Program overview - Electronics

Year I							
Semester I			Hours/Week				
Nr	M/E	Courses	L	NE	Lab	ECTS	Teacher
1.	M	Mathematics 1	3	3	0	7	Marjan Demaj, Qefsere Gjonbalaj, Zenun Loshaj
2.	M	Physics 1	3	1	1	6	Rashit Maliqi, Skender Ahmetaj
3.	M	Fundamentals of electrical engineering	3	3	0	7	Ruzhdi Sefa, Luan Ahma
4.	M	Programming Language	2	0	2	5	Agni Dika
5.	E	Non-technical courses:					
		1.English Language	1	2	0	5	1.Qerim Spahija, Vjollca Belegu-Caka
		2.German Language	1	2	0	5	2. From UP staff
		3.Communication skills	2	1	0	5	3. From UP staff
Semester II							
1.	M	Electric Circuits	3	3	0	7	Ruzhdi Sefa, Luan Ahma
2.	M	Physics 2	3	1	1	6	Rashit Maliqi, Skender Ahmetaj
3.	M	Mathematics 2	3	3	0	7	Marjan Demaj, Qefsere Gjonbalaj, Zenun Loshaj, Shqipe Lohaj
4.	M	Algorithms and Data Structures	2	0	2	5	Agni Dika
5.	M	Digital Circuits	2	1	1	5	Agni Dika, Sabrije Osmanaj
Year II							
Semester III			**Hours/Week**				
No	M/E	Courses	L	NE	Lab	ECTS	Teacher
1.	M	Electrical Materials	2	1	1	5	Isuf Krasniqi
2.	M	Mathematics 3E	2	2	0	5	Shqipe Lohaj
3.	M	Signals and systems	3	2	0	5	Ilir Limani

4.	M	Automation	2	1	1	5	Avni Skeja
5.	M	Electronics	2	1	1	5	Myzafere Limani
6.	M	Electrical Measurements	3	0	2	5	Ali Gashi
Semester IV							
1.	M	Computer Architecture	2	0	2	5	Agni Dika
2.	M	Power Systems	3	2	0	6	Vjollca Komoni, Gani Latifi
3.	M	Electromagnetic Fields and Waves	3	0	1	6	Luan Ahma, Mimoza Ibrani
4.	M	Electronic Devices	3	1	1	7	Myzafere Limani
5.	E	Non-technical courses:					
		1. Management	2	1	0	6	1.From Industry
		2. Project Management	2	1	0	6	2.Bernard Nikaj

Year III							
Semester V			Hours/Week				
Nr.	M/E	Courses	L	NE	Lab	ECTS	Teacher
1.	M	Microprocessors and microcontrollers	2	0	2	6	Lavdim Kurtaj
2.	M	Digital Electronics	2	1	1	6	Sabrije Osmanaj
3.	M	Power Electronics	2	1	1	6	Myzafere Limani
5.	E	Non-technical courses:					
		1. Macroeconomics	2	2	0	6	1. From Industry
		2. Entreprenuership	2	1	0	6	2. Bernard Nikaj
6	E	Elective courses:					
		1. Digital Signal Processing	2	2	0	6	1.Ilir Limani
		2. Optoelectronics	2	2	0	6	2. Nebi Caka
		3. Sensors and actuators	2	0	2	6	3. Qamil Kabashi
		4. Electronic communications	2	2	0	6	4.Mimoza Ibrani
		5. Measurements instrumentation and	2	0	2	6	5.Qamil Kabashi

		6. DAQ Fundamentals of mechatronics	2	2	0	6	6.From FME
Semester VI							
1.	M	Microelectronics	2	1	1	6	Nebi Caka, Milaim Zabeli
2.	M	Analog Electronics	2	2	2	6	Myzafere Limani
3.	E	Elective courses:					
		1. Multimedia	2	0	2	6	1.Myzafere Limani
		fundamentals	2	2	0	6	2.Lavdim Kurtaj
		2. Fundamentals of robotic	2	2	0	6	3.Nebi Caka, Milaim Zabeli
		3. Optical Communication Technology	2	2	0	6	4.Vegim Gashi
		4. Interleaved systems	2	2	0	6	5.Nebi Caka
		5. Computer Aided Design of Electronic Systems					
5.	M	Internship				6	
6.	M	Bachelor Thesis				6	

1.1.1. Course Descriptions

Course title: Mathematics 1 (Mandatory, Sem. I, 7 ECTS)
The objective of the course: The purpose of the course is to enable students that knowledge gain through this course can apply as an auxiliary device in the professional courses of electrical engineering and computer study.
Learning outcomes: On successful completion of the course, students will be able to: 1. Know and designs to solve various problems in the field of their profession, when dealing with operations with complex numbers. Using matrices and determinants, as well as, they are able to solve and apply problems associated with systems of linear equations. 2. Understand and apply the concepts of vectors and other elements of analytical geometry in space, designs and develops these problems. 3. In research finds various electrical phenomena functional connections sizes that phenomenon of differential calculus then describes and examines them about functional, know to find their maximum values and a whole through the graphical presentation noting all properties them.
Course content. Real and complex numbers. Matrices, determinants and solving linear systems. Operations with vectors and linear combination of vectors. Scalar product of two vectors and the angle between them. Vector product, scalar triple product and vector triple product of vectors. Liner independence of vectors and basis decomposition of vectors. The functionofone realvariable, limits and its continuity. Limit of sequences. Definition of series and their convergence. Criteria for convergence of series. Derivative of a function and applications.
Methods of teaching: 45 hours of lectures + 45 hours of auditoria exercises. Approximately 120 hours of personal study and exercise.
Grading System: Homework 10%, Mid-term exams 30 %, Final Exam 60 %
Literature:

1. Hamiti E. - Matematika I, Prishtinë 1995.
2. Hamiti E. - Matematika II, Prishtinë 1997.
3. Peci H, Doko M. - Përmbledhje detyrash të zgjidhura nga Matematika I, Prishtinë 1997.
4. Loshaj Z. - Përmbledhje detyrash të zgjidhura nga Matematika II, Prishtinë 1996.

Course title: Physics 1 (Mandatory, Sem. I, 6 ECTS)
The goal : Using the physical laws to solve the basic problems of engineering.
Learning outcomes: 1. Analyze simple mechanical systems and solve equations of motion. 2. Apply principles of conservation of energy and momentum to particle collisions.3. Explain the conditions of statics of rigid bodies and the equation of motion for rotation of the rigid body around fixed axis. 4.Understand the first law of thermodynamics and analyze thermodynamic cycles.
Course content: The international system of Units. Physical methods, dimensions and units. Kinematics of particle, linear, rotational and curvilinear motion. Newton s laws. System of particles, center of mass, conservation of momentum. Work, energy, power. Conservative non conservative forces. Statics. Mechanics of rigid body. Gravitation. Inertial and non inertial frames. Statics of fluids, flow of ideal and real fluids. Heat and thermometry, Kinetic theory of heat. Thermodynamics, cyclic processes, entropy.

Methods of teaching: 45 hours of lectures + 15 hours of auditorial exercises + 15 hours of laboratory exercises. Approximately 75 hours of personal study.

Grading System:

Seminar 10%, Mid-term exams 30 %, Final Exam 60 %

Literature:

1. S. Skenderi, R,Maliqi, "Physic for thechnical faculty", UP, Pristina, 2005.
2. J. Serway, Physics for scientists and engineering , Thomson Books, 2004.
3. D. Haliday, R.Resnick, J.Walker, Fundametals of Physics, John Wiley &Sons, 2001.

Course title: Fundamentals of electrical engineering (Mandatory, Sem. I, 7 ECTS)

The goal : The purpose of the course is to introduce the basic principles of electrical and magnetic field.

Learning outcomes: On successful completion of the course, students will be able to: 1. Explain fundamental laws of electromagnetism (Coulomb's, Biot-Savart, F araday's and Gauss's law). 2. Apply the fundamental laws of electromagnetism to solution of electromagnetic field problems, 3. Classify problems of electromagnetic fields into static electric, static magnetic, static current and dynamic fields. 4. Apply calculation of electromagnetic fields, inductances and capacitances to solution of practical problems. 5. Apply Matlab software for soving basic problems in both elctrical and magnetic field. 6. Apply gained knowledge of electromagnetic skills in other fields

Course content: Basics of electricity, Coulomb's law and field intensity. Gauss's law. Electric potential. An electric dipole and flux lines. Electrostatic induction. Electric generator. Polarization in dielectrics. Generalized Gauss's law. Boundary conditions. Capacitance. Electrostatic networks. Energy and forces in electrostatic fields. Electrostatic field analysis using MATLAB. Basics of magnetism. Magnetic flux density. Lorentz force. Biot-Savart's law. Forces due to magnetic field. Magnetic torque and moment. Ampere's law. Magnetic dipole. Magnetization in materials. Generalized Ampere's law. Magnetic boundary conditions. Magnetostatic field analysis using MATLAB. Faraday's law. Inductors and inductances. Magnetic energy. Magnetic circuits.

