recycling Technologies	5.	6
6.	Student Internship	5.	4
7.	Wastewater Treatment Systems	6.	6
8.	Environmental Protection	6.	6
9.	Recycling Processes Control	6.	6
10.	Environmental Monitoring	6.	6
11.	Renewable Energy	6.	6
12.	Final Thesis	6.	8
Total ECTS			60
Total ECTS (first, second and third year)			180

Book of the courses

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Mathematics in Engineering

Course Status: Compulsory

Nuber of ECTS: 7

Requirements: None

Course Objectives:
Master matrix, systems of equations, statements, functions, and integrals to allow monitoring of professional electric engineering subjects and extending the mathematical knowledge.

Course Otucomes:
Students will be ableto solvecomplex mathematicaltasks related to theapplication of modernmathematicalmethods in theElectrical Engineeringfield.

Course Content:
Theoretical instruction:

1. Real and complex numbers.
2. The concept of matrix characteristics and operations.
3. The concept of determinants and characteristics. Methods for calculation.
4. Matrix inverse.
5. Solving systems of linear equations. Gaussian, Kramer and matrix methods.
6. Functions: definition, basic properties, limit value
7. Functions: continuity and asymptotes.
8. Colloquium 1
9. Derivative of functions.
10. Differential functions.
11. Monitoring performance of functions and drawing graphics.
12. Indefinite integrals.
13. Definite integrals.
14. Use of integrals.
15. Colloquium 2

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical classes follow a teaching program and go through the exercises in computer laboratory using software packages Octave and Maxima.

Textbooks and References:

1. Savic, Z. Miskovic, A. Zekovic, *Matematika 1-udzbenik,* Visoka skola elektrotehnike i racunarstva, Beograd, 2010.
2. Savic, A. Zekovic, Matematika 1-prirucnik za laboratorijske vezbe, Visoka skola elektrotehnike i racunarstva, Beograd, 2010.
3. Kovacevic, Z. Miskovic, A. Savic, Matematika za inzenjere, Visoka skola elektrotehnike i racunarstva, Beograd, 2008.
4. Z. Miskovic, I. Kovacevic, A. Savic, *Zbirka resenih zadataka iz matematike sa pismenih ispita,* Visoka skola elektrotehnike i racunarstva, Beograd, 2007.
5. I. Kovacevic, A. Savic, *Matematika-prirucnik za laboratorijske vezbe,* Visoka skola elektrotehnike i racunarstva, Beograd, 2008.

Instruction methods: Lectures, calculation exercises, laboratory exercises, consultations, term papers, defense laboratory exercises and written exam, oral exam.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	*10*	Written exam	*0*
Practical work	*10*	Oral exam	*29*
Preliminary exams(s)	*51*		
Seminar(s)	*0*		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Electrical Engineering

Course Status: Compulsory

Nuber of ECTS: 7

Requirements: None

Course Objectives:
Acquisition of basic knowledge in the field of electrical engineering

Course Otucomes:
Knowledge of operation and characteristics of generators, resistors, coils and capacitors in the networks with a time constant and alternating currents.

Course Content:
Theoretical instruction:

1. Electrostatics Coulomb's law, electric field vector, the electric potential.
2. Electrostatics Potential difference and voltage, capacitors and capacitance.
3. Electrical networks with a time constant currents Electric current, electric circuits, resistance, resistors and conductors.
4. Electrical networks with a time constant currents Electrical work and power, sources of electric current; Kirchhoff's laws.
5. Electrical networks with a time constant currents Solving electrical networks; electrical networks theorems: superposition theorem
6. Electrical networks with a time constant currents Thevenin`s theorem
7. Colloquium 1
8. Electromagnetism Magnetic field, magnetic field of current contours in the vacuum
9. Electromagnetism Magnetic properties of materials, electromagnetic induction
10. Electromagnetism Inductive elements and inductance
11. Electrical networks with alternating currents Electrical network with alternating currents, R (resistive) elements (serial and parallel connection of resistors)
12. Electrical networks with alternating currents L (inductive) and C (capacitive) elements (serial and parallel connection); power and power factor
13. Electrical networks with alternating currents Basic notions during the change of the working regime in electrical networks
14. Electrical networks with alternating currents Solving electrical networks;
15. Colloquium 2

Practical instruction (Problem solving sessions/Lab work/Practical training):
Introduction to the software package Electronics Workbench (EWB). The basic elements, the sources of power supply, indicators and instruments in EWB. Ohm's law. Kirchhoff's laws. Thevenin`s theorem . Resistor in the circuit of alternating current (AC circuit). Capacitor in AC circuit. Electromagnetic coil in AC circuit. Serial RLC circuit. Parallel RLC circuit.

Textbooks and References:

1. SurutkaJ., Osnovi elektrotehnike-elektrostatika, stalne jednosmerne struje, Akademska misao, Beograd, 2005.
2. SurutkaJ., Osnovi elektrotehnike-elektromagnetizam, Akademska misao, Beograd, 2002.
3. SurutkaJ., Djekić M., Osnovi elektrotehnike-naizmenične struje, Tehnički fakultet, Čačak, 2000.

Instruction methods:
Lectures, problem solving sessions, laboratory exercises, assignments, consultations, colloquiums, knowledge tests, final exam.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	*10*	Written exam	*30*
Practical work	*10*	Oral exam	
Preliminary exams(s)	*50*		
Seminar(s)			

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: English Language

Course Status: Elective

Nuber of ECTS: 4

Requirements: none

Course Objectives:
Is to train students to be able to communicate in English using general or professional terms

Course Outcomes:
In the end of semester students will be able to communicate in English and to use professional literature

Course Content:
Theoretical instruction:

1. Everyday uses of computers. Types of computers
2. Parts of computer. Keyboard and mouse
3. Interview: Student. Input devices
4. Output devices. English tenses – active form
5. Storage devices. Graphical user interface
6. Interview: Computing support assistant. English tenses – continuous form
7. Networks. Communications
8. The Internet 1: E-mail and newsgroups. The passive voice
9. The Internet 2: The World Wide Web. Interview: The website designer
10. World processing. Databases and spreadsheets
11. Graphics and multimedia. Indirect speach
12. Programming. Interview: Analyst/programmer. Low-level systems
13. Future trends. Sequence of tenses
14. Interview: IT Manager. Issues in computing
15. Careers in computing. Interview: Systems manager

Practical instruction (Problem solving sessions/Lab work/Practical training):
Reading, writing, pronunciation and listening acording to class subject

Textbooks and References:

1. V. Jokanović, Practice English, Visoka škola elektrotehike i računarstva strukovnih studija, Beograd, 2015.
2. E. H. Glendinning, J. McEwan, Basic English for Computing, Oxford University Press, 2001.

Instruction methods: Lectures, calculation exercises, laboratory exercises, consultations, term papers, defense laboratory exercises and written exam, oral exam.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	*10*	Written exam	*30*
Practical work		Oral exam	
Preliminary exams(s)	60	.....	
Seminar(s)			

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: German Language

Course Status: Elective

Nuber of ECTS: 6

Requirements: none

Course Objectives:
Overcoming the most frequent form of vocabulary, spelling and basic phonological rules, as well as the base of grammar competence.

Course Outcomes:
Upon completion of this course, students will be able to understand simple (written and spoken) texts as well as to conduct simple (written and oral) communication. On this first level, students will master the language to the extent that they can deal with everyday situations.

Course Content:
Theoretical instruction:

1. Normative grammar of the German language - personal and confessional substitutes,
2. An indefinite and indefinite member,
3. Declination of members, adjectives, nouns and personal substitutes,
4. Singular and plural nouns, negations with "nicht" and "kein",
5. Conjugation of the most frequent verbs in the present,
6. The position of the verb in the sentence,
7. Colloquium 1
8. Explicit and questionable sentences, attachments for the place, time and manner
9. Structing vocabulary necessary for finding out in everyday situations.
10. Presentation, familiarity, family members, origin, housing, colors, shopping,
11. Basic concepts in electrical engineering,
12. Electrical engineering in technique,
13. Basic concepts from computing,
14. Informatics and Computing.
15. Colloquium 2

Practical instruction (Problem solving sessions/Lab work/Practical training):
Exercises, discussion with students, dialogue / vocal exercises, check of acquired knowledge, analysis of practical work, consultations

Textbooks and References:

1. B.Monika, N..Daniela, P.Hiemstra, S.Reimann, M.Specht, Franz, *Schritte international 1* (Kursbuch + Arbeitsbuch + CD). Hueber Verlag, 2006.
2. K.Petra, K.Kienle, Isabel,*Schritte international 1*(Lehrerhandbuch). Hueber Verlag, 2006.
3. Двојезични речник (Langenscheidt, PONS)

Instruction methods: Lectures, calculation exercises, laboratory exercises, consultations, term papers, defense laboratory exercises and written exam, oral exam.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	*5*	Written exam	*25*
Practical work	5	Oral exam	*25*
Preliminary exams(s)	*40*		
Seminar(s)	*0*		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Physics

Course Status: Elective

Number of ECTS: 6

Requirements:none

Course Objectives:
Elementary knowledge of physics which is the base of technique.

Course Outcomes:
Increased level knowledge and application in defining, studying and managing processes and systems in physics and electrical engineering, as well as the ability for critical thinking, application of calculation methods, dimensional analysis, proper use of measurement units and presentation of knowledge (oral and written).

