Program Overview - Telecommunications

Year I							
Semester I			Hours/Week				
No.	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				
Nr.	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	Elektronics	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	1	0	6	Vjollca Komoni, Gani Latifi
3.	M	Electromagnetic Fields and Waves	3	1	0	6	Luan Ahma, Mimoza Ibrani
4.	M	Telecommunications	3	1	1	7	Enver Hamiti
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	Information Theory	2	2	0	6	Rexhep Hasani
2.	M	Digital Signal Processing	2	2	0	6	Ilir Limani
3.	M	Microwave and antennas	2	2	0	6	Enver Hamiti
4.	E	Elective courses:					
		1. Mobile communications	2	2	0	6	1. Salem Lepaja
		2. Introduction to Bioelectromagnetics	2	2	0	6	2. Mimoza Ibrani
5.	E	Non-technical courses:					
		1. Macroeconomy	2	2	0	6	1. From Industry
		2. Entreprenuership	2	2	0	6	2. Bernard Nikaj

In the VI semester, the student chooses one of the groups of courses offered in the field of: Telecommunications systems, Communication networks and Bio-communications.

Semester VI Telecommunication systems							
1.	M	Transmission systems	2	2	0	5	Rexhep Hasani

2.	M	Analog communication circuits	2	1	1	5	Enver Hamiti
3.	M	Switching systems	2	0	2	4	Besnik Shatri
4.	E	Elective courses: 1. Optical Communication Technology 2. Digital Television	2 2	2 0	0 2	6 4	1. Nebi Caka 2. Mehdi Kepuska
5.	M	Internship				6	
6.	M	Bachelor thesis				6	
Semester VI Communication Networks							
1.	M	Telecommunication Networks	2	0	3	7	Mimoza Ibrani
2.	M	Distributed information systems	2	0	2	6	Isak Shabani
3.	E	Elective courses: 1. Data Transmission 2. Software Engineering 3. Communication Protocols	 2 2 2	 0 0 0	 2 2 2	 5 5 5	 1. Bujar Krasniqi 2. Blerim Rexha 3. Salem Lepaja
4.	M	Internship				6	
5	M	Bachelor thesis				6	
Semester VI – Bio Communications							
1	M	Introduction to Biomedical Engineering	2	0	0	5	Mimoza Ibrani
2.	M	Electromagnetic fields and living systems	2	2	0	5	Luan Ahma
3.	M	Laboratory on Bio-Communications	1	0	2	3	Mimoza Ibrani
4.	E	Elective course: 1. Telemedicine 2. Human Computer Interaction (HCI) 3. Interference in communication systems	 2 2 2	 2 2 2	 0 0 0	 5 5 5	 1. From Industry 2. Isak Shabani 3. Luan Ahma
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. Mikroprogramming. Instruction sets. Addressing modes and formats. Prosessor structure and function. Reduced Instruction Set Computers (RISCs).
Methods of teaching: 30 hours of lectures + 30 hours of auditorial 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", 8th Edition, 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: Telecommunications (Mandatory, Sem. IV, 7 ECTS)
The goal: The purpose of the course is to introduce the basic principles of analog and digital telecommunications.
Learning outcomes: On successful completion of the course, students will be able to: 1. Explain the basic concepts in telecommunications including signals & spectra, sampling, analog modulation processes, noise and its effects, basic A / D conversion techniques and basic multiplex / multiple access techniques 2. Identify and recognize main characteristic of analog and digital modulation methods; 3. Explain basic concepts in digital telecommunications including digital telecommunication systems performance criteria 4. Know baseband and passband digital transmission techniques 5. Draft a paper on a particular issue or issues in the field of telecommunications.