Teaching Methodology: 45 hours of lectures + 45 hours of tutorials. Approximately 70 hours of personal study and exercise including seminars.

Grading System: First assesment:30%, Second assesment: 25%, Home exercises 10%, Attendance: 5%, Final exam, 30%, Total:100%

Literature:

1. Nexhat Orana, *Bazat e elektroteknikës 1*, Prishtinë, 1994
2. Nexhat Orana, *Bazat e elektroteknikës 2,* Prishtinë, 1994
3. M.N. *Sadiku, Elements of electromagnetic*, Oxford University Press, New York, 2001

Course title: Programming Language (Mandatory, Sem. I, 5 ECTS)

The goal : The purpose of the course is to introduce the basic principles of programming and algorithms, for solution of problems with computer and writing of respective programs in C++ programming language.

Learning outcomes: On successful completion of the course, students will be able to write programs in C++ programming language, including the use of different functions.

Course content: Introduction to algorithms: sum, product and factoriel. Array operations and algorithms: sum/product of the array members, counting members, searching and sorting. Matrix manipulations: creation, sum/product of the members, searching, creationg vector from the matrix members. Introduction to C++ programming language: variable types, operators, statements. Input and output: input of numbers, arrays, strings and their output, use of manipulators. Branching: if, goto, switch( ). Loops: while, do-while, for. Loops: breaking, continuing and exiting. Functions: defining and executing, parametters and arguments, mathematical and string functions. Using vectors and matrices with functions. Recursion, pointers, references. User defined types: enumerations, structures, classes.
Methods of teaching: 30 hours of lectures + 30 hours of auditorial/lab exercises. Approximately 100 hours of personal study and exercise including home problems/tasks.
Grading System: Attendance 10%, Mid-term problems 30 %, Collocui/Final Exam 60 %
Literature:

1. Agni Dika, "Algoritmet, me programe në C++", Universiteti i Prishtinës, Fakulteti Elektroteknik, Prishtinë, 2004, http://www.agnidika.net/algoritmetCpp.pdf
2. Agni Dika Bazat e Programimit në C++, Universiteti i Europës Juglindore, Tetovë, ISBN 9989-866-23-6, http://www.agnidika.net/programimiCpp.pdf
3. H.M. Deitel, P. J. Deitel, How to Program C++, Prentice Hall, Upper Saddle River, New Jersey, ISBN 0-13-111881-1
4. Robert Lafore, Object-Oriented Programming in C++, Sams, Indianopolis, Indiana, ISBN-10:0-672-32308-7

Course title: English Language (Elective, Sem. I, 5 ECTS)
The goal: The aim of the course is to develop students' communication skills inEnglish Language, in both oral and written form,with special focus in the field of electrical and computer engineering.
Learning outcomes: Upon successful completion of this course students will be able:1. To apply active English Language in their everyday life; 2. To communicate in English Language in both oral and written form at appropriate level, primarily in their professional field of study; 3. To ask and respond questions from the field of electrical and computer engineeringin English Language; 4. To translate texts from the field of electrical and computer engineering.
Teaching methodology: 15 hours lectures, 30 hours exercises. Approximately 100 hours of independent work including the seminar paper.
Assessment: Seminar paper 10%, intermediate assessment 30 %, final exam 60 %
Basic literature:

1. Markovic, Jelica, *Engleski jezik za studente elektrotehnickog fakulteta*, Beograd, 1989
2. D. Nastić, V. Kosovac: "Engleski jezik za elektrotehnicke i masinske fakultete", Svjetlost Sarajevo, 1984.

Course title: Communication skills (Elective, Sem. I, 5 ECTS)
The goal: The goal of this course is to develop written and verbal communication skills and group work.
Learning outcomes: On successful completion of the course, students will be able to:
1. write different official and business letters; 2. write formal and informal emails; 3. write a five-paragraph essay; 4. write different reports (visit r., field r., feasibility r., progress r.); 5.

write laboratory reports; 6. use the Internet to find specific information; 7. use the computer to write different reports; 8. write minutes of meetings; 9. write a paper on a particular problem or issue; 10. write CVs and applications for work; 11. hold oral presentations; 12. respond to job interviews.

Course content: Introduction to communication skills. Words and sentences. Writing process. Technical information. Internet information and e-mail: World Wide Web (www). Essays and exam answers. Laboratory reports. Reports. Proposals, specifications and manuals. Final year projects and reportss. Spoken presentations. Group work and meetings. Letters. CVs and job applications. Interviews: Interview for job.

Methods of teaching: 30 hours of lectures + 15 hours of exercises. Approximately 100 hours of personal study and exercise including home-work.

Grading System: 1st Exam: 25%; 2nd Exam: 25%; 50%, Home-work: 25 %, Final exam: 25 %

Literature:

1. Majlinda Nishku, *Si të shkruajmë: procesi dhe shkrimet funksionale*, CDE, Tiranë, 2004.
2. Rami Memushaj, *Shqipja standarde. Si ta flasim dhe ta shkruajmë.* Toena, Tiranë, 2004.
3. Bardhyl Musai, *Si të shkruajmë ese*, CDE, Tiranë, 2004.
4. John W. Davies, *Communication Skills. A Guide for Engineering and Applied Science Students*, Prentice Hall, 2001.

Course title: Electric Circuits (Mandatory, Sem. II, 7 ECTS)

The goal: The purpose of the course is to introduce the basic principles of electrical circuits.

Learning outcomes: On successful completion of the course, students will be able to: 1. Understand and apply Kirchhoff's Laws to DC and AC circuit analysis. 2. Understand and apply phasors for sinusoidal steady-state AC circuit analysis 3. Analyze DC and AC circuits by following circuit analysis methods and theorems (nodal analysis, mesh analysis, star-delta transformation, transformation between real source models, Millman's, Thévenin's and Norton's theorems 4. Understand and apply the principle of linearity and superposition to AC and DC circuits 5. Analyze transient response of first order circuits (series RC and RL). 6. Use software PSPICE for solving DC and AC circuits. 7. Apply gained knowledge of electric circuit skills in other fields

Course Content: Concepts, elements and topology of electric circuits**.** – Types of electrical circuits. Elementary DC circuits – Circuit Elements, Electrical resistance- Ohm's law. Construction of circuitmodel.Voltage and potential in electric circuit. Current source. Kirchoff's laws. Analysis of a Circuit Containing Dependent Sources. Complex DC circuits. DC circuit analysis using SPICE. Current and voltage waveforms. Techniques of Circuit Analysis. Sinusoidal Steady-State Analysis. The Sinusoidal Response, The Passive Circuit Elements in the Frequency Domain, Sinusoidal Steady-State Power Calculations, Maximum Power Transfer. AC circuit analysis using SPICE. Magnetically coupled circuits. Response of First-Order *RL* and *RC* Circuits. Transient circuit analysis using SPICE. Balanced Three-Phase Circuits. SPICE analysis of three phase circuits.

Teaching methodology: 45 hours lectures, 45 hours tutorials, and approximately 70 hours independent work.

Assesment: First assesment:30%, Second assesment: 25%, Home work 10%, Attendance: 5%, Final exam, 30%, Total:100%

Literature :

1. Nexhat Orana, *Bazat e elektroteknikës 1*, Prishtinë, 1994
2. Nexhat Orana, *Bazat e elektroteknikës 2,* Prishtinë, 1994
3. Ch. Alexander, M. N. Sadiku, Electric circuits, McGraw Hill, New York, 2000

Course title: Physics II (Mandatory, Sem. II, 6 ECTS)

The goal: Using the physical laws of modern physics in modeling and solving specific engineering problem.

Learning outcomes: On successful completion of the course, students will be able to: 1. Apply the linearization technique to equations of motion of oscillatory 2. Explain the wave equation in non dispersive medium 3. Analyze optical systems using the methods of geometrical optics.4 . Explain the phenomena of interference, diffraction and polarization of light.5. Explain Planck's law of black body radiation. 6. Relate the atomic spectrum to quantization of energy levels.

Course content: Solid state materials elasticity. Mechanical oscillation and mechanical waves. Sound waves. Doppler s effect. Electromagnetic waves. Maxell s equation s. Wave equation, wave propagation. Geometrical optics, mirrors, lenses and prisms. Physical optics. Interference, diffraction and polarization. Photometry. Quantum nature of light. Blackbody radiation, quantization. Photo effect and Compton s effect. Atom structure. Atomic specters. X-rays. Atomic nucleus. Radioactivity. Relativistic mechanics.

Methods of teaching: 45 hours of lectures + 15 hours of auditorial exercises + 15 hours of laboratory exercises. Approximately 75 hours of personal study.