Course Content:
Theoretical instruction:

1. Twelve chosen lectures from the corpus of applicable physics.
2. Rotational motion kinematics.
3. Dynamics. Types of force. Law of changes in the amount of movement, law of inertia, law of action and reaction
4. Rotational motion dynamics
5. Oscillations and waves
6. Conservation laws (conservation of energy, conservation of linear momentum, conservation of angular momentum).
7. Colloquium 1
8. Mechanics of fluids (pressure, fluid pressure in idle state, thrust, flow of ideal fluids).
9. Thermophysics (temperature and heat, kinetic theory of gases, equation of state of ideal gas and gas laws).
10. Thermodynamics (first and second law of thermodynamics, Karno cycle)
11. Electrostatics
12. Electromagnetism
13. Quantum properties, wave nature of matter, quantum mechanics.
14. Basics of atomic and atomic physics, radioactivity
15. Colloquium 2

Practical instruction (Problem solving sessions/Lab work/Practical training):

1. Auditory lectures.
2. Frontal experiments

Textbooks and References:

1. V.Babovic,V.Sajfert, Odabrane lekcije iz fizike, Visa elektrotehnicka skola, Beograd, 2002.
2. V.Babovic, Radna sveska iz fizike, Visa elektrotehnicka skola, Beograd, 2002.

Instruction methods:
Lectures,discussions,term papers, slvin of problems, frontal experiments.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	10	Written exam	65
Practical work		Oral exam	
Preliminary exams(s)			
Seminar(s)	25		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Materials and Components in Electrical Engineering

Course Status: Elective

Number of ECTS: 6

Requirements: None

Course Objectives:
Acquiring basic knowledgeof materials and components in electrical engineering.

Course Otucomes:
After completing this course students will have basic knowledgeof materials and components in electrical engineering and should be able to work independently in laboratory with passive components, power cables and fiber-optical connectors.

Course Content:
Theoretical instruction:

1. Basic notions about the matter. Atomic structure of the matter.
2. Structure of the atom. Chemical bonds. State of aggregation. Crystal grid.
3. Semiconductors: microstructure, main representatives and application.
4. Conductors: microstructure, main representatives and application.
5. Superconductors: microstructure, main representatives and application.
6. Dielectrics: microstructure, main representatives and application.
7. Magnetics: microstructure, main representatives and application.
8. Methods and devices for testing materials and components.
9. Passive electronic components: resistors, capacitors, coils.
10. Resistors, types of resistors and their marking.
11. Capacitors. Types of capacitors, various ways of marking capacitors.
12. Coils. Transformers. Relays.
13. Power cables and cable accessories.
14. Optical cable and optical fiber. Fiber-optical connectors.
15. Optical transmitters and receivers and other elements of fiber-optical systems.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Are performed in a hardware laboratory with the active participation of students. Students independently or with the help of teachers solve tasks in the field of passive components, power cables and optical cables.

Textbooks and References:

1. Petrović V., Kisić E.Elektrotehnički materijali i komponente - priručnik, VIŠER, Beograd, 2016.
2. Ramović R. i dr. Zbirka zadataka iz elemenata elektronskih uređaja, Elektrotehnički fakultet, Beograd, 2012.
3. P.Osmokrović, Elektrotehnički materijali, Akademska misao, Beograd, 2003.

Instruction methods:
Lectures, auditory excercises and laboratory excercises. Confirmation of knowledgeis conducted through three colloquial exams, seminar papers, written and verbal examination.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	5	Written exam	30
Practical work	25	Oral exam	
Preliminary exams(s)	40		
Seminar(s)			

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Fundamentals of Management

Course Status: Elective

Number of ECTS: 6

Requirements: None

Course Objectives:
The aim of this course is to acquiring theoretical and practical knowledge and modern methods and techniques which can be used in the field of business systems

Course Otucomes:
After completing this course, students will be able for using knowledge, modern methods and techniques in the process of planning, organizing, managing and controlling the various operations, enterprise, organization system parts and / or. organizational system as a whole.

Course Content:
Theoretical instruction:

1. Definition of Management Processes
2. History management development
3. Process control
4. Functional fields of management
5. Sub-Process -Planning
6. Sub-Process -Organizing
7. Sub-Process -Recruitment
8. Sub-Process - Leadership
9. Sub-Process -Control
10. Manager
11. Leadership
12. Inovation management
13. Change management
14. Communications management
15. Knowledge management

Practical instruction (Problem solving sessions/Lab work/Practical training):
Methods and techniques for the implementation of the process of planning, organizing, leading and controlling. Models of organization. Decision-making and modern methods for making business decisions. Quality as a competitive advantage. Contemporary theories of motivation .The roles and tasks of managers. Building a career. Stress management. Groups and converting groups in effective teams. Case studies.

Textbooks and References:

1. Ž. Vasić, D. Sajfert, M. Jevremović:Osnovimenadžmenta, VIŠER, Beograd, 2013.
2. Petar Jovanović: Menadžment, teorija i praksa, FPM, Beograd, 2015.
3. Chuck W., Principi menadžmenta, DataStatus, Beograd, 2013.

Instruction methods:
Lectures, problem solving sessions, assignments, consultations, preliminary exams, knowledge tests, final exam.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	*5*	Written exam	*30*
Practical work	*15*	Oral exam	
Preliminary exam(s)	*50*		
Seminar(s)			

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Basis of Electrical Power Engineering

Course Status: Elective

Number of ECTS: 6

Requirements: Knowledge of basic concepts in electrical engineering and mathematics.

Course Objectives:
To provide students with basic knowledge of electric power engineering.

Course Outcomes:
To apply basic knowledge of electrical power engineering.

Course Content:
Theoretical instruction:

1. Introductory lecture (the organization and content of the course). Introduction to basic of electrical power engineering. Fundamentals of electromechanical energy conversion.
2. Three-phase electric power. Energy and Environment.
3. Energy sources. None and renewable energy. Electrical energy.
4. Electrical power system.
5. Power plants.
6. Conventional and unconventional power plants.
7. Transmission and distribution of electrical energy.
8. Electrical installations.
9. Electrical energy converters.
10. Transformers.
11. Electrical machines. Induction machines.
12. Synchronous machines.
13. Direct-current machines.
14. Distribution network remote control.
15. Preliminary exam.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical training program follows the lecture.

Textbooks and References:

1. M. Milanković, D. Perić, I. Vlajić-Naumovska, *Basic of Electrical Power Engineering*, College of Electrical Engineering, Belgrade, 2016. (in Serbian)
2. I. Vlajić-Naumovska, M. Ivezić, B. Čupić, Basic of Electrical Power Engineering - manual for laboratory exercises, College of Electrical Engineering, Belgrade, 2016. (in Serbian)
3. G. Dotlić, Power Engineering - through standards, laws, regulations and technical recommendations, SMEITS, Belgrade, 2013.

Instruction methods:
Lectures, problem solving sessions, laboratory exercises, assignments, consultations, preliminary exams, knowledge tests, final exam.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	10	Written exam	65
Practical work		Oral exam	
Preliminary exams(s)			
Seminar(s)	25		

Study Program: Environmental Engineering
Type and Level of Studies: Basic applied studies, First level of higher education
Course Title: Internet Services
Course Status: Elective
Number of ECTS: 6
Requirements: None
Course Objectives: The aim of the course is to introduce students to the emergence and development of the Internet and the most important Internet services.
Course Outcomes: Students are trained for independent professional use of the most important Internet services.
Course Content: *Theoretical instruction:* 1. The origins and development of the Internet. 2. Connecting to the Internet: permanent and temporary access (specific).Dial-up access. DSL access. 3. Broadband Internet: Access via GPRS and G3 cellular networks. Wireless access. 4. URL. Domains. Registration of international and domestic domains. 5. The syntax on the Internet. 6. E-mail service. 7. SPAM. Viruses. 8. The first test. 9. Conference (news) service. 10. Web service. Search the Web. Advanced search. 11. FTP service: file transfer. FTP servers. Access servers. 12. Service telnet: telnet access servers from a Windows environment. Access toservers over the Internet client Neterm. Options telnet service. 13. Internet telephony: Similarities and differences between traditional and Internet telephony. Equipment for Internet telephony. Internet clients (NetMeeting, Skype). 14. Voip. 15. Other preliminary exams. *Practical instruction (Problem solving sessions/Lab work/Practical training):* Practical classes are held in the computer lab, connected to the LAN and the Internet.
Textbooks and References: 1. Dr Predrag Staletić: Priručnik iz internet servisa, VISER, Beograd, 2011.
Instruction methods: Lectures, problem solving sessions, laboratory exercises, assignments, consultations, preliminary exams, knowledge tests, final exam.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	/	Written exam	10
Practical work	10	Oral exam	60
Preliminary exams(s)	/		/
Seminar(s)	30		30

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Mechanics

Course Status: Elective

Number of ECTS: 6

Requirements: None

Course Objectives:
Introduces students to the basic notions and concepts of kinematics and dynamics; make them ready to understand the problems and fields that implement mechanics (like control and automation).

Course Otucomes:
Student will be capable of understanding problems of control and automation (where mechanics is applied) and individually solving simpler problems of statics, kinematics, and dynamics (including the formulation of mathematical models that will be used in the analysis and synthesis of control). Understanding the basic principles will allow student to efficiently use the literature in solving more complex problems.