Course content: Communication systems model. Information and its measure. Spectral analysis of signals. Random noise. Linear and nonlinear systems. Analog modulations. FDM/FDMA. Sampling process. Pulse modulations. A/D conversion. Pulse code modulation (PCM), differential PCM, delta modulation. TDM/TDMA. Overview of basic analog communication systems. Model of digital telecommunication system. Source encoding. Performance criteria and limits of communication systems. Baseband digital transmission. Line codes. Intersymbol interference. Nyquist criteria. Channel equalization techniques. Digital modulation techniques. Overview of modern digital communication systems.
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 including seminars.
Grading System: Seminar 10%, Mid-term exams 30 %, Final Exam 60 %
Literature:

1. R. E. Ziemer and W. H. Tranter, "Principles of communications", 5th Ed., John Wiley & Sons Inc., 2002
2. Roger Freeman, "Fundamentals of Telecommunications", A John Wiley & Sons, inc. publication, 2004
3. HWEI HSU, PH.D. "Analog and Digital Communications" , second edition, Shaum~s outline s series, 2003

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
1. Clifford F. Gray, Eric W. Larson: Project Management, The managerial Process, McGraw-Hill, 2006
2. Denis Lock: Project Management, Gower Publishing Limited, 2008

Course title: Information Theory (Mandatory, Sem V. 6 ECTS)
Course objectives: The main purpose of this course is to introduce students to the basic aspects of information theory and provide them an overview of the different coding techniques, for channel capacity and error finding through various control coding methods.
Learning outcomes: After completing this course the student will be able: to recognize basic concepts of information theory and different coding techniques; to make the comparison of real practical situations using as reference the three basic Shannon's theorems in information theory; to be able to realize and analyze different optimal coding schemes and source compression; and to be able to use the acquired abilities and skills in this course for further scientific research work.
Contents: Genesis and the notion of information theory; Memory and memoryless sources; Measurement of the amount of information; Model of communication system; Messages, symbols and signals; Some properties of probability; Random events and the amount of information; System's model; Mutual information; Entropy and entropy properties; Channel capacity; Coding and entropy; Entropy coding; Compression methods; Types of codes; Optimal coding; Kraft's inequity; Entropy coding methods; Shannon-Fano coding; Huffman coding; Arithmetic coding; Dictionary methods; Run-length coding; Source coding; Source coding basic methods; Quantization; Subsampling; Transform coding; Differential coding; model based coding; Channel capacity in the presence of the Gaussian noise; Introduction to error detection and correction codes; Linear block coding; Error detection with parity check method.
Teaching methodology: lecture, discussion, project tasks.
Evaluation Methods: First assessment: 20%, Second assessment: 20%, Project tasks: 10%. Attendance 5%, Final Exam: 35%
Literature:
1. Essentials of Error-Control Coding, Castiñeira Jorge Moreira, Patrick Guy Farrell, 2006 John Wiley & Sons Ltd.
2. Telecommunications Demystified, Carl Nassar, by LLH Technology Publishing, 2001.

Course title: Digital Signal Processing (Mandatory, 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:Microwave and antennas (Mandatory, Sem. V, 6 ECTS)
The goal : Present principles of operation and analysis methods for passive microwave elements, microwave circuits and antennas that are used for modern communication and wireless systems at frequencies 0.3-300 GHz.
Learning outcomes: On successful completion of the course, students will be able to: 1. Be familiar with the basic topics in high frequency, microwave engineering and antennas 2. Use HF analysis and design tools for matching purposes, such as Smith chart 3. Understand the operation of microwave circuits using S-parameters 4. Understand the general parameters and operation of antennas 5. Draft a paper on a particular issue or issues in the field of microwave and antennas.
Course content: Basic features of radio communication systems. Transmission lines. Smith charts and scattering parameters. CAD tools. Microwave elements and circuits using microstrip lines. Waveguides and microwave elements. Basic characteristics and parameters of antennas: far- field, radiation intensity, radiation patterns, directivity, gain, polarization, ect . Microwave antennas. Antenna array.
Methods of teaching: 30 hours of lectures + 30 hours of auditorial exercises. Approximately 90 hours of personal study and exercise, including seminars.
Grading System Seminar 10%, Mid-term exams 30 %, Final Exam 60 % (Subject to minor changes).
Literature:

1. David M. Pozar "**Microwave Engineering** ", Copyright, 2005 John Wiley & Sons Inc.
2. Kai Chang, Radio Frequency Circuit Design, John Wiley & Sons, 2001
3. John D. Kraus, Ronald J. Marhofka:" Antennas for all Application", Third Edition , McGraw Hill.2002

Course title: Mobile communications (Elective, Sem. V, 6 ECTS)
The goal: The purpose of the course is to introduce students to basic concepts, principles and systems ofmobile communications.
Learning outcomes: On successful completion of the course, students: Will have a good knowledge of basic principles of mobile communications and of a wide range of mobile communication technologies. 2. Will have a good understanding of wireless transmission. 3. Will

have a good understanding of multiplexing and of multiple access techniques used in mobile communication systems. 4. Will have a good understanding of architecture of mobile communication systems: GSM, GPRS, UMTS, LTE, WiMAX, WLAN and satellite systems. 5. Will have a good understanding of mobility management in mobile communication networks.