Grading System: Seminar 10%, Mid-term exams 20 %, Final Exam 60 % .

Literature:

1. S. Skenderi, R,Maliqi, “Physic for thechnical faculty”, UP, Pristina, 2005.
2. J. Serway, Physics for scientists and engineerings, Thomson Books, 2004.
3. D. Haliday, R.Resnick, J.Walker, Fundametals of Physics, John Wiley &Sons, 2001.

Course title: Mathematics 2 (Mandatory, Sem. II, 7 ECTS)

The goal: The purpose of the course is to enable students to knowledge gained through this course can apply as an auxiliary device in the professional courses of study electrical engineering and computer.

Learning outcomes: On successful completion of the course, students will be able to: 1. Understand the notion of indefinite integral and definite integral and their application in the computation of various measures in geometry, electrical engineering, mechanics and other areas; 2. Understand basic techniques in calculus of several variables and apply on finding local and global extremes of differentiable functions of several variables; 3. Relate techniques of Mathematics and use them to solve basic types of ordinary differential equations and create a mathematical model, based on the differential equation, related to electrical engineering.

Course content. Indefinite and definite integral. Methods of integration (method of substitution and integration by parts). Applications of integral calculus. Function of several

variables, Euclidean space R^n. The notion of the graph of the function in several variables. Limit and continuity of functions in several variables. Partial derivatives. Higher order derivatives. Derivatives of composite functions and chain rule. Local extreme of function of several variables. First-order differential equation. Orthogonal trajectories. Singular solutions of differential equations of the first order. Linear differential equation of the second order. Higher-order linear ordinary differential equations with constant coefficients. Linear systems of two or more ordinary differential equations

Methods of teaching: 45 hours of lectures + 45 hours of auditoria exercises. Approximately 120 hours of personal study and exercise.

Grading System: Homework 10%, Mid-term exams 30 %, Final Exam 60 %

Literature:

1. Hamiti E. - Matematika II, Prishtinë 1995.
2. Hamiti E. - Matematika III, Prishtinë 1997.
3. Loshaj Z. - Përmbledhje detyrash të zgjidhura nga Matematika II, Prishtinë 1996.
4. Hamiti E., Lohaj Sh. – Matematika III – Përmbledhje detyrash, Prishtinë 1998.

Course title: Algorithms and Data Structures (Mandatory, Sem. II, 5 ECTS)

The goal : The purpose of the course is to help studens in advancing their knowledge for different algorithms, data structures and use of classes and objects in programming.

Learning outcomes: On successful completion of the course, students will be able to compile advanced algorithms, to define structures and classes and to use them in writing advanced programs.

Course content: Definition and use of advanced functions, iline functions, macro functions, function overloading, templates. Searching and sorting algorithms: different methods for searching and sorting.

User defined types. Object oriented programming: classes and objects. Classes and member functions. Using public and private members. Declaring objects and operating with their components. Pointers and functions with pointers. References and functions with references. Stack. Queue. Linked lists, adding/deleting members. List searching and sorting. Binary tree. Graphs. Files: sequential and direct access files.

Methods of teaching: 30 hours of lectures + 30 hours of auditorial/lab exercises. Approximately 100 hours of personal study and exercise including home problems/tasks.

Grading System:

Attendance 10%, Mid-term problems 30 %, Collocui/Final Exam 60 %

Literature:

1. Agni Dika, Programimi i Orientuar në Objekte, me programe në C++, UEJL, Fakulteti i Shkencave Bashkëkohore, Tetovë, ISBN 9989-866-25-2, http://www.agnidika.net/programimiobjekte.pdf
2. D. S. Malik, C++ Programming: Program Design Including, Data Structures, Course Technology, Thomson Leraning, Boston, Massachusetts, ISBN 0-619-03569-2
3. H.M. Deitel, P. J. Deitel, How to Program C++, Prentice Hall, Upper Saddle River, New Jersey, ISBN 0-13-111881-1
4. Robert Lafore, Object-Oriented Programming in C++, Sams, Indianopolis, Indiana, ISBN-10:0-672-32308-7
5. D. S. Malik, Programming: From Problem Analysis To Program Design, Course Technology, Thomson Leraning, Boston, Massachusetts, ISBN 0-619-06213-4

Course title: Digital Circuits (Mandatory, Sem. II, 5 ECTS)
The goal: The purpose of the course is to present the way of digital logic design (analysis and design).
Learning outcomes: On successful completion of the course, students will be able to: 1. Explain and find the functions that performs a digital logic circuit. 2. To formulate differnet codes for information. 3. To express values in different system: Binary, Octal, Hexadecimal,etc. 4. Analyze logic circuits. 5. Designing the digital circuits.
Contents: Numerical systems. The binary number system, arithmetic operations in the binary system. Transformations between systems. Codes and encoding. Boolean algebra. Logical functions and their presentation. Combinatorial logic circuits. Analysis of logic circuits. Synthesis of logic circuits. Encoders, decoders, codes transducers, multiplexers, demultiplexers, arithmetic circuits, comparators, ROM memories. Digital sequential circuits. Flip-Flops: SR, JK, D, T. StateTables of the circuits. Diagram of states of the circuit. Analysis of synchronous sequential circuits. Analysis of asynchronous sequential circuits. Design of sequential circuits. Design of digital counters. Design of memory. Software for simulating logic circuits.
Methods of teaching: 30 hours of lectures + 15 hours of auditorial exercises and 15 hors of laboratory exercises. Approximately 70 hours of personal study and exercise including projects.
Grading System: Presence 10%, Projects 30 %, Final Exam 60 %
Literature:

1. Agni Dika "Qarqet digjitale kombinuese I", Universiteti i Prishtinës, 2008
2. S.M. Deokar, A. A. Phadke, "Digital Logic Design and VHDL", Wiles, 2009

Course title: Electrical Materials (Mandatory, Sem. III, 5 ECTS)
Objectives of the course (module): As students gain knowledge of the basic features of materials used in engineering and dependency features their effects of external field's forms.
Learning outcomes: After completing this course (course) the student will be able to: 1. To enrich knowledge Micro structure of materials. 2. To enrich knowledge of the basic features of conductive materials, dielectric and magnetic and 3. To be able to make quality selection of materials depending on the electro influences of various external fields.
Contents: Basic knowledge on materials microstructure. Conductive materials, materials with greater conductivity, semiconductor materials and super-basic features and their characteristics. Materials and their dielectric and magnetic materials, basic features and their use. Experimental Determination of the basic characteristics of materials, conductors, and magnetic insulation
Methodology of teaching:(30 hours of lectures, 30 hours of laboratory exercises. Approximately 100 hours of independent work including elaborations processing of experimental data.
Evaluation: Evaluation of the first 15%, second 15% rating, the third rating 15%, 5% Regular attendance, final exam 50%.
Literature:

1. A. Abbas, I. Krasniqi: "Materialet elektroteknike" Pristine, 1997

2. A. Robert: "Dielectric Materials and application", London, 1995,
3. D.G. Fink, H.W. Beaty, "Standard Handbook for Engineers ELECTRICAL" Mc. Graw Hill, N.Y, 1995

Course title: MathematicsIII(E) (Mandatory, Sem. III, 5 ECTS)
The goal: Is to enable students that knowledge gain through this course can apply as an auxiliary device in the professional courses of electrical engineering and computer study.
Learning outcomes: On successful completion of the course, students will be able to: 1. Formulate and to solve various problems in the field of their profession, when dealing with double, triple, line and surface integrals, vector functions in the space, scalar and vector fields and Fourier series. 2. The student will know to describe and solve problems related to the mechanics and the theory of electrical circuits. With the acquired knowledge the student will be trained to make mathematical models related to specific professional problems.
Course content: Double and triple integrals, definition, calculation and their application in mechanics. Line integral of the first type and the second type, their definition, calculation, and Green's formula. Surface integral of the first type and the second type, their definition, calculation, Stocks and Gauss-Ostrogradsky formula. Vector functions in space. The gradient of the scalar field. The divergence and rotor of the vector field. Fourier series. Dirichlet conditions. Parseval identtity. Fourier series of the complex forme. Fourier transformations and Fourier Integral. Classical and axiomatic definition of probability. Events. Random variables and their distribution. Mathematical expectation, variance, standard deviation and other moments.
Methods of teaching: 30 hours of lectures + 30 hours of auditoria exercises. Personal study and exercise, discussions and group and individual consultations.
Grading System: Homework 10%, Mid-term exams 30 %, Final Exam 60 %
Literature:

1. Hamiti E. - Matematika III/1, Prishtinë 1995.
2. Hamiti E. - Matematika III/2, Prishtinë 1997.
3. HAMITI E, LOHAJ SH. - Përmbledhje detyrash të zgjidhura nga Matematika III, Prishtinë 2001.
4. HAMITI E, LOHAJ SH. - Përmbledhje detyrash të zgjidhura nga Matematika IV, Prishtinë 2002

Course title: Signals and Systems (Mandatory, Sem III. , 5 ECTS)
Course objectives: The objectives of the course are to introduce students to the basic concepts of signals, system modeling, and system classification; to develop students' understanding of time-domain and frequency domain approaches to the analysis of continuous and discrete systems; to provide students with necessary tools and techniques to analyze systems; and to develop students' ability to apply modern simulation software to system analysis.
Learning outcomes: Student will learn properties of signals and systems and the ways how to represent them in time and frequency domain. After finishing the course student will be familiar with fundamental methods of signal and system analysis, in time and transform domain, through problem solving and performing corresponding simulations.