Course Content:
Theoretical instruction:

1. Introduction.
2. Statics.Notionofforce (actionandreaction).
3. Equilibrium of forces: planar system of forces.
4. Equilibrium of forces: spatial system of forces.
5. Kinematicsofaparticle.Positionandmotion.
6. Coordinateframes (Cartesian, cylindrical, spherical, naturaltrihedron).
7. Velocityandacceleration.
8. Dynamicsof a particle.Force and motion – Newton's law (in terms of vectors and in different frames).
9. Oscillations.
10. Work, power, and energy.
11. Rotational movement.Angularvelocityandacceleration.
12. Dynamicequationofrotation. Kineticenergyofrotarymotion.
13. Theorems-lawsofconservation.Lawofmomentum. Lawofangularmomentum.
14. Lawofenergy.
15. Impact theory.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Follows the lectures.

Textbooks and References:

1. D.Mikičić, D.Popović, Mehanika, Građevinska knjiga, Beograd, 1993
2. D.Popović, D.Mikičić, Zbornik zadataka iz mehanike, Građevinska knjiga, Beograd, 1985.

Instruction methods:
Lectures, problem solving sessions, laboratory exercises, assignments, consultations, mid-termtest and Final test.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities		Written exam	40
Practical work		Oral exam	
Preliminary exams(s)	40		
Seminar(s)	20		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Basics of Computer Science and Computing

Course Status: Elective

Nuber of ECTS: 6

Requirements: None

Course Objectives:
Acquiring basic knowledge of informatics, architecture of computer, computer system and its components and prerequisites for programming.

Course Otucomes:
After completing this course students will have basic knowledge about structures of data, system software, architecture and organization of computer and capability of defining procedure for solving tasks through designing algorithms using basic structures of programming.

Course Content:
Theoretical instruction:

1. Introduction to computer processing of information. Historical development of computer resources.
2. Introduction to information systems. Definition and types, methods of projecting information systems.
3. Modern programming tools.
4. Operating systems, historical review and modern operating systems.
5. General model of computer system. Functional block scheme of computer. Hierarchical model of computer system.
6. Mathematical basics of computer. Number systems. Conversions from one number system to another.
7. Binary number system. Signed and unsigned numbers.
8. Inscription in format of fixed and moving comma. Basic arithmetical operations in binary number system.
9. Inscription in code "8421" and "more 3 ". Arithmetical operations on binary coded numbers.
10. Electronic basis of computer. Logical operations, basic logical circuits and nets . Decoders, multiplexers, semi adders, adders.
11. Computer hardware. Simplified architecture of computer. Buses, input, output and memory access.
12. Peripheral units. Modes of transfer input/output data. Devices for input and publishing of data.
13. Basics of programming. Solving of tasks using computers.
14. Algorithms. Quality of algorithms. Methods for describing of algorithm: flow chart. Basic programming structures.
15. Protection of computer resources and systems.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Follows the lectures.

Textbooks and References:

1. V Petrović, Obradović S. M. Mijalković, *Osnovi informatike i računarstva*, VISER, Beograd, 2009.
2. V Petrović, *Osnovi informatike i računarstva-priručnik*, VISER, Beograd, 2010.
3. Prokin D., Petrović V., Mijalković M., *Zbirka zadataka iz Osnova računarske tehnike*, Viša elektrotehnička škola, Beograd, 2011.

Instruction methods:
Lectures, auditory exercises, laboratory exercises.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	10	Written exam	30
Practical work	20	Oral exam	
Preliminary exams(s)	40		
Seminar(s)			

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Application software

Course Status: Elective

Nuber of ECTS: 6

Prerequisites: Knowledge of computer operating system, file management.

Course Objectives:
Students will be able to use standard application software and involment in the digital society.

Course Otucomes:
Students will understand the principles of the use of application software and know how to use programmes for word processing, presentation and cross calculations, using the basic Internet service, and to combine the implementation of various programs.

Course Content:
Theoretical instruction:

1. Introductory lecture (the organization and content of the course).
2. Entering and editing text, formatting text, characters, paragraphs and pages.
3. Advanced word processing techniques. Embedding objects in the text.
4. Tables; Equation.
5. Presentations. Basic rules to create and display presentations, making slide.
6. Presentations. Handling components slide. Installation of object. Animation.
7. Spreadsheets. Basic concepts.
8. Colloquium 1
9. Edit cell content, editing a worksheet; principle.
10. Formatting Spreadsheets. Examples.
11. Functions, basic application techniques.
12. Diagrams. Database.
13. Advanced techniques.
14. Combined use of different programs.
15. Colloquium 2

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical classes follow the program of lectures.

Textbooks and References:

1. R. Vukić, D. Perić, I. Vlajić-Naumovska, *Aplikativni softver*, VIŠER, Beograd, 2011., 3th Edition of handbook.
2. ECDL literature- Modules 3, 4, 6 and 7
3. On line preparation: www.ecdltest.rs

Instruction methods:
Lectures, problem solving sessions, laboratory exercises, assignments, consultations, preliminary exams, knowledge tests, final exam.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities		Written exam	*40*
Practical work		Oral exam	
Preliminary exam(s)	*20*		
Seminar(s)	*40*		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Ecological Regulations

Course Status: Elective

Nuber of ECTS: 6

Requirements: None

Course Objectives:
Introducing students to basic international and national regulations in the field of environmental protection, in particular EU regulations, international conventions of the United Nations and the Council of Europe and environmental legislation in the Republic of Serbia, especially those relating to environmental media (water, air, land, flora and fauna).

Course Otucomes:
To enable students to recognize the importance and the role of environmental regulations to protect the environment, ensuring sustainable development and the creation of the concept of sustainable communities.

Course Content:
Theoretical instruction:

1. The emergence and development of environmental regulations and environmental law
2. UN documents and their significance for the creation of global environmental
3. Council of Europe environmental regulations. Ecological regulations of the EU
4. The concept of sustainable development and sustainable communities in international legislative
5. The creation and development of environmental regulations in Serbia
6. First colloquium
7. Integrated Environmental Protection System in the Republic of Serbia
8. Internal part of an integral environmental protection system - Law about Environmental Protection
9. External part of an integral environmental protection system - Law about Environmental Protection
10. Specific laws and regulations relating to the protection of environmental
11. The relationship between environmental and energy regulations.
12. Energy Regulations in the Republic of Serbia.
13. Energy sources, efficiency, safety and renewable sources
14. Relationship between environmental law and environmental policies. Ecological policy of the EU and the Republic of Serbia
15. Second colloquium

Practical instruction (Problem solving sessions/Lab work/Practical training):
Through practical lessons, students will developed case studies about ecological regulations.

Textbooks and References:

1. Н. Драгојловић, Т. Мишчевић (ур.), *Животна средина*, Еврпски покрет у Србији, Београд, 2010.
2. Т.Мишћевић, М.Симурдић (ур), Енергетика, Европски покрет у Србији, Београд, 2010
3. Д.Миленковић, Право заштите животне средине, Виша политехничка школа у Београду, 2006
4. В. Јолџић, Еколошка политика – *од идеје до изградње међународног еколошког права*, Београд, 2008

Instruction methods:
Lectures, problem solving sessions, laboratory exercises, assignments, consultations, colloquiums, knowledge tests, final exam.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	*10*	Written exam	
Practical work	*20*	Oral exam	*50*
Preliminary exams(s)	*20*		
Seminar(s)			

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Physical and Chemical Processes in Recycling

Course Status: Elective

Nuber of ECTS: 6

Requirements: none

Course Objectives:
The adoption of basic knowledge on the physical and chemical characteristics of recyclable materials, students can independently monitor the engineering, material and energy flows in recycling technologies.

Course Outcomes:
Acquisition of engineering knowledge necessary for further training in the recycling field of metals, non-metals, polymers, composites. Introduction to process-technological aspects of obtaining useful components from waste, by-products and secondary raw materials.

Course Content:
Theoretical instruction:

1. The aim and importance of recycling. Recycling and sustainable development.
2. Collection, sorting and preparation of waste for processing. Material and energy balance.
3. Blending and separation. Metallurgical processing.
4. Recycle batteries and accumulators.
5. Specific flows of electrical and electronic waste.
6. Hazardous and radioactive waste.
7. Recycling of glass, ceramics and construction materials.
8. Recycle poly (vinyl chloride).
9. Recycling of polystyrene. Recycles ABS.
10. Recycling of polyamide.
11. Reticulation of thermosetting polymers.
12. Recycling of tires and other rubber products.
13. Recycling of paper and cardboard.
14. Recycling of packaging materials.
15. Economic and environmental aspects of recycling.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Basic chemical operations and separation methods, condensed state, chemical kinetics and equilibrium, electron transfer reactions, tour of the recycling plant for electronic waste.

Textbooks and References:

1. Hodolič J. i dr., Reciklaža i reciklažne tehnologije , Fakultet tehničkih nauka, Novi Sad, 2011.
2. Lund, H.F., Recycling Handbook, 2nd Edition,", McGraw-Hill, 2000.
3. C.P. Rader, S.D. Baldwin, D.D. Cornell, G.D. Sadler, R.F. Stockel, Eds., Plastics, Rubber and Paper Recycling: A Pragmatic Approach, ACS Symposium Series 609, ACS, Washington D.C., 1995
4. Rao, S.R., Resource Recovery and Recycling from Metallurgical Wastes, ELSEVIER, 2006.

Instruction methods:
Lectures, calculation exercises, laboratory exercises, consultations, term papers, defense laboratory exercises and written exam, oral exam.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	*10*	Written exam	*50*
Practical work	*20*	Oral exam	*0*
Preliminary exams(s)	*20*		
Seminar(s)	*0*		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Business Plan

Course Status: Elective

Nuber of ECTS: 6

Course Objectives:
Teach students basic ideas, concepts and the structure of business plan with the emphasis on the modern format of the business plan for a contemporary electronic business of small and medium enterprises.