Course content: *Introduction to mobile communications*. Wireless communication system components. *Wireless transmission*: wireless issues, mobility issues, frequency issues, signal propagation, modulation and antennas. *Basic concepts* of mobile cellular comm*unications*: cells, base stations, frequency reuse, mobility management. *Modulation techniques*: PSK, QPSK, QAM, DSSS, OFDM. *Multiple access techniques*: Slotted Aloha, CSMA/CA, FDMA, TDMA, CDMA, OFDMA. *Wireless Communication Systems*: terrestrial mobile cellular communication networks (GSM, GPRS, UMTS, LTE), WiMAX technology, Wireless LANs and satellite communication networks.

Methods of teaching: 30 hours of lectures + 15 hours of auditorial exercises + 15 hours of computer exercises. Approximately 100 hours of personal study and exercise including assignments.

Gradig System: Assignment 15%, Mid-term exams 30 %, Final Exam 55 %

Literature:

1. A. F. Molisch, "Wireless Communications", Second Edition, John Wiley & Sons Ltd., 2011.
2. S. Lepaja, Mobility and QoS in Global Broadband Communication Networks, Ph.D. Dissertation, TU WIEN, March 2005.
3. J. Schiller, Mobile Communications, Addison-Wesley, 2000.

Course title: Introduction to Bioelectromagnetics (Elective, Sem. V, 6 ECTS)

The goal: To provide students with basic information on interaction between electromagnetic fields and humans.

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

1. Explain background, definition and fundamentals of bioelectromagnetics; **2.** Describe mechanisms and parameters that quantify interaction between humans and electromagnetic fields;

3. Compare different human exposure scenarios through case –studies; 4. Assess compliance of human exposure with general safety standards and guidelines; 5. Demonstrate knowledge of measurement of field strength techniques and protocols

Course content: Biolectromagnetics: Definition and fundamentals. Basic concepts of electromagnetic fields and waves: Maxwell's equations, spectrum, wave equation and properties. Coupling mechanisms between electromagnetic fields and humans. Electromagnetic properties of human body: permittivity, permeability and conductivity of biological tissues of human body. Specific Absorption Rate: energy transfer from field to human body, deposition on bio tissues. Interaction between human and low frequency electromagnetic fields, exposure bio-effects . Interaction between human and high frequency electromagnetic fields, exposure bio-effects. Safety standards and exposure limits: ICNIRP, IEEE and CELNEC. Thermal and non-thermal effects. Case studies such as: Power line and public health, Mobile phone and human health etc.

.**Methods of teaching:** 30 hours of lectures + 15 hours auditorial+15 hours laboratory 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. Cynthia Furse, " Basic Introduction to Bioelectromagnetics" CRC Press, 2010
2. Riadd Habash, "Electromagnetic Fields and Radiation : Human Bioeffects and Safety", CRC Press, 2001.
3. Luan Ahma, Mimoza Ibrani " Hyrje ne bioelektromagnetike", dispence, UP, 2010

Subject Title : Entreprenuership (Elective, sem V. 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.

"Telecommunication Systems"

Course title:Transmission systems (Mandatory, Sem VI. 5 ECTS*)*

The aim of the course: The main objective of this course is to introduce students to the various transmission systems and provide them an overview of current techniques and technologies. Approach to this aim includes two aspects - the transmission one and telecommunications networks.

Learning outcomes: After completing this course the student will be able: To recognize the different transmission systems and related techniques implemented in modern technology; to make the description and distinguish the advantages and disadvantages of the techniques and technologies

of different transmission systems; to design and implement of different telecommunications networks and transmission systems; and to be able to use the abilities and skills acquired in this course for further work and scientific research.