Course content: Introduction to basic theoretical concepts of signal and systems. Impulse response and convolution. Differential and difference equations. Fourier series and signal decomposition in harmonic components. Fourier transformation, spectrum of continuous signal and its properties. Amplitude modulation and sampling. System analysis in the frequency domain. Ideal filters. Demodulation and reconstruction of sampled signals. Fourier analysis of signals and systems in discrete time. Laplace transformation and its applications in the analysis of signals and systems. z-transform, properties, transfer function, stability and analysis in z domain.
Teaching methodology: 45 hours of lectures + 30 hours of exercises. Approximately 75 hours of personal study, including homework exercises.
Grading System: Homework 10%, Mid-term exams 30 %, Final Exam 60 %
Literature:

1. "*Schaum's Outline of Theory and Problems of Signals and Systems*", Hwei P. Hsu, 1995, McGraw-Hill.
2. "*Signals and Systems*", Alan V. Oppenheim, et al, 2nd ed., 1996, Prentice Hall.
3. "*Fundamentals of Signals and Systems-Using Matlab*", E. Kamen and B. Heck; 3rd ed., 2006, Prentice Hall.

Course title: Automation (Mandatory, Sem. III, 5 ECTS)
The goal : The purpose of the course is to introduce the students with the concepts and fundamental structures of automatic control systems.
Learning outcomes: On successful completion of the course, students will be able to: 1. To be thoroughly familiar with the concept and standard structures of automatic control systems. To appreciate the importance of feedback in system performance. **2.** Write dynamic equations of automatic systems, obtain a mathematical model of different control systems 3. Become familiar with the modeling of systems in the form of block diagrams and obtain transfer functions from such structures. 4.Perform system analysis in time domain and frequency domain 5. Conclude on important features of control systems based on the analysis of time and frequency responses.
Course content: Introduction to the fundamental of automatic control. The necessary mathematical apparatus for analysis of control systems. Mathematical modeling of electrical, mechanical and thermal systems. Time domain analysis of control systems. Step response of control systems and data inferring from recorded responses. Frequency domain analysis of control systems. Bode and Nyquist diagrams; deriving system features from these diagrams. Modeling and analysis of systems in state space. Controllability, observability and feedback controllers.
Methods of teaching: 30 hours of lectures + 15 hours of auditorial exercises + 15 hours of laboratory exercises. Approximately 100 hours of personal study and exercise including seminars.
Grading System: Seminar 10%, Mid-term exams 30 %, Final Exam 60 %
Literature:

1. F. Golnaraghi & B. C. Kuo, *Automatic Control Systems*, John Wiley & Sons
2. J. D'Azzo & C.Houpis, *Automatic Control Systems, Analysis and Design. Conventional and Modern*. McGraw Hill
3. A. Skeja, *Rregullimi Automatik,* Ligjwrata tw autorizuara

Course title: Electronics (Mandatory, Sem. III, 5 ECTS)
The goals: To provide an introduction to basic concepts in the field of electronics. This course is one of the fundamental courses for all departments of electrical engineering and will prepare students for more advanced courses in the field of electronics.
Learning outcomes: Upon completion of this course the student will be able to: Understand the basics of electronics within the field of electrical engineering, to analyze and design the diode circuits, bipolar and FET transistor and their models; analyze and design transistor circuits for small signals, analyze and utilize operational amplifiers, will be able to continue studies in advanced electronic courses and electrical circuits.
Course content: Basic concepts, current voltage, Kirchhoff's laws, Norton's theorem and Thevenin's theorem. Ac circuits, resonance, transfer function, four pole networks, filters and amplifiers. Diodes circuits, zener diodes, drivers, and diodes circuits for signal processing. Bipolar transistors, the basic configuration bipolar transistor circuits, models for small signals. Basic amplifier configurations: common Emitter, common based and common collector. Field effect transistor, operational principles, models for small signals. MOSFET transistors. Basic amplifier configurations: common sours, common gates and common drain. Operational amplifiers, real and ideal characteristics, basic circuits with operational amplifiers, AO applications. Feedback elements, differential amplifier. Data acquisition and control processes, comparators, oscillators, A/D transducers D/A transducers, time conversion. Computers and interconnection circuits.
Methods of teaching: 30 hours of lectures + 15 hours of auditorial exercises + 15 hours of laboratory exercises. Approximately 100 hours of personal study and exercise.
Grading System: Test 1: 15 % , Test 2: 15 % Final test: 20%, Final exam: 50%
Literature:

1. Donald Neamen, Electronic Circuit Analysis and Design, McGraw-Hill Education, 2000,
2. Adel S. Sedra, Kenneth C. Smith, Microelectronic Circuits, Oxford University Press, 2007,
3. Myzafere Limani, Elektronika, Universiteti i Prishtinës, ligjërata të autorizuara, 2008.

Course name: Electrical Measurements (Mandatory, Sem. III, 5 ECTS)
Course objectives: To achieve the basic theoretical and practical knowledge's about Electrical Measurements.
Learning Outcomes: After completion of this course, student should be able to use instruments and measuring methods for measuring of electrical, nonelectrical and magnetic quantities. He should be able to do this in professional engineering and scientific manner estimating the measurement uncertainty of measured result. The covered span of measured quantities is that used utilities in industries and research without special measurements, i.e. student should have knowledge's about: sensors, instruments, amplifiers and converters of quantities.
Course Content: Measuring *units* and *measuring errors*. The use of resistor combinations to build measuring schemes for: *voltage-potentiometers* and current *dividers*, *measuring potentiometers* and *measuring bridges*. Discus and use the: *thermocouples, resistive temperature detectors, thermistor's for temperature measurements, and strain gauge*

resistors to measure mechanical tension. Discus and use of different *sensors: capacitive, inductive, magnetic and electromagnetic and induction type*, for different *measurements of physical quantities*. Knowledge and ability to use methods and instruments to measure *electrical quantities as: voltage and current (both ac and dc), resistance, impedance and reactance; power and energy (both dc and ac in single and three phase system*. Discus and use methods and instruments to *measure magnetic quantities: flux, flux density, intensity of magnetic field and magnetic losses in ferromagnetic material*.

Teaching methodology: 45 hours lectures with solution of problems, and 30 hours laboratory work. Approximately 75 hours with lecturer and teaching assistant.

Assessments: 3 tests each one 15 %, laboratory work test 15% and final exam 40 %.

Literature:

1. A. Gashi, Matjet elektrike, ligjëratat dhe prezantimet 2012.
2. M.J. KORSTEN, W.OTTHIUS, F. VAN DER HEIJDEN "Measurement Science for Engineers, Elsevier Science & Technology Books, 2004.
3. M. SEDLÁČEK, V. HAASZ, Electrical Measurements and Instrumentation, Prague 2000.

Course title: Computer Architecture (Mandatory, Sem. IV, 5 ECTS)

The goal: The purpose of the course is to introduce computer architecture and organization, their structure and function.

Learning outcomes: On successful completion of the course, students will be able to:

1.Explain the evolution of computers, their development over generations, the bus system, all types of memories, Input/Output modules, instructions, addressing mode, addressing formats,designing and construction of modern processors. 2. To be able to write and execute programs in Assembler language, using registers. 3. To be able to evaluate the performance of a computer. 4. To know the requirements and design parameters of the processor, memory and computers in general.

Contents: The evolution of computers. The performance of computers. Top Level View - Buses. Cache memory. Internal memory technology. External memory. Input / Output Modules. Computers arithmetic. Assembler language. Microprogramming. Instruction sets. Addressing modes and formats. Processor structure and function. Reduced Instruction Set Computers (RISCs).

Methods of teaching: 30 hours of lectures + 30 hours of auditoria and laboratory exercises. Approximately 80 hours of personal study and exercise including projects.

Grading System: Presence 10%, Projects 30 %, Final Exam 60 %

Literature:

1. Williams Stallings "Computer Organization and Architecture – Designing for Performance", 8thEdition, Prentice Hall, 2010
2. Linda Null and Julia Lobur, "The essentials of Computer Organization and Architecture", Jones and Bartlett Publishers, 2003.