Course Outcomes:
Students are being trained for critical and expert considerations of business of a future small and medium enterprise, as well as for preparation, organization and writing the business plan for the enterprise.

Course Content:
Theoretical instruction:

1. The concept of business plan.
2. Mission and vision.
3. Business processes and the enterprise description.
4. Business goals and objectives.
5. Market analysis (Marketing plan).
6. Analysis of competition.
7. Financial analysis (Financial plan).
8. Colloquium 1.
9. Risk analysis.
10. Phases, tasks and milestones in the project of an e-business.
11. Software based specification of business processes.
12. Executive summary.
13. Format and presentation of business plan.
14. Defending business plan in front of investors.
15. Colloquium 2.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Through practical classes, students will pass through case studies in which they will be able to use the acquired knowledge at the theoretical lessons in order to solve specific problems presented in these case studies.

Textbooks and References:
[1] M. D. Lutovac, D. V. Tošić, *Biznis plan za elektronsko poslovanje,* Beograd, VETŠ, 2006.
[2] M. D. Lutovac, D. V. Tošić, *Priručnik: Biznis plan za elektronsko poslovanje,* Beograd, VETŠ, 2007.

Instruction methods:
Lectures. Laboratory work.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities		Written exam	40
Practical work		Oral exam	
Preliminary exam(s)	20		
Seminar(s)	40		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Environmental Management

Course Status: Elective

Number of ECTS: 6

Requirements: None

Course objectives:
To familiarize students with basic environmental problems as well as problems arising from inadequate environmental management. Insight opportunities through the implementation of environmental management elements and functions of the management system, as well as the integration of environment and development in the economic, social and political dimensions of society.

Course Outcomes:
Acquiring knowledge through which students are trained for implementation modern management models for purposes of environment protection, both at micro and macro levels of observation.

Course Content:
Theoretical instruction:

1. Principles and key concepts of environmental management
2. Regional and global environmental problems
3. Dilemmas and opportunities of environmental management
4. Establishment of Environmental Management
5. Overview of the functions of environmental management
6. Application management aspects of environmental issues
7. Colloquium 1
8. The impact of production activities on the environment.
9. Protecting the environment from the impact of the production, transmission and distribution of electric power systems
10. Modeling system of environmental management according to ISO 14 000
11. Strategic approach to solving global environmental problems.
12. Management of hazardous and non-hazardous waste management
13. Ecosystem approach in ecological management.
14. The role of education and scientific research (fostering innovation) in the management of the environment.
15. Colloquium 2

Practical instruction (Problem solving sessions/Lab work/Practical training):
Through practical classes, students will pass through case studies in which they will be able to use the acquired knowledge at the theoretical lessons in order to solve specific problems presented in these case studies.

Textbooks and References:

1. Petrović N., Ekološkimenadžment, FON, Beograd, 2016.
2. Spellman F. Handbook of Environmental Engineering, by Taylor & Francis Group, LLC, NY, 2016.

Instruction methods:
Lectures, problem solving sessions, laboratory exercises, assignments, consultations, preliminary exams, knowledge tests, final exam.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	10	Written exam	
Practical work	20	Oral exam	50
Preliminary exam(s)	20	.....	
Seminar(s)			

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Electronic and Electrical Waste Management

Course Status: Elective

Number of ECTS: 6

Requirements:

Course Objectives:
Acquiring knowledge and skills on electronic and electrical waste management.

Course Outcomes:
Knowledge and skills for the implementation of the systemic approach to waste management at the local and regional level, selection of waste treatment methods and optimization of the electronic and electrical waste management system in the function of environmental quality.

Course Content:
Theoretical instruction:

1. Basic concepts and definitions concerning waste.
2. Types of waste.
3. Keeping natural resources - sustainable development.
4. Defining electronic and electrical waste.
5. Categories of electronic and electrical equipment.
6. Categorization of waste based on the characteristics of waste, selection of authorized collectors / processors / warehouses / carriers / exporters of waste.
7. Colloquium 1
8. Electronic and electrical waste management.
9. Treatment and disposal of electronic and electrical waste.
10. Recycling of electronic and electrical waste, recycling effects.
11. Display of electronic and electrical waste management in EU.
12. Standards, laws and regulations, strategies and action plans for electronic and electrical waste management in the Republic of Serbia.
13. Tools for electronic data management on waste.
14. Mechanisms of fees and subsidies in the waste management system.
15. Colloquium 2

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical training program follows the lecture.

Textbooks and References:

1. Ilić, M., Miletić, S, Osnovi upravljanja čvrstim otpadom, Beograd, 2002
2. Šimon A. Đarmati, Menadžment otpada, Fakultet za primenjenu ekologiju, Beograd, 2008.

Instruction methods:
Lectures, auditory exercises, laboratory exercises, consultations, written exam

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	10	Written exam	30
Practical work	10	Oral exam	20
Preliminary exam(s)	20		
Seminar(s)	10		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: New Energy Technologies

Course Status: Elective

Number of ECTS: 6

Requirements: Knowledge of basic concepts of Electrical engineering and Electroenergetic engineering allows the successful monitoring of teaching.

Course Objectives:
Introduction to basic knowledge of energetics and new energy technologies.

Course Outcomes:
Students will be able to apply basic knowledge of energetics and new energy technologies and to overcome narrow teaching of vocational study programs..

Course Content:
Theoretical instruction:

1. Introductory lecture (the organization and content of the course). Basic values: speed, speed of rotation, force, momentum, work, energy, power. The units for energy and power.
2. Classification of forms of energy. The primary, transformed and useful forms of energy.
3. Electric energy. Power system.
4. Introduction to renewable energy: solar, water, wind, biomass, biodiesel and biogas.
5. Non-renewable forms of energy: coal, oil, gas, nuclear fuel, geothermal energy.
6. Unconventional forms of energy.
7. Transformation of primary energy sources in more convenient forms of energy.
8. Preparation and processing of coal, petroleum refinery processing, nuclear fuel cycles.
9. Transport of energy.
10. The distribution of energy.
11. Electricity market. Basic concepts. Regulatory Agency.
12. Energy and ecology.
13. Energy efficiency.
14. Security of energy supply.
15. Energetics and sustainable development.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical training program follows the lecture.

Textbooks and References:

3. V. Nelson: *Wind Energy - Renewable Energy and the Environment*, Malestrom 2009.
4. V.Mijailović: *Distribuirani izvori energije-principi rada i eksploatacioni aspekti*, Akademska misao, Beograd, 2011.

Instruction methods:
Lectures, exercises, laboratory exercises, consultations, written exam

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	10	Written exam	30
Practical work	10	Oral exam	30
Preliminary exam(s)	10		
Seminar(s)	10		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Sustainable Development

Course Status: Elective

Nuber of ECTS: 6

Requirements: None

Course Objectives:
The objective of the course is to acquire knowledge about the significance of the concept of sustainable development

Course Otucomes:
Training students to apply the concept of sustainable development in the protection of the environment, implementing the Millennium Goals of Humanity (2015) and balanced economic growth that respects the principles of sustainability.

Course Content:
Theoretical instruction:

1. Genesis and development of the concept of sustainable development. Three fundaments of sustainable development.
2. Economic development. Macroeconomic movements. Employment. Energy and industry. New technologies.
3. Renewable energy sources.
4. Environment and natural resources. Waste. Land.
5. Environmental Management System.
6. Air pollution: Spot and diffuse air pollution. Cross-border air pollution. "Acid rain"
7. Pollution of drinking water sources
8. Pollution of arable land.
9. Deforestation and changes in biodiversity.
10. Gender and Ethnic Equality.
11. Serbia's sustainable development strategy.
12. Management of harmless waste
13. Hazardous Waste Management
14. Noise, noise sources, measurement reporting and noise protection.
15. Financing the strategy of sustainable development of Serbia

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical classes are conducted in the auditory classroom. The goal of practical teaching is to further deepen the knowledge and skills in the field of implementation of the concept of sustainable development on examples from practice.

Textbooks and References:

1. Anđelka N. Mihajlov, Održivi razvoj i životna sredina ka Evropi u 95 koraka, Privredna komora Srbije i "Ambasadori životne sredine", 2005.
2. M. Pantelić, B. Jordović, G. Braun, D. Brković, Ekologija i zaštita životne sredine, Tehnički fakultet, Čačak, 2007.

Instruction methods:
Lectures, problem solving sessions, laboratory exercises, assignments, consultations, colloquiums, knowledge tests, final exam.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	10	Written exam	
Practical work		Oral exam	50
Preliminary exams(s)	40	.....	
Seminar(s)			

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Measurements 1

Course Status: Elective

Number of ECTS: 6

Requirements: Knowledge of basic concepts of electrical engineering and electronics.

Course objectives:
To provide basic theoretical and practical knowledge of the measurements in electrical engineering. To introduse students to properties of measuring devices and their application. To provide the students with the ability to practically realize procedures of measuring the basic electrical quantities and ability to use the computer for processing and analysis of measurement data.

Course Outcomes:
At the end of the course, the students will be familiar with the basic principles of measurement techniques, structures and working methods of measuring electrical circuits. The students will be able to work with modern electronic measuring instruments. The students will be able to use computers for mathematical processing and graphical display of measurement results.