Contents: The importance of telecommunications; Historical development and standardization; Development of telecommunication businesses; Telecommunication networks – overview; Telephone numbering; Local-access network; Regional network; International network; Telecommunication networks; Management of telecommunications networks; Types of information and their applications; Basic concept of a transmission system; Transmission media with copper cables; Optical communications; Optical fiber cables; Propagation and application of the electromagnetic spectrum; Propagation modes; Loss of radio waves in free space; Antennas; Radio broadcasting; Microwave radio relay systems; Satellite transmission; Infra red light; Laser light; Signal impairment during transmission; Distance digital signal transmission; Line coding; Data transmission; Multiplexers and concentrators; Optical multiplexing; Mobile communications; Operating principle of a cellular network.

Teaching Methodology: Lecture, discussion, project tasks

Evaluation: First assessment: 20%, Second assessment20%, Project tasks 20%, Attendance: 5%, Final exam: 35%

Literature:

1. Introduction to Telecommunications Network Engineering, Tarmo Anttalainen, Second Edition, Artech House.
2. Optical Fiber Communications, John M. Senior, Third Edition, Prentice Hall.
3. Telecomunikacionet, Ardian Shehu, University Book.

Course title: Analog communication circuits (Mandatory, Sem. V, 5 ECTS)

The goal : This course will provide skills in analyzing and designing of high frequency electronic circuits used in HF communications.

Learning outcomes: On successful completion of the course, students will be able to: 1. Analyze and design HF amplifier and matching circuits by using S-parameters. 2. Use special HF analysis and design tools. 3. Understand the operation and design of sophisticated HF communication circuits such as PLL frequency synthesizers, mixers, oscillators etc. 4. Draft a paper on a particular issue or issues in the field of analog communication circuits.

Course content: Introduction to wireless communication systems.Transmission lines and Smith Chart applications. HF network analysis. Matching networks. Filters. HF amplifiers analysis and design. Mixers. PLL circuits. Transistor oscillators and frequency synthesizers.

Methods of teaching: 30 hours of lectures + 30 hours of auditorial exercises. Approximately 90 hours of personal study and exercise, including seminars.

Grading System Seminar 10%, Mid-term exams 30 %, Final Exam 60 % (Subject to minor changes)

Literature:

1. D. M. Pozar, **Microwave and RF Design of Wireless Systems,**John Wiley & Sons, 2001
2. Kai Chang, **Radio Frequency Circuit Design**, John Wiley & Sons, 2001
3. E. Hamiti, **Qarqet komunikuese analoge**, ligjërata të autorizuara, Prishtinë 2009

Course title : Switching systems (Mandatory, Sem VI. 4 ECTS)
The course goal: Students will become familiar with switching concept in general, Switching systems – their positioning, architecture, function, services & facilites as well as their role and operation in different telecommunications networks.
Learning outcomes: After successful finalisation of the course, the students will gain the knowledge about: 1.Switching concept and the development of the switching techniques from the first manual analog systems to the today digital switching systems; 2. The principles of two main switching techniques: circuit switching and packet switching – their characteristics, advantages and disadvantages; 3. Principles of time switch and space switch as well as possible switching matrix combinations used to build group switches in modern switching systems; 4. The functional, hardware and software architecture of a geberic and hypothetic digital switching system, function, control levels and their control hierarchy; 5. The interfaces and signaling systems used to interconnect digital switching systems; 6. Services and facilities offerd by digital switching systems; 7. Main telecommunications traffic concepts and use of the techniques and formulas for traffic load calculation and measurement during the dimensioning and monitoring of the switching systems' operation; 8. The pricilples and challenges of voice (VoIP) and interactive media transfer in packed switched networks. NGN network, its characteristics, architecture, functional elemements and used protocols. Softswitch as central switching node in modern telecommunications networks.
Course content: Introduction to switching, switching systems development; Digital switching systems architecture, control and communication; Digital switching systems software; Digital switching systems interfaces and signalling; Digital switching systems services and facilities; Switching system traffic engineering and measurement techniques; VoIP principles and challenges. Next Generation Network (NGN) characteristics, architecture and protocols; Softswitch – characteristics and architecture;
Teaching methodology: 45 hours of lectures + 15 hours of laboratory exercises. Approximately 60 hours of personal study and exercise including seminars.
Assessment system: Presence 10%, Intermediate assessment 20 %, Final exam 70 %
Literature:

1. S. R. Ali, "Digital switching systems (System Reliability and Analysis) ", Bell Communication Research, Inc. Piscataway, New Jersey, McGraw-Hill, Inc, 1998
2. S. Lika, "Algoritme të telekomit – Centralet telefonike dixhitale ", Shtëpia Botuese e Librit Universitar, Tiranë, 2002
3. R.Parkinson, "Traffic Engineering Techniques in Telecommunications", Infotel System Corp.WhitePaper
4. R. Swale: "Voice over IP – Systems and solutions", BT Communications Technology Series 3, 2008
5. Ericsson, "Understanding telecommunications " , 2003

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: Digital Television (Elective, Sem. VI, 4 ECTS)
The goal : The purpose of the course is to introduce the basic principles of analog and digital television technology.
Learning outcomes: On successful completion of the course, students will be able to: 1. Explain basic process of having television signal (video and audio). 2. Explain process of transforming light energy to electrical signal. 3.Explain process of gating television signal conform existing technical rules. 4. Explain transmission process of television signal in terrestrial and satellite network.
Course content: Light, physical and psychological characteristics of light,light emitors.Caracteristics of human yes,fotometrix units.Camera tube ,CCD , horizontal and vertical syncronisation.Video signal processing, television camera.NTSC,PAL SECAM television standards.Digitalisation of video signal,compresion process ,JPEG, MPEG video signal. Recording and archiving TV signal. Transmission of TV signal on terrestrial and satellite networc.Mejuring methods of TV signal.
Grading System: Seminar 30%; Home work -10%; attendance -10%; Final Exam- 50 %
Literature:

1. M. Robin "Digital Television Fundamentals" McGraw-Hill-New York-2000
2. B. Nastic " Televizija " Naucna kniga -Beograd -1980
3. Articles on Internet .
4. Shum materiale nga faqet e internetit

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.

"Communication Networks"

Course title: Telecommunication Networks *(*Mandatory, Sem. VI, 7 ECTS)
The goal: The course aims at providing basic knowledge of modern telecommunication architectures, as well as fundamental tools for the analysis of telecommunications networks and services. Students gain practical knowledge and skills required for dimensioning and troubleshooting network
Learning outcomes: On successful completion of the course, students will be able to:

1. Define concept, architecture, protocols and organisation of Telecommunication Networks; 2. Describe principles of circuit-switched and packet-switched networks and their applications; .3. Demonstrate knowledge on medium access controls and LANs 4. Develop skills for network management and troubleshooting 5. Analyze different aspect of OSI and TCP/IP layered communication models

Course content: Communication Networks and Services; Applications and Layered Architectures: The OSI Reference Model, Overview of TCP/IP Architecture; Digital Transmission Fundamentals: Characterization of Communication Channels, Coding, Modulation, Properties of Media and Digital Transmission Systems; Circuit-Switching Networks: Multiplexing, SONET, Signaling, Telephone network; Peer-to-Peer Protocols and Data Link Layer: Peer-to-Peer Protocols, Service Models and Reliable Data Transfer Service, Framing, Point-to-Point Protocol, HDLC Data Link Control; Medium Access Control Protocols and Local Area Networks: Multiple Access Communication; Random Access, LAN Protocols, Ethernet and IEEE 802.3 LAN Standard, Token-Ring and IEEE 802.5 LAN Standard, FDDI, Wireless LANs and IEEE 802.11 Standard; Packet-Switching Networks: Topology, Datagrams and Virtual Circuits, Routing, Traffic Management; TCP/IP: Architecture, The Internet Protocol, IPv6, User Datagram Protocol, Transmission Control Protocol, Internet Routing Protocols, Multicast Routing, DHCP, NAT, and Mobile IP ; ATM Networks; Advanced Network Architectures; Security Protocols; Basics of Network Management and Troubleshooting.

Methods of teaching: 30 hours of lectures + 45 laboratory 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. Alberto-Leon Garcia, Indra Widjaja " Communication Networks" McGraw-Hill 2003
2. Sumit Kasera, Nishit Narang, Sumita Narang " Communication Netwroks" McGraw-Hill 2005
3. Tarek N. Saadawi , Mostafa H. Ammar "Fundamentals of Telecommunication networks" Wiley-Interscience, 1994

Course title: Distributed information systems (Mandatory, VI semester. 6 ECTS)

The goal: The course aim is to prepare students to understand distributed system techniques and apply them in practice.