Course title: Power Systems (Mandatory, Sem. IV, 6 ECTS)

The goals: The purpose of the course is to introduce the basic principles of operation of the power system and electrical machines.

Learning outcomes: On successful completion of the course, students will be able to:

1. Have knowledge of the power system, its components (power plants, transmission and distribution networks, substations). 2. Have knowledge of transformers, operating principle, equivalent schemes, types of transformers and their application. 3. To know the principles of energy conversion and operating principle of the DC Machines. 4. To recognize principles of operating of AC machines with special emphasis on induction motors and synchronous generator.

Course content: Power System and its component parts. Power plants, transmission and distribution system. Thermal power plants, nuclear power plants, hydro power plants, wind power plants, solar plants. Single-phase and three-phase circuits analysis. Cables. Transmission lines. Principles of energy conversion. The operating principle of transformer, equivalent schemes, determination of transformer parameter. The operating principle of the DC Machines. Types of excitation. Control of voltage and speed. Models of AC machines. The operating principle of induction machines. Equivalent schemes, the induced voltage, torque and starting of induction motor. The operating principle of synchronous machine.

Methods of teaching: 45 hours of lectures + 30 hours of auditoria exercises. Approximately 100 hours of personal study.

Grading System: First exams 20%, Second exams 20 %, Final Exam 60 %

Literature:

1. George G. Karady & Keith Holbert, *Electrical Energy Conversion and Transport*, John Wiley,2005.
2. Guru, B.S and Hiziroglu, H.R. *Electric Machinery and Transfoermers*, Oxford Universitz Press, New York- Oxford 2001.
3. Gani Latifi, **Shndërrimi i energjisë elektrike**, Prishtinë 1997
4. Vjollca Komoni, Gani Latifi **Elektronenergjetika**, ligjëratat, Prishtinë 2008

Course title: Electromagnetic Fields and Waves (Mandatory, Sem. IV, 6 ECTS)

The goal: To provide students with the background necessary to understand the interplay between electricity and magnetism, the electromagnetic wave properties and its propagation in different media through various junctions.

Learning outcomes: On successful completion of the course, students will be able to: 1. Apply vector calculus to analyze the behavior of static electric fields and magnetic fields in standard configurations; 2. Describe the parameters of quasistatic and time varying fields, guided and free space wave propagation and the underpinning role of Maxwell's equations. 3. Explain examples of the interaction between waves and media and to be able to relate these to engineering design considerations and function; 4. Illustrate and analyze transmission lines; 5.Practice calculation of electromagnetic filed to solution of practical problems.

Course content: Vector Analysis: Gradient, Divergence and Curl, Laplacian operator.

Electrostatics: Maxwell's equations, Charge and current distributions, Gauss Law, Electrical scalar potential, Electrical properties of materials, Method of images, Electrostatic potential energy.

Magnetostatics: Magnetic forces and torques, Maxwell's magnetostatic equations, Vector magnetic potential, Boundary conditions, Inductance, Magnetic energy. Maxwell's equation for time varying fields: Faraday Law, Displacement current, Retarded potentials. Electromagnetic Waves: Derivation of the wave equation, solution of wave equation for TEM case, plane wave concepts, wavelength, attenuation and phase constants, propagation of

waves in lossless and lossy media. Transmission Lines: Derivation of transmission line parameters, attenuation and phase coefficients, characteristic impedance, SWR definition, lossless and lossy lines and matching techniques.

.**Methods of teaching:** 45 hours of lectures + 15 hours of combined auditorial and laboratory exercises. Approximately 80-90 hours of personal study and exercise including assignments.

Grading System: Assignment 15%, Mid-term exam 35 %, Final Exam 50 %

Literature:

1. Fawwaz T. Ulaby, Eric Michielssen and Umberto Ravaioli, "Fundamentals of Applied Electromagnetics" Prentice Hall 6th Edition, 2010
2. Magdy F. IIskander "Electromagnetic Fields and Waves ", Waveland Press, 2012

Course title: Electronic Devices (Mandatory, Sem. IV, 7 ECTS)

The goals: The course is designed to teach the physical principles and operational characteristics of advanced semiconductor electronic devices with emphasis on metal-oxide systems, bipolar, high-electron mobility, and field-effect transistors. Topics also include quantum point contact and tunneling devices. The course provides advanced background in solid state electronic devices.

Learning outcomes: On successful completion of the course, students will be able to understand the details of operation of the advanced semiconductor electronic devices know the parameters of electronic devices that govern their performance and limitations, be familiar with tendency in contemporary microelectronics and principles of nano-scale electronic devices.

Course content: Energy Band Model, Bonding Model, Carrier Energy, Carrier Concentrations Distributions, Fermi Level in Equilibrium, Carrier Drift in Electric Fields, Recombination & Carrier Lifetime, Quasi-Fermi Levels, Carrier Diffusion, Drift & Diffusion, p-n Contact, Contact Potential, Forward & Reverse Bias, Diode Equation, Reverse Bias Breakdown, Junction Capacitance, MOSFET Basic Concepts, Ideal MOS Capacitor, Threshold Voltage Capacitance vs. Gate Voltage MOSFET Voltage/Current Relations, BJT Basic Concepts, Current Distribution Diagrams, Current Amplification Factor, Emitter Injection Efficiency, Base Charge Transit Time/Lifetime, Common Emitter Amplification.

Methods of teaching: 45 hours of lectures + 15 hours of auditorial exercises + 15 hours of laboratory exercises. Approximately 100 hours of personal study and exercise.

Grading System: Test 1: 15 %, Test 2: 15 % , Final test: 20% **,** Final Exam 50 %

Literature:

1. Ben Streetman and Sanjay Banerjee: Solid State Electronic Devices Sixth Edition, Pearson, Prentice Hall, 20009,
2. Donald A. Neamen, Semiconductor Physics and Devices, Irwin, Chicago, 2004,
3. Myzafere Limani, Komponentet Elektronike – ligjërata të autorizuara, Universiteti i Prishtinës, 2009.

Course Title : Project Management (Elective, Sem IV, 6 ECTS)

Course/Module aim: This module aims to introduce students to the basic concepts of project management and offer them the opportunity that through practice they apply these concepts.

Expected results : At the end of this course, students will be able to: Identify projects and distringuish them from other activities in the organization. Understand the importance of project planning and activities required for good planning. Understand the complex natyre of managing project activities. Use different techniques for project management (such as PERT). Identify required skills for a good project manager. Understand concepts of project costs, project budgets and activities required for their management. Identify and manage project risks. Understand the importance of project audit and monitoring.
Course contents: Introduction to project management. Project phases and life cycle. Project team management. Cost and time planning. Project planning and scheduling. Resource alocation. Risk Management. Project monitoring and control. Project auditing.
Teaching methodology: 30 hours of lectures and 30 hours of practice. Approximately 100 hours of independent work including term presentation.
Grading: Presentation 20%, Wikipedia project 10 %, Final exam 70 %
Literature :

1. Suzana Panariti: Menaxhimi i Projekteve, Shtëpia Botuese e Librit Universitar 2010, Tirane
2. Clifford F. Gray, Eric W. Larson: Project Management, The managerial Process, McGraw-Hill, 2006
3. Denis Lock: Project Management, Gower Publishing Limited, 2008

Course title: Microprocessors and microcontrollers (Mandatory, Sem V., 6 ECTS)
The goal: Familiarity with parts of computer hardware. Uses of microprocessors/microcontrollers in different applications. Basic microcontrollers concepts. Familiarity with architecture of 8051 family of microcontrollers. Familiarity with software development systems. Microcontroller programming in assembler, C and Basic. Programming and utilization of peripheral devices.
Learning outcomes: On successful completion of the course, students will be able to: 1. know structure of microprocessor systems that are faced with; 2. design microprocessor and microcontroller based systems for specific application; 3. write program for specific application; 4. find and repair defects in microprocessor systems.
Course content: Motivation and introduction to microprocessor systems. Logical circuit and microprocessor system design. Microprocessor systems and details abut communication between units, time diagrams. Internal structure of 8051 and variations among different producers. Introduction to development system. Instruction set. Input/output ports and communication with peripherals. Programming in assembler. Keyboard and display. Program structure. State diagrams. Timer function and programming. Interrupts - generation and processing. Serial communication. A/D and D/A conversion. Programming in higher level languages, C, Basic, Pascal.
Methods of teaching: 30 hours of lectures, 30 hours of laboratory exercises.
Grading System: Mid-term exams 10%+10%, Project 40%, Final exam 20%+20%.
Literature:

1. D. V. Hall, *Microprocessors and digital systems*, McGraw-Hill
2. S. MacKenzie, *The 8051 microcontroller*, Prentice-Hall
3. Kenneth J. Ayala, *The 8051 microcontroller: Architecture, Programming and Applications*, West Carolina University, 1991
4. David Calcutt, Fred Cowan, Hassan Parchizadeh, *8051 Microcontrollers: An Applications-Based Introduction*, Newnes, 2004

5. Muhammed Ali Mazidi, *The 8051 Microcontroller And Embedded Systems Using Assembly And C*, Pearson Education, 2007

Course title: Digital Electronics (Mandatory, Sem. V, 6 ECTS)
The goal: The main purpose of the course is to study the principles and applications of modern Digital Electronics. The course will cover the fundamentals of digital system design (i.e. combinational and sequential circuit elements) using both traditional and modern design techniques. Introductory concepts of Hardware Description Language (HDL) will be taught and small digital circuits will be built using Verilog HDL.
Learning outcomes: On successful completion of the course, students will be able to: demonstrate the knowledge of operation of basic types of flip-flops, registers, counters, decoders, encoders, multiplexers, and de-multiplexers, analyze and design digital combinational circuits including arithmetic circuits (half adder, full adder, multiplier), demonstrate knowledge of the nomenclature and technology in the area of memory devices: ROM, RAM, PROM, PLD, FPGAs, etc.
Course content: Introductory concepts, MSI logic circuits, FF timing considerations, propagation delay, critical path,. Introduction to HDL and CAD tools, circuit design with Verilog HDL. Circuit design with HDL, Sequential circuit analysis with state diagrams, Finite State Machine, Hazards in digital circuits. IC logic family, TTL characteristics, Interfacing digital systems with the analog environment, D/A and A/D conversion, Inverter Operation. Memory devices, DRAM, SRAM, ROM, Circuit design with HDL. Memory devices, Programmable logic devices, PLA, FPGA.
Methods of teaching: Lectures, Exams, Consultations, Seminars, Internship visits
Grading System: Seminar 10%, Mid-term exams 30 %, Final Exam 60 %
Literature:

1. R.J. Tocci., N.S.Widmer, G.L. Moss. Digital Systems, Principles and Applications, Pearson/Prentice Hall.
2. T.L.Floyd. Digital Fundamentals, 8th Ed. Prentice Hall.
3. Fundamentals of Digital Logic with Verilog Design, Brown and Vranesic, 2E, ISBN: 9780073380339
4. Digital Design, Mano and Ciletti, 4E, ISBN: 0131989243
5. S. D. Brown, Z. G. Vranešić (2001). Fundamentals of Digital Logic with VHDL Design, McGraw-Hill

Course title: Power Electronics (Mandatory, Sem V., 6 ECTS)
The goals: to provide knowledge on theoretical and applied power electronic devices and power electronic switches, expansion of knowledge on the theory and applications of power convertors, understand the concepts of application of thyristors, analyze and design various power converter circuits (DC/AC, A /AC and DC/DC and AC/DC).
Learning outcomes: Upon completion of this course the student will be able to: understand the power electronic devices, power rectifiers, have sufficient knowledge for the analysis and implementation of different types of thyristors; be able to describe the operational principles of various circuits such as power converters, inverters, AC/AC and DC/DC transducers and, to be able to analyze the characteristics and to draw the voltage and currents wave forms for

different working conditions, be able to analyze, discuss and design different types of power converters to meet the required specifications.
Course content: Power semiconductor diodes, rectifiers, Thyristors, converters three-phase converters, thyristor's commutation techniques, power transistors, inverters, inverters with supplementary switching, alternative converters (AC/AC), Cycle converters, DC / DC converter, UPS (uninterruptable power sources), Static switches.
Methods of teaching: 30 hours of lectures + 15 hours of auditorial exercises + 15 hours of laboratory exercises. Approximately 100 hours of personal study and exercise.
Grading System: Test 1: 15 %. Test 2: 15 %. Final test: 20% , Final exam: 50%
Literature:

1. M. Rashid, Power electronics, Prentice Hall, 2007,
2. Hemann, K, Basic Principles of Power Electronics, New York, 1986,
3. Mazda, R, Power Electronics, Addison Wesley, Inc., 1998,
4. Myzafere Limani, Elektronika Energjetike, Universiteti i Prishtinës, 2001.

Subject Title : Entreprenuership (Elective, Sem IV, 6 ECTS)
Course/Module aim: This module aims to introduce to students the basic concpets of innovation and entreprenuership in order to stimulate their entrprenurial learning and action.
Expected outcomes : At the end of this course, the students shall be able to: Understand the concepts of entreprenuership and inovation. Understand how these concepts differ from traditional management. Have basic understanding of mainstream theories relating to entreprenuership and innovation. Understand the requirements of starting a business. Understand basic pillars of business models. Understand various sources of business financing. Understand the usage of technology and the impact of internet on entreprenuership practice. Have basic understanding of the experience and case studies from the day to day practice of entrprenuership in Kosovo.
Course contents: Innovation practice and systemic entreprenuership. Entreprenuership in practice. Entreprenurial strategies. Business Model Framework. Business Model Patterns. Business model design techniques. Business strategy based on business model framework. Innovative business model desing processes. Examples of business models in practice and the application of the business model canvas.
Teaching methodology: 30 hours of lectures, 30 hours of practice. Approximately 100 hours of independent work, including the business plan preparation. During practice an important role is played by guest lecturers who are usually sucessfull kosovar entreprenuers or representatives of organizations that promote and support entreprenuership development.
Grading: Business Plan 40%, Final Exam 60 %
Literature :

1. Peter F. Drucker: Inovacioni dhe Ndërmarrësia, Shtëpia Botuese e Librit Universitar 2010, Tirane
2. Alexander Oswalder dhe Yves Pigneur: Business Model Generation, John Wiley and Sons, 2010.

Course title: Digital Signal Processing (Elective, Sem V. , 6 ECTS)
Course objectives: Getting a deeper insight into the discrete signal processing and system analysis. Getting acquired with different system structures, DFT, FFT, multi-rate DSP, IIR

and FIR digital filter design methods. To introduce students to basics of discrete random signal processing.

Learning outcomes: Students should be able to do the following upon completion of this course: To understand and to use different methods for discrete signal and system analysis in discrete time and frequency domain. To understand circular convolution, its relationship to linear convolution, and how linear convolution can be achieved via the discrete Fourier transform. To master digital filter (IIR and FIR) design. To understand multi-rate discrete systems and multi-rate signal processing techniques. To understand basics of discrete random signal processing.

Course content: Discrete signals and systems, impulse response, convolution, difference equations, correlation. Discrete-Time Fourier transform and sampling. z-Transform. Discrete Fourier Transform. Fast Fourier Transform. Discrete system implementation structures. Design of recursive and non-recursive digital filters.Multi-rate signal processing. Random signals and discrete linear systems, introduction to optimal filtering.

Teaching methodology: 30 hours of lectures + 30 hours of exercises. Approximately 75 hours of personal study, including homework exercises.

Grading System: Homework 10%, Mid-term exams 30 %, Final Exam 60 %

Literature:

1. *Discrete -Time Signal Processing*", Alan V. Oppenheim, et al, 2nd ed., 1998, Prentice Hall.
2. "*Schaum's Outline of Theory and Problems of Digital Signal Processing*", Monson H. Hayes, McGraw-Hill, 2011.
3. "*Digital Signal Processing - Principles, Algorithms and Applications*", John G. Proakis and Dimitris G. Manolakis; 3rd ed., 1996, Prentice Hall

Course title: Optoelectronics (Elective, Sem V, 6 ECTS)

The goal: *The goal of this course*is to introduce the main optoelectronic components, devices, and phenomena of optical radiation to which they are based.

Learning outcomes: On successful completion of the course, students will be able to: 1. explain phenomena and laws of optical radiation; 2. describe the construction and working principle of main optoelectronic components, such as: LEDs, photodiodes, phototransistors, photo-couplers, different types of lasers (solid, gaseous, liquid, etc.) optical-disks; optical waveguides etc.; 3. describe the construction and working principle of main optoelectronic devices, such as: modulators (electro-optical, magneto-optical and acusto-optical), laser printer, barcode reader 4. describe the working principle of recording and reproducing holograms 5. describe the construction of optical fibers and optical cables 6. explain the problems that arise during the course of optical fibers and in their coupling with photo-emitter and photo-detector. 7. show areas of use of lasers, illustrating with a concrete implementation; 8. outline, roughly, the operation of a telecommunications system based on fibre optic cable; 9. describe the principles on which the optical computer is based; 10. draft a paper on a particular issue or issues in the field of optoelectronics.

Course content: The nature of light. Characteristic properties and phenomena of light. Radiometric and photometric main concepts. Thermodynamics of radiation and interactions of radiation with material. Photo-emitters. Photo-detectors. Lasers. Optical resonators. Main types of lasers. Modulation of light. Optical-disk systems. Optoelectronics sensor systems. Optical waveguide systems (fiber-optic systems). Signal degradation in optical fibers. Optical fiber fabrication. Fiber-optic communication systems. Integrated optics. Optical information-processing systems. Holography. Optical computer.