Course Content:
Theoretical instruction:

1. Opening lecture (the organization and content of the course). Measurements, and metrology (significance, historical background). Basic concepts and definitions.
2. Physical quantities and units of measurement.
3. Measurements (measurement methodology, measurement model, the results of measurements).
4. Measurement error (error term, classification, measurement uncertainty, the account of errors)
5. Measuring instruments and their characteristics. Laboratory standards.
6. Analog elements of electronic measuring instruments (operational amplifiers, voltage reference sources).
7. Digital elements of electronic measuring instruments (logic gates, counters, digit displays).
8. Quantization and coding.
9. Measurements of time intervals and a frequency.
10. Analog-to-digital converters.
11. Basic concepts of measurement in electrical engineering.
12. A measurement of DC voltage and DC current.
13. A measurement of electrical resistance.
14. Legal metrology.
15. Concluding remarks, directions of further professional development, self-evaluation of the course.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Multifunctional digital measuring instruments. Measurements using an oscilloscope. Testing electromechanical relays. Testing of measurement sensor of DC voltage to DC current. Processing of measurement data using a computer. Measuring the output resistance of voltage sources. Operational amplifier in the measuring technique. A measurement of electrical resistance using the operational amplifier. Digital-to-analog converter. Analog-to-digital converter. Digital measurements of time intervals and frequency. Measuring the output resistance of the current source.

Textbooks and References:

1. P. Bošnjaković, Umeće merenja, VIŠER, 2011.
2. P. Bošnjaković, D. Prokin, Merenja 1, Priručnik za laboratorijske vežbe, VIŠER, 2016.
3. P. Pravica, I. Bagarić, Metrologija električnih veličina, Nauka, 1993.
4. D. Stanković, Fizičko - tehnička merenja, merenje neelektričnih viličina električnim putem, Naučna knjiga, 1993.
5. J. Webster, The measurement, instrumentation, and sensors handbook, IEEE Press, 1999.

Instruction methods:
Lectures, problem solving sessions, laboratory exercises, consultations, colloquiums, final exam.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	5	Written exam	30
Practical work	15	Oral exam	
Preliminary exam(s)	40		
Seminar(s)	10		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Protection Against Ionizing and Non-Ionizing Radiation

Course Status: Elective

Number of ECTS: 6

Requirements: Knowledge of basic concepts of electrical engineering and mathematics.

Course objectives:
Obtaining basic knowledge of the nature of ionizing and non-ionizing radiation and its sources. Getting acquainted with radiation detection and measurement methods; precaution against accident and radiation.

Course Outcomes:
Students will be able to recognize sources and hazards of ionizing and non-ionizing radiation as well as take action and apply protection procedures

Course Content:
Theoretical instruction:

1. Electromagnetic radiation. Spectrum and energy of radiation. Radiation classification. Relevant physical quantities in radiation protection.
2. Legal framework and regulations. European Union directives.
3. Sources of ionizing radiation in nature, medicine, industry and research.
4. Radiation detection and dosimetry. Devices and methods.
5. Biological effect of radiation.
6. Nuclear power plants and their impact on human health and the environment.
7. NORM and TENORM materials. Radioactive waste management.
8. Definition of non-ionizing radiation. Natural and artificial sources of non-ionizing radiation.
9. Basic restrictions and their parameters. Reference levels.
10. Electric and magnetic field from high voltage equipment and facilities.
11. Electromagnetic effect of consumer electronics and home appliances.
12. Radiofrequency (RF) radiation.
13. Electromagnetic compatibility (EMC).
14. Techniques and measures of protection against non-ionizing radiation.
15. Colloquium.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical teaching follows a program of lectures.

Textbooks and References:

1. B. Popović, *Elektromagnetika*, Akademska misao, Beograd, 2005.
2. P. Osmokrović, Osnovi nuklearne fizike, Akademska misao, Beograd, 2008.
3. G. F. Knoll, Radiation Detection and Measurement , 4th edition, Wiley, 2010
4. E. J. Turner, Atoms, Radiation, and Radiation Protection, WILEY-VCH Verlag GmbH & Co.KGaA, Weinheim, 2007.

Instruction methods:
Lectures, laboratory exercises, consultations, accredited laboratories visits, seminary work, colloquium, final exam.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	5	Written exam	30
Practical work	15	Oral exam	
Preliminary exam(s)	40		
Seminar(s)	10		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Modern methods of air purification in industry

Course Status: Elective

Nuber of ECTS: 6

Requirements: Knowledge from the basis of electroenergetics and new energy technologies.

Course Objectives:
Acquiring basic knowledge about the role and significance of electric power devices (EPD) applied in ecology. Study of EPD as a means for removing air pollution in industry, electrical power industry, studying advanced air quality management techniques.

Course Otucomes:
Students will be trained to understand the basic principles of air purification, the working methods of the EPD used in this area for the elimination of air pollution, in order to meet the emission limit values in industrial plants.

Course Content:
Theoretical instruction:

1. Introductory lecture; Basic concepts of sources of industrial air pollution (thermal power plants, cement plants, heating plants), global and domestic emission limit values (ELV).
2. The negative effect of the sources of air-pollution on the ecosystem, basic techniques and the ways to reduce air-pollution.
3. Bio-ionisers as an air purifier.
4. Electrostatic methods and their applications in the reduction of air pollution (electrostatic precipitator).
5. The role of electric power supplies in air purification systems (basic principles and topology).
6. The basic principles of operation of the electric power plants for air purification (separation of solids, desulphurization, denitrification, removal of mercury and heavy metals).
7. Colloquium 1
8. Ways and methods for depositing isolated solids from the air.
9. Ways and methods of using secondary products of desulphurization and denitrification .
10. Sensors and measuring methods used in air purification systems.
11. Basic principles of monitoring and control of emissions of aero-pollutants.
12. Application of information technologies in air purification systems in industry and electric power industry.
13. Modern methods of "ON-Line" monitoring of emissions and data acquisition.
14. Trends in the future development of electric power plants for air purification - possibility of realization of thermal power plants and heating plants without chimney.
15. Colloquium 2

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical classes are organized through auditory exercises and seminar work. Practical classes are fully followed by a lecture program. A part of practical lessons is foreseen through the visit to the electric power plants for purification of waste gases at thermal power plants.

Textbooks and References:

1. S. Vukosavić, Ž. Despotović, I. Cvetković,*"Savremene metode elektrostatičkog izdvajanja čestica iz dimnih gasova na termoelektranama i toplanama*", Studija urađenau okviru projekta Ministarstva nauke TR3022, ETF, Univerzitet u Beogradu, Institut "Institut M. Pupin", Univerzitet u Beogradu, Beograd 2006.
2. Ž. Despotović, S. Vukosavić, M. Bakić, Savremeni elektrostatički izdvajači, *ENERGIJA-ekonomija-ekologija*, Vol 3, pp 237-247, 2010.
3. D.A.Vallero, *Fundamentals of Air Pollution* (Fifth edition), Academic Press, 2014.
4. M.Z.Jacobson, *Air Pollution and Global Warming*, Cambridge University Press, 2012.
5. Ken Parker, *Electrical operation of electrostatic precipitators*, 3rd, IEE Power and Energy, London, 2003.

Instruction methods:
Interactive work in lectures, exercises. Preparation of seminar work.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	10	Written exam	30
Practical work	10	Oral exam	
Preliminary exams(s)	20+20		
Seminar(s)	10		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Discrete Mathematics

Course Status: Elective

Number of ECTS: 6

Requirements: None

Course objectives:
Understanding the mathematics of computer science theory and the tasks in the field of logic, sets, graphs, combinatorics, Boolean algebra and algorithms.

Course Outcomes:
Students will be able to solve problems of discrete structures that are the basis of the work of modern computer systems.

Course Content:
Theoretical instruction:

1. Sets and relations.
2. Functions
3. Fundamentals of logic
4. Tables of truth
5. Boolean algebra
6. The logic of conclusions
7. Colloquium 1
8. Quantification account
9. Basics of combinatory
10. Graph theory
11. Theory of codes
12. Theory of conclusion
13. Elements of the theory of algorithms
14. Algorithmic structure
15. Colloquium 2

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical classes follow a teaching program and go through the exercises in computer laboratory.
Curricula of a subject complies with the recommendations from IEEE/ACM Computing Curriculum: CE2004 Computer Engineering Body of Knowledge: CE-DSC 0-6, CE-ALG 0-2.

Textbooks and References:

1. A. Savic, A. Zekovic, *Diskretna matematika i algoritmi-udzbenik,* Visoka skola elektrotehnike i racunarstva, Beograd, 2010.
2. A. Savic, A. Zekovic, *Diskretna matematika i algoritmi-prirucnik za laboratorijske vezbe,* Visoka skola elektrotehnike i racunarstva, Beograd, 2010.
3. D. Cvetkovic, S. Simic, *Odabrana poglavlja iz diskretne matematike,* Akademska misao,Beograd, 2004.
4. I. Milovanovic, E. Milovanovic, B. Randjelovic, *Diskretna matematika,* Elektronski fakultet, Nis, 2001.
5. J. Anderson, *Diskretna matematika,* Racunarski fakultet, Beograd, 2005.

Instruction methods:
Lectures, calculation exercises, laboratory exercises, consultations, term papers, defense laboratory exercises and written exam, oral exam.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	10	Written exam	0
Practical work	10	Oral exam	19
Preliminary exam(s)	51		
Seminar(s)	10		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Protection Against Noise and Vibration

Course Status: Elective

Number of ECTS: 6

Requirements: Knowledge of basic concepts of electrical engineering and mathematics

Course objectives:
To provide students students with the basic notions of noise and vibration problems, as well as to provide the knowledge needed for noise measurements and design of noise and vibration insulation systems.

Course Outcomes:
At the end of the course, the students will be familiar with the basic principles of measurement techniques and trained to independently solve elementary problems in the field of noise and vibration.

Course Content:
Theoretical instruction:

1. Introduction to physical acoustics, generation, reception and propagation of sound
2. Psychophysical acoustics, the influence of noise on man;
3. Basics of frequency analysis of sound, measurement in acoustics;
4. Electro-mechanical-acoustic analogies;
5. Noise: definition and basic concepts;
6. Types of noise and basic concepts, barriersinsulation, insulation between rooms; Law of mass;
7. Air born noise: analysis and protection systems;
8. Structural noise, types, origin and ways of implementation.
9. Colloquium 1.
10. Introduction to vibration theory, analysis of the mass-spring system; Basics of vibration measurement;
11. Wind turbines as a source of noise: analysis and solutions;
12. Basic principles of sound insulation; Homogeneous and multilayer barriers; Windows and doors in noise protection systems; Floating floors;
13. Standards and legal regulations;
14. Active noise protection systems.
15. Colloquium 2.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Measurement of air noise between two rooms; Measurement of urban noise; Measurements of structural noise; Solving practical problems: Designing noise insulation systems; Training for useof software packages Sound Plan and Comsol

Textbooks and References:

1. D. Cvetkovic, M. Prascevic, Noise and Vibration, Faculty of Occupational Safety, Nis, 2005
2. M. Praščević, D. Cvetković, Environmental noise, Faculty of Occupational Safety, Niš, 2005.

Instruction methods:
Lectures, problem solving sessions, laboratory exercises, consultations, colloquiums, final exam.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	5	Written exam	5
Practical work	25	Oral exam	0
Preliminary exam(s)	20		
Seminar(s)	0		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Waste-to-energy Production

Course Status: Elective

Number of ECTS: 6

Requirements: None

Course objectives:
Knowledge of the basic concepts of electrical engineering provide successfully teaching.

Course Outcomes:
Students will be trained to design and maintain facilities in the thermal power plant for municipal waste.

Course Content:
Theoretical instruction:

1. Introduction; Types of waste. General characteristics of waste.
2. Waste energy as a renewable energy source.
3. Direct use of heat by burning combustible elements from waste
4. Use of secondary raw materials by recycling and production of new products
5. Modern technologies for disposal of municipal waste.
6. Physical-chemical conversion of waste energy into waste fuel - RDF fraction.
7. Bio-chemical conversion of waste energy into electricity.
8. Colloquium
9. Thermo-chemical conversion of energy is wasted in heat energy.
10. Analysis of the emission of harmful gases into the environment in the conversion of energy into electrical (thermal) energy
11. Use of municipal waste for energy purposes.
12. Design of thermal power plant - (CHP) to municipal waste.
13. Technical and economic analysis (CHP) on municipal waste.
14. Selection of installation site thermal power plant for municipal waste. Perspectives for installation thermal power plant on municipal waste in the Republic of Serbia.
15. Examples of the plant for obtaining energy from waste.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical teaching program follows the lectures

Textbooks and References:

1. N.Počuča, Biomasa ekološki efekti primene, AGM knjiga, Beograd 2015.
2. S. Stucki, C. Ludwig, S. Hellweg, Municipla Solid Waste Management: Strategies and Technologies for Sustainable Solutions, Springer – Verlag Berlin Heidelberg, 2013.
3. Statistika otpada i upravljanje otpadom u Republici Srbiji, 2008–2010, Republički Zavod za statistiku, Beograd, 2012.

Instruction methods:
Lectures, calculation exercises, laboratory exercises, consultations, term papers, defense laboratory exercises and written exam, oral exam.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	10	Written exam	30
Practical work	10	Oral exam	30
Preliminary exam(s)	10		
Seminar(s)	10		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Project Management

Course Status: Elective

Number of ECTS: 6

Requirements: None

Course objectives:
To provide students with theoretical and practical knowledge and skills in the management of a variety of investment, business and social projects.

Course Outcomes:
After passing the exam, students will be able to apply practical knowledge in the planning process, monitoring and control project implementation, with particular emphasis on monitoring and control of time, resources and costs, as well as the management of specialized management disciplines.

Course Content:
Theoretical instruction:

1. Concept and types of projects
2. Project management concept
3. Organization for project management
4. Management of human resources
5. Project manager
6. Methods and techniques of project management
7. Planning project implementation
8. Monitoring and control of the project
9. Reporting system of the project realization
10. Standard computer packages for project management
11. Contract management
12. Quality management
13. Risk management
14. Communications management
15. Change management

Practical instruction (Problem solving sessions/Lab work/Practical training):
It takes place in a computer lab with the use of Primavera software package.

Textbooks and References:

1. P. Jovanović, Upravljanjeprojektom, 11. Izdanje, Fakultetzaprojektni i inovacionimenadžment, Beograd, 2015.
2. Ž. Vasić, M.Jevremović, D. Majkić, Upravljanjeprojektom, praktikum, Visokaškolaelektrotehnike i računarstvastrukovnihstudija, Beograd, 2015.
3. Kerzner H, Project management, 10th edition, Wiley Jersy, 2009.

Instruction methods:
Lectures, problem solving sessions, laboratory exercises, assignments, consultations, preliminary exams, knowledge tests, final exam.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	5	Written exam	30
Practical work	15	Oral exam	
Preliminary exam(s)	50		
Seminar(s)	15		

Study Program: Automatics and vehicle control systems

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Real Time Control Systems

Course Status: Elective

Nuber of ECTS: 6

Requirements: None

Course Objectives:
The objective of this course is to familiarize with basic principles of real time control, ways and possibilities of regulation of various processes, as well as training for programmable logic controllers.

Course Otucomes:
Students will acquire basic knowledge about real time process control, as well as ways for processes control using programmable logic controllers. Students will be trained to program programmable logic controllers.

Course Content:
Theoretical instruction:

1. Real time control (RTC). Real time conditions
2. Sensors and actuators in RTC. Parallel and serial data transfer. Devices for obtaining information in the real time systems
3. Overview of the main technological processes. Mechanical processes, liquid and gas flow, process of pressure change, thermal processes, dynamics of heat exchanger.
4. Design of automatic control system with one input and one output.
5. Design of control systems with more than one input and more than one output.
6. Industrial components of automatic control system.
7. Theoretical basis of Programmable Logic Controllers.
8. Fundamentals of ladder programming.
9. Getting to know CX-Programmer.
10. Getting to know WinProladder.
11. Control system for regulation of heat processes
12. Control system for regulation of shift and speed.
13. Control system for regulation of the level and the flow of liquid.
14. Design issues. Elements of synthesis of control systems. Notion of optimal and adaptive control. Individual design of assigned homework.
15. SCADA systems.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Are performed in a hardware laboratory with the active participation of students. Students independently or with the help of teachers solve tasks in the field of real time controlusing PLC. Solving specific tasks based on set exercises.

Textbooks and References:

1. Petrović V., Upravljanje u realnom vremenu - priručnik, VIŠER, Beograd, 2016.
2. Turajlić S., Upravljanje procesima, Elektrotehnički fakultet, Beograd, 2011.
3. Draganović Lj., Projektovanje sistema automatskog upravljanja, Lola Institut, Boegrad, 2000.
4. Đurović M., Upravljanje u realnom vremenu, Univerzitet Crne Gore, Cetinje, 1999.
5. Matić N., Uvod u PLC kontrolere, Mikro elektronika, Beograd, 2001.

Instruction methods:
Lectures, laboratory exercises. Confirmation of knowledgeis conducted through homework, seminar papers and written examination in the following manner: written exam is obligatory, defended seminar papers and homework are acknowledged as a part of exam.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities		Written exam	30
Practical work	20	Oral exam	
Preliminary exams(s)	20		
Seminar(s)	30		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Probability and Statistics

Course Status: Elective

Nuber of ECTS: 6

Requirements: None

Course Objectives:
To trainstudents to make decisions in planning or management related to knowledge of probability.

Course Otucomes:
At the end of the course, students will be able to design and solve software and process quality problems, analyze data from different sources and understand the importance of empirical methods in software engineering.

Course Content:
Theoretical instruction:

1. Introduction to Probability and Counting.
2. Conditional Probability and Independence.
3. Discrete Random Variables.
4. ContinuousRandom Variables.
5. Distributions Basic Terms.
6. Binomial Distribution and Poisson Distribution.
7. Normal Distribution.
8. Expectation and Distribution Parameters.
9. Functions of Random Variables.
10. Central Limit Theorem.
11. Random Processes.
12. Introduction to Mathematical Statistics.
13. Parameter Estimation.
14. Testing Statistical Hypothesis.
15. Applied Statistics in Engineering

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical classes follow the program of lectures and take place through exercises in the computer laboratory, using the software package Octave.

Textbooks and References:

1. S. Strbac-Savic, A. Savic, Verovatnoca i statistka, VISER, Beograd, 2013.
2. A. Savic, S. Strbac-Savic, A. Zekovic, Verovatnoca i statistika - prirucnik za laboratorijske vezbe, VISER, Beograd, 2011.
3. S. Cvetkovic, Elementi teorije verovatnoce i matematicke statistike, Akademska misao, Beograd, 2004.