Methods of teaching: 30 hours of lectures + 30 hours of auditorial and laboratory exercises. Approximately 100 hours of personal study and exercise including home-work.
Grading System: 1st Exam: 25%; 2nd Exam: 25%; 50%, Home-work: 25 %, Final exam: 25 %
Literatura:

1. Nebi Caka, *Optoelektronika*, Universiteti i Prishtinës, 1996.
2. John Wilson, John Hawkes, *Optoelectronics*, 3rd edition, Prentice Hall, 1998.
3. Saleh, B.E.A.; Teich, M.C. *Fundamentals of photonics*. 2nd ed. New York [etc.]: John Wiley& Sons, 2007. ISBN 9780471358329.

Course title: Sensors and actuators (Elective, Sem V, 6 ECTS)
The goals: This course examines types and uses of industrial sensors and actuators. Topics include temperature, pressure, optical, position and flow sensors. The course will also include wiring and troubleshooting of sensors and actuators.
Learning outcomes: Upon successful completion of this course, the student should be able to: Identify the components of a closed loop control system; Describe typical control system hardware: sensors, controllers and actuators; Describe types and operation of temperature, pressure, optical, position, and flow sensors; Compare electric, pneumatic, and hydraulic actuators; Wire and operate AC and DC motor drives; Describe proper wiring and cabling of sensors and actuators; Outline safety procedures when working with automated control systems.
Course content: Typical control systems. Mechanical parameter sensors. Motion and position sensors. Force sensors. Pressure sensors. Level sensors. Flow sensors. Temperature sensors. Thermocouples. Light sensors. Humidity sensors. Counters. Actuators. Electromechanical actuators. Hydraulic-pneumatic actuators. Alarm units. Graphic displays. Recording and indicating equipment. Test equipment. Troubleshooting.
Methods of teaching: 30 hours of lectures + 30 hours lab. Approximately 100 hours of personal study and exercise.
Grading System: Lab 50 % , Final exam: 50%
Literature:

1. Clarence W. de Silva, Sensors and Actuators: Control System Instrumentation, CRC Press 2007,
2. P.C. Sen, *Principle of Electric Machines and Power Electronics, 2nd Ed., John Wiley, 1997,*
3. Jacob Fraden, Handbook of Modern Sensors: Physics, Designs, and Applications, 4th ed., 2010.

Course title: Electronic communications *(*Elective, Sem. V, 6 ECTS)
The goal: The course aims at providing concept and fundamental knowledge on characteristics and architectures of electronic communication systems. Introduction to complete overview of modern communication technologies and their possibilities in service implementation.
Learning outcomes: On successful completion of the course, students will be able to: 1. Explain elements of electronic communication system and define parameters that describe information transmission in different types of communication systems; 2. Identify and

recognize main characteristic of analog and digital modulation methods; 3. Select modulation method parameters for meeting given application demands; 4. Distinguish multiplexing techniques, compare switching techniques, understand multiple access techniques; 5. Analyze possibilities and limitations of different communication systems

Course content: General model of communication system, transmission media: types, characteristics and applications. Modulation concept, basic forms of analog and digital modulation techniques. Multiplexing, switching and multiple access techniques. Open systems interconnect reference model, interconnectivity and internetworking. Overview of telecommunication network architectures and characteristics. Overview of commercial wireless systems and technologies. Service classification and implementation.

Methods of teaching: 30 hours of lectures + 30 hours exercises. Approximately 80-90 hours of personal study and exercise including assignments.

Grading System: Assignment 30%, Mid-term exam 30 %, Final Exam 40 %

Literature:

1. R: E. Ziemer, W. H. Tranter, "Principles of Communications" , Wiley, 2008
2. J. G. Proakis, M. Salehi " Fundamentals of Communication Systems",Prentice Hall, 2005
3. R. Horak,Communications Systems and Networks, Wiley, 2002

Course title: Measurements instrumentation and DAQ (Elective, Sem V, 6 ECTS)

The goals: Students will learn about the basics of data acquisition (DAQ). They will become familiar with the components in the computer and their settings by using Measurement and Automation Explorer. Then the students will write data acquisition programs using both software and hardware timing. The automatic code generation and DAQ Assistant features of LabVIEW will enable the students to write these programs faster and with a better understanding of the timing concepts, allowing them to draw conclusions about the results of their programs.

Learning outcomes: Upon successful completion of this course, the student should be able to: become familiar with the data acquisition hardware your computer; Understand, analyses and apply LabVIEW data acquirement from the DAQ hardware; Differentiate between hardware timed finite acquisition; hardware timed continuous acquisition; and software timed on demand acquisition.

Course content: Measurement & Automation Explorer. Data Neighborhood. DAQmx Tasks. Devices and Interfaces. Self Test. Test Panels. Scales. DAQ Custom Scales Wizard. Software. IVI Drivers. DAQ Assistant. Automatic Code Generation.

Methods of teaching: 15 hours of lectures + 45 hours lab. Approximately 80 hours of personal study and exercise.

Grading System: Lab 70 %. Final exam: 30%

Literature:

1. Robert H. Bishop (2003), *LabVIEW Student Edition*, Prentic-Hall,
2. LabVIEW Introduction Course,
3. Introduction to LabVIEW 7 and Data Acquisition (NI-DAQmx).

Course title: Microelectronics (Mandatory, Sem VI, 6 ECTS)

The goal: *The goal of this course*is to introduce the modern technologies of fabrication of monolithic and hybrid integrated circuits, and basic stages of analog and digital monolithic integrated circuits.
Learning outcomes: On successful completion of the course, students will be able to:
1. describe in detail the main stages of fabrication of monolithic integrated circuits; 2. compare with each other different isolation techniques of integrated circuits; 3. describe the main features of bipolar transistors and unipolar transistors and other components of integrated circuits; 4. present the main design rules of monolithic integrated circuits; 5. make the difference between monolithic circuits and hybrid circuits (thin-film and thick-film); 6. explain the functioning of basic stages of analog integrated circuits and digital integrated circuits; 7. solve numerical problems related to the technology of fabrication of integrated circuits; 8. draft a paper on a particular issue or issues in the field of microelectronics.
Course content: Introduction to Microelectronics. Planar silicon (Si) technology for fabrication of monolithic integrated circuits. Isolation techniques of components in monolithic integrated circuits. Components of bipolar integrated circuits. Components of unipolar (MOS) integrated circuits. Components of integrated circuits based on GaAs. Designing of monolithic integrated circuits. Hybrid integrated circuits (thin-film and thick-film). Basic stages of analog monolithic integrated circuits. Basic stages of digital monolithic integrated circuits. Design for testability (DFT) methods in integrated circuit. Introduction to nanotechnology.
Methods of teaching: 30 hours of lectures + 30 hours of auditorial and laboratory exercises. Approximately 100 hours of personal study and exercise including home-works.
Grading System: 1st Exam: 25%; 2nd Exam: 25%; 50%, Home-work: 25 %, Final exam: 25 %
Literatura:

1. Nebi Caka, *Mikroelektronikë*, (dispensë), UP-FIEK, Prishtinë, 2006.
2. Cui Zheng, *Micro-Nanofabrication: Technologies and Applications*, Spinger, 2005.
3. Sami Franssila, *Introduction to Microfabrication*, John Wiley & Sons Ltd., 2004.

Course title: Analog Electronics (Mandatory, Sem VI., 6 ECTS)
The goals: To provide an introduction to basic concepts in the field of analog electronics and expanding the theoretical and applicative analysis of analog electronic circuits with emphasis on the characteristics of amplifiers and their frequency response, power amplifiers, theory and applications of operational amplifiers and integrated circuits, familiarity with the concepts and design feedback, oscillators, and active filters.
Learning outcomes: Upon completion of this course the student will be able to: adopt linear analysis tools such as Bode techniques, the constant time techniques, concepts of feedback (positive and negative) to identify, analyze and design the basic amplifier topologies, to apply concepts of feedback analysis for analog amplifiers design, to design power amplifiers; analyze and design analog electronic circuits with OA (active filters and oscillator).
Course content: Frequency characteristics of amplifiers, power amplifiers, feedback and stability, frequency compensation, amplifiers with feedback, negative feedback and effects on linear amplifiers, operational amplifiers real and ideal, basic circuits with operational amplifiers, oscillators, active filters, integrated analog circuits, design and implementation of integrated circuits.
Methods of teaching: 30 hours of lectures + 30 hours of auditorial exercises + 30 hours of laboratory exercises. Approximately 100 hours of personal study and exercise.
Grading System: Test 1: 15 %. Test 2: 15 % **.** Final test: 20% **.** Final exam: 50%

Literature:

1. Donald Neamen, Electronic Circuit Analysis and Design, McGraw-Hill Education, 2000,
2. Adel S. Sedra, Kenneth C. Smith, Microelectronic Circuits, Oxford University Press, 2007,
3. Myzafere Limani, Elektronika 2, Universiteti i Prishtinës, ligjërata të autorizuara, 2005.