Instruction methods:
Lectures, problem solving sessions, laboratory exercises, consultations, colloquiums, homework, ,final exam.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	10	Written exam	30
Practical work	20	Oral exam	10
Preliminary exams(s)	30		
Seminar(s)			

Study Program: Environmental Engineering
Type and Level of Studies: Basic applied studies, First level of higher education
Course Title: Database systems
Course Status: Elective
Nuber of ECTS: 6
Requirements: Basic knowledge of operating systems
Course Objectives: Objectiveofthiscourseistoteachstudentsbasictechniquesofdatabasedesignandinformationsystem'sapplications, makingqueriesindatabasecomputerlanguageSQL.
Course Otucomes: Studentsareabletoindependentlydesignsimpledatabasesandapplications, andtomake complexqueries.
Course Content: *Theoretical instruction:* 1. Review and development of databases 2. DatabaseManagementSystems 3. Database creation, attribute definiton and field peoperties 4. Data models 5. Working with tables, table data view and creating and setting table relationships 6. Relational database 7. Colloquium 1 8. Query languages 9. Queries with calculated values and using of aggregate functions. 10. Design of Relational databases 11. Transaction processing 12. Database physical design 13. Query languages basics 14. Data organization 15. Colloquium 2 *Practical instruction (Problem solving sessions/Lab work/Practical training):* 1. Database creation, attribute definiton and field peoperties 2. Choosing the primary key, importing and linking tables from other databases and data input. 3. Working with tables, table data view and creating and setting table relationships. 4. Creating queries using QBE. 5. Creating queries over multiple tables and nested queries. 6. Queries with calculated values and using of aggregate functions. 7. Action and parametrized queries. 8. Forms creation and change. 9. Using forms for data manipulation. 10. Reports creation and change. 11. Reports for showing calculated values and data from multiple tables or queries.
Textbooks and References: 1. Kaluđerčić P., Obradović S., Projektovanje informacionih sistema i relacione baze podataka, Visoka škola elektrotehnike i računarstva strukovnih studija, Beograd, 2007 2. Obradović S., Vučinić B., Pandurov T., MSQL Struktuirani upitni jezik, Viša elektrotehnička škola, Beograd, 2005. 3. Obradović S., Pandurov T., Vučinić B , S.Mesarović, V.Petković, Sistem za upravljanje bazama podataka-MSAccess, Visoka škola elektrotehnike i računarstva strukovnih studija, Beograd, 2007
Instruction methods: Lessons ar eorganized using: lectures and laboratory exercises.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	10	Written exam	35
Practical work	20	Oral exam	35
Preliminary exams(s)			
Seminar(s)			

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Recycling Technologies

Course Status: Elective

Nuber of ECTS: 6

Requirements: None

Course Objectives:
Introducing students to the basic concepts of ecology and environmental problems. Introducing students with the ways of applying real technical systems and technologies for the purpose of solving ecological problems.

Course Otucomes:
Ability of students to identify and minimize environmental problems, generators of these problems and environmental impact.

Course Content:
Theoretical instruction:

1. Recycling industry
2. Green economy and sustainable development
3. Circular Economy
4. Conservation of natural resources as a contribution to the recycling of waste
5. Recycling non-hazardous and hazardous waste
6. Recycling technologies
7. Recycling effects
8. Reduction of pollution by organized collection of waste for recycling
9. The primary selection of waste as a basic requirement for recycling
10. Strategy of organized and complete recycling of waste materials
11. Recycling of special waste streams
12. Recyclable waste types
13. Recycling of special streams of hazardous waste: electrical and electronic waste, waste oils, batteries, accumulators and vehicles.
14. Recycling of special non-hazardous waste streams: packaging and packaging waste
15. Recycling of metal waste.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Method of marking recyclable waste types. Eco sign. Getting acquainted with the US EPA List and the European Waste Catalog. Methods of sampling and analysis of hazardous and non-hazardous waste for recycling to the content of specific organic and inorganic components. Getting acquainted with the procedures for handling hazardous waste at the stage of collection, transport and temporary storage for recycling. Demonstration of the management of recyclable waste (hazardous and non-hazardous) in certain waste treatment / recycling plants in RS. Visits to one of the recycling plants for hazardous waste and non-hazardous waste recycling plants. Visit to the company that deals with the recycling of industrial waste. Visit the foundry. Analysis of the effect of recycling from aspect 3E (energy + economics + ecology).

Textbooks and References:

1. Hodolič J. i dr., Reciklaža i reciklažne tehnologije, Fakultet tehničkih nauka, Novi Sad, 2011.

Instruction methods:
Lectures, problem solving sessions, laboratory exercises, consultations, colloquiums, final exam.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	10	Written exam	40
Practical work	10	Oral exam	20
Preliminary exams(s)	20		
Seminar(s)			

Study Program: Environmental Engineering			
Type and Level of Studies: Basic applied studies, First level of higher education			
Course Title: Student intership			
Course Status: Compulsory			
Nuber of ECTS: 4			
Requirements: None			
Course Objectives: Connecting theknowledge acquiredin classwith the requirements ofpractical tasks.			
Course Otucomes: Trainingfor workin institutionsand trainingfor publicoral presentation.			
Course Content: *Practical instruction:* Practical workis carried out inappropriate professionalfactories, companies and public institutions, as in organizations that provide innovative activity, as well as in car houses and modern services. During the course, and at the end of professional practice, it is acquired to write a diary in the way of term paper and it s defended in an oral way.			
Textbooks and References:			
Instruction methods: Lectures, problem solving sessions, laboratory exercises, consultations, colloquiums, knowledge tests, final exam.			
Grading (maximum number of points: 100)			
Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities		Written exam	
Practical work	50	Oral exam	30
Preliminary exams(s)			
Seminar(s)	20		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Wastewater Treatment Systems

Course Status: Elective

Nuber of ECTS: 6

Requirements: Knowledge in physics, the basis of electroenergetics and new energy technologies.

Course Objectives:
Acquiring basic knowledge about the role and importance of plants and electric power devices (EPD) for the treatment of wastewater (municipal and industrial), studying advanced water quality management techniques.

Course Otucomes:
Students will be taught to understand the basic principles and techniques of water pollution treatment (municipal and industrial), the functioning of EPD that are used in the wastewater treatment systems as well as the basic principles of their design.

Course Content:
Theoretical instruction:

1. Introductory lecture; Basic concepts about the formation of wastewater (municipal and industrial), concept of wastewater treatment, global and domestic norms in terms of limit values.
2. Health and ecological aspects in water pollution treatment management.
3. Physical-chemical methods for treatment of wastewater and associated electro-energy devices for their efficient realization.
4. Basic principles of biological and anaerobic procedures for wastewater treatment; Examples of the characteristic of the reactor with an emphasis on the application of measuring and regulating and control devices.
5. Combined technology systems and water pollution treatment facilities; methods of technological process realizations and their electro-control circuits.
6. Polluted water disinfection systems.
7. Colloquium 1
8. Waste material disposal systems.
9. Electric actuators and drive mechanisms in the technological process of wastewater treatment (municipal and industrial); aspect of the energy efficiency of the plants.
10. Application of regulated electric motors drives in the systems of technological treatment of waste water.
11. Measurement-regulational systems and monitoring systems, which are applied in the technological process of wastewater treatment (municipal and industrial).
12. Basic principles of sampling and analysis of municipal and industrial waters; application of information technologies and databases.
13. Procedure for the elaboration of electro-energy projects for concrete technological plants for treatment of municipal and industrial wastewater.
14. Modern trends in the promotion of the use of energy and measuring and regulating equipment for the treatment of waste water (intelligent drive systems, sensor networks, HMI, SCADA control systems).
15. Colloquium 2

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical classes are fully followed by a lecture program..

Textbooks and References:

1. D. Povrenović, M. Knežević, *Osnove tehnologije prečišćavanja otpadnih voda*, TMF-Beograd, 2013.
2. *Wastewater treatment plants-Recommended Electrical Network Design for Efficient Plant and Energy Operations*, IEC standard compliance, Schneider Electric, 2012.
3. Mackenzie L. Davis, *Water and Wastewater Engineering*, McGraw-Hill Companies, lnc, 2010
4. Shun Dar Lin, *Water and Wastewater Calculations Manual* (Sec.Ed.), McGraw-Hill Companies, Inc., 2007

Instruction methods:
Lectures, problem solving sessions, laboratory exercises, consultations, colloquiums, homework, final exam.

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	10	Written exam	30
Practical work	10	Oral exam	
Preliminary exams(s)	20+20		
Seminar(s)			

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Environmental protection

Course Status: Elective

Nuber of ECTS: 6

Requirements: Knowledge of basic concepts of electrical engineering and mathematics which can enable students to follow the course successfully.

Course Objectives:
To introduce students to basic concepts of environmental protection.

Course Otucomes:
Students will be able to apply basic knowledge of environmental protection.

Course Content:
Theoretical instruction:

1. The environment – term, factors (water, air, soil).
2. The condition of the environment and identifying problems.
3. Endangering the environment. The sources of pollution.
4. Cadastre of polluters, sources of pollution and polluting substances of the environment.
5. The consequences of air, water, soil and food pollution.
6. Measures and activities used in the environmental protection. The preventive measures.
7. Transport and dispersion of pollutants.
8. Controlling the accidents. Risk estimation.
9. Monitoring of the environment. The principles and techniques of collecting samples.
10. Environmental management. Human-enviroment interaction.
11. Environmental protection system.
12. The international and national legal framework and cooperation in the area of environmental protection.
13. Environmental protection and energetics - pollution sources, energy efficiency, renewable energy sources.
14. Enriching the environment.
15. Colloquium.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical teaching program follows the lecture.