Course title: Multimedia fundamentals (Elective, Sem VI., 6 ECTS)

The goals: To provide basic knowledge for the development and use of multimedia - combining text, graphics, sound, animation, video images, To enhance the knowledge of students about the nature of various media, capture and creation, digitization and modification of any type of media, architecture and technology of multimedia systems, the principles behind effective multimedia presentations, to enable students to analyze, design and develop multimedia presentations through software packages; treat the fundamental concepts of contemporary technologies and develop new technologies

Learning outcomes: After completing this course the student will be able to: essentially to know the nature of the text, image, sound, video and animation; Have knowledge for creating, editing and storage of various media; Have knowledge to implement digitization and compression in multimedia: To have knowledge and skills to use the tools for creating multimedia products, have knowledge of web-based multimedia systems: to use and develop various software packages for the design of multimedia presentations that complement and expand those requirements.

Course content: Multimedia systems. History of multimedia systems. The multimedia software tools. Photo and Video Editing. Technical design. The presentation of multimedia data. Digitalization of sound. MIDI. Basics of digital video. Elements of information theory. Computer networks. Independent work in the lab.

Methods of teaching: 30 hours lectures, 30 independent works in lab. Approximately 80 hours of personal study and exercise.

Grading System: • Presetation 1: 20 % • Presetation 2: 20 % • Presetation 3: 20 % • Tests (3) : 50%

Literature:

1. Myzafere Limani: Kompjuterika Multimediale – Prishtinë, 2006,
2. Ze-Nian Li, Mark S. Drew, Fundamentals of Multimedia, Pearson Prentice Hall, 2004.

Course title: Fundamentals of robotic (Elective, Sem. VI, 6 ECTS)

The goal: Familiarity with robotic concepts. Describing relative positions and motions in space. Methods for calculating dynamic interactions. How to do joint control and reactions between then. Failiarity with mathods for task decomposition at different execution levels. Familiarity with sensors and processing of their information. Robot programming.

Learning outcomes: On successful completion of the course, students will be able to: 1. identify robot structure and characteristic elements; 2. describe motions and to calculate dynamic interactions; 3. design robot joint controller; 4. make transition from given problem to necessary executive details; 5. get engaged into advanced control and information processing from different sensors, as foundation for making "intelligent" robots.

Course content: Introduction and historic development of robotics. Direct kinematics problem. Rotation and composite matrix. Image geometry. inverse kinematics problem and methods, analytic, geometric, and numeric. Robot arm dynamics. Lagrange-Euler formulation. Newton-Euler formulation. Manipulator trajectory planning. Interpolated trajectories at different levels. Planning trajectories in Cartesian space. Planning trajectories under different constraints. Controlling robotic manipulator. Controlling PUMA and CRS Catalyst-5 robot. Computed torque technique. Other control methods. Adaptive control. Sensors in robotics. Visual information processing. Robot programming.
Methods of teaching: 30 hours of lectures, 15 hours of auditory exercises, 15 hours of laboratory exercises.
Grading System: Mid-term exams 10%+10%, Lab. work 20%, Final exam 30%+20%.
Literature:

1. K.S. Fu, R.C. Gonzales, C.S.G. Lee, *ROBOTICS, Control, Sensing,Vision, and Intelligence*, McGraw-Hill
2. Paul P., *Robot Manipulators Mathematics, Progrmming and Control*, MIT Press
3. Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, *Robotics - Modelling, Planning and Control*, Springer, 2009
4. Antti J. Koivo, Fundamentals for Control of Robotic Manipulators, John Wiley & Sons, 1989

Course title: Optical Communication Technology (Elective, Sem. VI, 6 ECTS)
The goal: The course deals with the basic phenomena associated with the technology that enables optical transmission of information.
Learning outcomes: On successful completion of the course, students will be able to:
1. distinguish between different fiber types; 2. determine parameters of optical sources LEDs and LDs; 3. determine parameters of photo-detectors PIN and APD; 4. perform splicing of optical fibers, 5. give examples of optical communication systems.
Course content: Introduction to fiber optic systems; Optical fibers, SM, MM, POF; Optical transmission line; Optical sources, LED, LD; Optical transmitter; Photodiodes, PIN, APD; Optical receiver; Optical modulators; Optical interconnection, Splicing; Examples of optical communication systems.
Methods of teaching: 30 hours of lectures + 30 hours of auditorial and laboratory exercises. Approximately 100 hours of personal study and exercise including home-works.
Grading System: 1st Exam: 25%; 2nd Exam: 25%; 50%, Home-work: 25 %, Final exam: 25 %
Literature:

1. B.E.A. Saleh, M.C. Teich, *Fundamentals of Photonics* 1991; John Wiley; 2007; ISBN: 978-0-471-35832-9
2. G.P. Agrawal, *Fiber-Optic Communication Systems*;; John Wiley; 2010; ISBN: 978-0-470-50511-3
3. Rozeta Mitrushi, *Komunikimet me fibra optike*, Tiranë, 2002.

Course title: Computer Aided Design of Electronic Systems (Elective, Sem. VI, 6 ECTS)
The goal: This course introduces students into the overall process of computer aided design of electronic equipment and systems.
Learning outcomes: On successful completion of the course, students will be able to:

1. describe the fabrication of printed circuit board (PCB), 2. describe fabrication and surface mount technologies, 3. prepare technical documentation, 4. use Altium Designer software program for analysis and simulation of electronic circuits, 5. design electronic circuits at the board level.

Course content: Electronic equipment development and life cycle. Printed circuit board (PCB) fabrication and surface mount technologies. Technical documentation. Introduction to Altium Designer. Circuit analysis and simulation. Board level design: PCB design rules, computer aided board design, mechanical design, preparation of manufacturing documentation.

Methods of teaching: 30 hours of lectures + 30 hours of auditorial and laboratory exercises. Approximately 100 hours of personal study and exercise including home-works.

Grading System: 1st Exam: 25%; 2nd Exam: 25%; 50%, Home-work: 25 %, Final exam: 25 %

Literature:

1. *Electronic Instrument Design*: Architecting for the Life Cycle; Kim R. Fowler; Oxford University Press; 1996; ISBN: 978-0195083712
2. *The Circuit Designer's Companion*; Tim Williams; Newnes; 2005; ISBN: 978-0750663700
3. *Noise Reduction Techniques in Electronic Systems*; Henry Ott; Wiley-Interscience; 1988; ISBN: 978-0471850687

Course title: Internship (Mandatory, Semester VI, 6 ECTS)

The goal: The students gain professional experience, depending on the field of study, in one of the local companies.

Learning outcomes: To be qualified for professional work, in the relevant field of study, and to be more prepared for the labor market.

Course Content: The content of this course depends on the company where the student shall finish 120 working hours. As a result, the content is drafted jointly from the coordinator of professional internships, appointed from the company, and the student who is going to work in such company. The coordinator of professional internships, who is appointed from the company, guides the student throughout the duration of his/her work in the company, and participates as a member of the commission in the presentation of the professional paper.

Teaching methodology: 120 working hours in the company, 30 working hours for the preparation of the presentation of professional internship.

Assesment: Presentation evaluation 40%, Presentation of the paper: 60%. Total:100%

Course title: Bachelor thesis (Mandatory, Sem VI, 6 ECTS)

The goals : The bachelor thesis is a comprehensive and independent task where the student has to demonstrate the ability to analyze the given problem from theoretical and practical aspects, devise a solution using the knowledge acquired in multiple courses and literature.

Learning outcomes: Upon completionofthis module studentswillbe able to:1. Togainconfidenceingained knowledge2.Have theability tofurther studiesofmandatory oradditional literature3.Consult withmentorwithquestionswellpreparedand structured; 4. Presenttheir workinwritten form, withastandard languageand guidelinesforthistypeof work, witha volume ofat least30sheetsofA4 format5.Topresentthe workin time of tenminutes with presentation prepared in PowerPoint

Course content: The thesis could be proposed by the supervisor or can be chosen by the student, and should be in the accordance with the qualification profile. The bachelor thesis is a comprehensive and independent task where the student has to demonstrate the ability to analyze the given problem from theoretical and practical aspects, devise a solution using the knowledge acquired in multiple courses and literature, and provides instructions for use and directions of future development.

Methods of teaching:

Compliant with the actual regulation at the faculty level on how to conduct a bachelor thesis.

Literature:

1. Depending on the bachelor thesis, will be offered different literature from mentor.