Textbooks and References:

1. Š. Đarmati, D. Veselinović, I. Gržetić, D. Marković, *Životna sredina i njena zaštita I*, Fakultet za primenjenu ekologiju,Univerzitet Singidunum, Beograd, 2008.
2. R. Sokolović, S. Sokolović: *"Inženjerstvo u zaštiti životne sredine"*, Tehnološki fakultet Novi Sad, 2002.

Instruction methods:
Interactive work on the course, exercises and consultations in order to encourage the students' initiative. Colloquiums as instruments for controlling students' progress in learning the courses' material. Students have to take the written exam.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	10	Written exam	60
Practical work		Oral exam	
Preliminary exams(s)	20		
Seminar(s)	10		

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Recycling Process Control

Course Status: Elective

Nuber of ECTS: 6

Requirements: Basic knowledge in electrical engineering.

Course Objectives:
Introduction of basic concepts in the recycling process control.

Course Otucomes:
Students will be trained to apply basic knowledge in the recycling process control.

Course Content:
Theoretical instruction:

1. Introductory lecture. The concept and importance of recycling processes (RP).
2. Organization of recycling processes and waste management within recycling facilities.
3. Main elements of the recycling process. Sorting, separation, disposal.
4. Sensors in RP. Metal detectors, velocity, motion, force, moment and temperature sensors, sensors for concentration of gases, etc.
5. Electric machines and actuators in RP. Electric motors, servomotors, hydraulics and pneumatics.
6. Mechanical elements in RP. Power transmissions, gears, bearings, etc.
7. Transportation systems. Overview of conventional transportation systems, actuator selection, most common problems and failures in transport systems, failure detection.
8. Sorting systems - separators. System overview, actuator selection.
9. Sorting systems - separators. The most common problems and failures in such systems, failure detection.
10. The role of the workforce (human factor) in such systems.
11. Grinding mills - mechanical processing of waste. Overview of conventional mills, actuator selection, most common problems and failures in such systems, failure detection.
12. Presses - mechanical processing of waste. Review of conventional presses, actuator selection, most common problems and failures in such systems, failure detection.
13. Composting process control.
14. Failure detection and diagnostics in recycling plants.
15. Recycling process monitoring systems. SCADA systems.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical (laboratory) classes follow lecture program.

Textbooks and References:

1. Gašić M., Transportni uređaji - neprekidni transport , Mašinski fakultet, Kraljevo,1997.
2. Tolmač D., Prvulović S., Transportni sistemi, Tehnički fakultet “Mihajlo Pupin”, Zrenjanin, 2012.
3. Popović M., Senzori i merenja, Zavod za udžbenike, Srpsko Sarajevo, 2004.
4. Popović M., Senzori u robotici, Viša elektrotehnička škola, Beograd, 1996.

Instruction methods:
Lectures, laboratory exercises. Confirmation of knowledgeis conducted through practical work, preliminary exams and written examination in the following manner: written exam is obligatory.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	10	Written exam	30
Practical work	30	Oral exam	
Preliminary exams(s)	30		
Seminar(s)			

Study Program: Environmental Engineering
Type and Level of Studies: Basic applied studies, First level of higher education
Course Title: Environmental Monitoring
Course Status: Elective
Nuber of ECTS: 6
Requirements: None
Course Objectives: Introducing students to modern methods of environmental monitoring.
Course Otucomes: Students will be able to plan and implement monitoring programs of environmental quality, ecological status and integrity of the ecosystem, but also to analyze and interpret the results and make conclusions and management decisions based on the results obtained by environmental monitoring.
Course Content: *Theoretical instruction:* 1. Legislation in the field of monitoring of air, water, wastewater, soil and other parts of the environment. 2. Properties of harmful substances in the air, water and soil. 3. Monitoring of industrial pollutants. Systematic measurements, examination and evaluation of environmental status indicators and environmental pollution. 4. Monitoring of standard harmful substances (SO2, NOx, CO2, CO). 5. Monitoring of the soot, emissions of metals. 6. Monitoring of specific harmful substances. 7. Colloquium 1 8. Monitoring of standard methods of harmful substances (SO2, NOx, CO2, CO), soot, monitoring of metal emissions. 9. Monitoring of the impact of public lighting on the increase of harmful substances in the air. 10. The specifics of automatic air monitoring in automatic stations. 11. Air monitoring in the room. 12. Bioindicators for examining the state of human health and ecosystem vulnerability. 13. Qualitative analysis of data in biomonitoring of non-ionizing and ionizing radiation. 14. Monitoring the environment using the Global Navigation Satellite System. 15. Colloquium 2 *Practical instruction (Problem solving sessions/Lab work/Practical training):* Practical teaching program follows the lecture.
Textbooks and References: 1. *Environmental Monitoring using GNSS*, Joseph Awange, Springer 2012. 2. *Handbook of Air Pollution Prevention Prevention and Control,* Nicholas P. Cheremisinoff, Ph.D., N&P Limited, Elsevier Science (USA), 2002. 3. *Advanced environmental monitoring*, Young Kim, Ulrich Platt, Springer 2008.
Instruction methods: Lectures, exercises, consultations. After the first half of the semester, a colloquium is organized. At the final exam, the level of knowledge of students acquired during the semester is assessed in writing.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	10	Written exam	50
Practical work		Oral exam	
Preliminary exams(s)	40		
Seminar(s)			

Study Program: Environmental Engineering

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Renewable Energy

Course Status: Elective

Number of ECTS: 6

Requirements: Knowledge of basic electrical concepts enables successful monitoring of teaching.

Course Objectives:
Introduction to basic concepts and importance of renewable energy.

Course Outcomes:
Students will be able to participate in projects and assess the potential use of renewable energy sources.

Course Content:
Theoretical instruction:

1. Introductory lecture (the organization and content of the course). Basic concepts.
2. The importance of using renewable energy sources.
3. Solar energy.
4. Measurement of solar radiation.
5. The use of solar energy.Solar collectors. Photovoltaic cells.
6. Wind power. Selection of sites for building wind farms.
7. Meteo measurements and estimates of energy potential.
8. Selection of sites for building wind farms.
9. Meteo measurements and estimates of energy potential.
10. Modern wind generators.
11. Small hydro power plants.
12. The energy of waves, tides.
13. Biomass energy.
14. Biogas energy. Energy biodiesel. Energy waste.
15. Trends in the use of renewable energy sources.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical training program follows the lecture.

Textbooks and References:

1. V.Mijailović: *Distribuirani izvori energije-principi rada i eksploatacioni aspekti* ,Akademska misao, Beograd, 2011.
2. V. Nelson: *Wind Energy - Renewable Energy and the Environment*, Malestrom 2009.
3. S. Tomović: *Alternativni izvori energije,* Tehnička knjiga, Beograd, 2002.

Instruction methods:
Lectures, auditory exercises, laboratory exercises, consultations, written exam

Grading (maximum number of points: 100)

Preliminary activities	Points	Final Exam	Points
Lectures activities	10	Written exam	30
Practical work	10	Oral exam	30
Preliminary exam(s)	10		
Seminar(s)	10		

Study Program: Environmental Engineering
Type and Level of Studies: Basic applied studies, First level of higher education
Course Title: Final Thesis
Course Status: Compulsory
Number of ECTS: 12
Requirements: Passed exam,from which student has chosen for his final project
Course Objectives: The aim of the final thesis issolution and/oranalysis and presentation of theoretical and/or practical problem, with which the candidate proves that he ha sacquired theintended level of professional competence and maturity in the particular field of technology.
Course Outcomes: Acquired degree of Profesional engineer of Electrical Engineering and Computer Science.
Course Content: The process of drafting and defense of the final thesis is determined by rules of the procedure for the preparation and defense of the final thesis. The student has the right to begin production of the final thesis when he stays up to three exams that he did not pass. The student selects one of the subjects from which he passed the exam, and the subject teacher to mentor.Mentor defines a topic and a final thesis assignments, after which the candidate log the topic. The student needs to complete the final thesis for at least three weeks and, maximum for one year from the date when he logged the topic. During the final thesis the student has the required consultations with the supervisor. Final thesis hould have a volume of 20 to 40 A4 pages, excluding annexes.The essential accessory is the final thesis and presentation of final thesis on are commended maximum of 20 films (slides). Technical processing of content and quality of the final thesis should be in accordance with instructions for making the final technical thesis that is an integral part of the Regulationson the procedure fort he preparation and defense of the final thesis. Mentor confirms the satisfactory quality of contentand technical processing, with his signatureon each copy of the final thesis. When he finishes production of the work, the student submits more scientific and educational application for approval ofthe final thesis defense, and with application he submits four copies of the final thesis. Each copy of the final thesis contain the entire text of the final thesis in electronic form (floppy or CD). Teaching-Academic Council determines the Commission for a public oral defense of the final thesis, which consists of, president, mentor and at least one member from among the teachers.The Commission may have additional members from among the teachers of higher education institutions or other prominent experts in the field dealt with the final thesis. Final thesisis defended orally in front of the Commission; student prepares a short presentation (15 minutes), which presents the basic assumptions of the problem and characteristics of the solution, then the Commission can ask questions and evaluate the final thesis a whole.
Textbooks and References:
Instruction methods: Lectures, problem solving sessions, laboratory exercises, assignments, consultations, colloquiums, knowledge tests, final exam.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities		Written exam	
Practical work		Oral exam	
Preliminary exam(s)			
Seminar(s)			