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

1. To understand main concepts and system model of distributed; 2. To compare distributed system; 3.To creates distributed systems;4. Manage distributed objects; 5. To realize e project relating a particular issue with distributed systems.

Course content: Characterization of distributed systems. System models. Networking and internetworking in Distributed Systems. Interprocess Communications. Remote Invocation. Indirect Communication. Distributed components and objects. Web Services. Peer-to-peer systems. Distributed File System. Name Services. Global Time and State. Distributed Transactions. Distributed Replication. Web based distributed systems.Distributed multimedia systems.

Methods of teaching: 30 hours of lecture, 30 hours of auditoria exercises and laboratory exercises. Approximately 100 hours of personal study and exercise including project.
Grading System: Attendance 10%, Project 30 %, written tests or final exam 60%.
Literature:

1. George Coulouris, Jean Dollimore, Tim Kindberg, Peter Baer Galvin and Greg Gagne , "Distributed Systems – Concepts and Design", 5th Edition, 2012.
2. Andrew S. Tanenbaum, "Distributed Systems – Concepts and Paradigms", 2rd Edition, 2007.

Course title: Data Transmission (Elective, Sem. VI, 5 ECTS)
The goal : The purpose of the course is describe the fundamentals of data transmission in wired and wireless networks.
Learning outcomes: On successful completion of the course, students will be able to:1. Understand the fundamentals of Data transmission, Data Networks, and the Internet 2. Transmission Media 3. Transmission Networks (Wireline and Wireless) 4.Transmission Protocols 5. Practical Applications of data transmission.
Course content:A historical overview of data transmission, data networks, Internet and protocol architecture. Analog and digital data transmission. Transmission media. Digital data transmission techniques. Circuit switching and Packet switching transmission. Data transmission in Cellular networks. Data transmission in Local area networks. Data transmission in Wireless Lans. Transmission protocols for Internet and Wireless Networks. Practical Applications of data transmission.
Methods of teaching: per week are 2 hours lectures and 2 hours laboratory exercises. A seminar work is supposed to be done by students in group of 2 max.
Grading System: Seminar 10%, Laboratory exercises 30 %, Final Exam 60 %
Literature:

1. W. Stallings "Data and Computer Communications" Prentice Hall 2011
2. A.J. Simonds, "Data Communications and Transmission Principles: An Introduction", Palgrave Macmillan 1997

Course title: Software Engineering (Elective, Sem. VI, 5 ECTS)
The goal : The purpose of the course is to introduce the basic principles of the development of a cost-effective and high-quality software program.
Learning outcomes: On successful completion of the course, students will be able to:
1. Possess basic knowledge of software processes **2.** Possess basic knowledge on software process models **3.** Apply different software process models **4.** Have basic knowledge of the cost of development of software systems in practice **5.** Manage software projects
Course content: Software systems engineering, Ethical and professional responsibility, Organization, people and computer systems. Models of software processes, Iterative and approximate processes, Rational Unified Model, CASE. Management activities, Project planning, Scheduling activities, Risk management, Version planning, Version management, Software tools. Functional and non-functional requirements, User requirements, System

requirements, Interface specification, Document of software requirements, Feasibility study, Analysis and validation of the requirements. System model and architectural design. Agile methods of software development. Reusability of software and testing.
Methods of teaching: 30 hours of lectures + 30 hours of auditorial exercises. Approximately 50 hours of personal study and exercise including seminars.
Grading System: Class activity and regular presence 10%, intermediary assessments 90 %.
Literature:

1. Ian Sommerville, Software Engineering, 9th Edition 2010
2. Roger S. Pressman, Software Engineering, A Practitioner's Approach, 2007

Course title: Communication Protocols (Elective, Sem. VI, 5 ECTS)
The goal: The purpose of the course is to introduce the protocol architecture, OSI and TCP/IP models and the most widely used protocols in communication networks.
Learning outcomes: On successful completion of the course, students:
1. Will be able to explain the basic principles of the hierarchical layer structure of protocols. 2. Will have a good understanding of the theoretical OSI model. 3. Will have a good understanding of the TCP/IP protocol stack and for the most widely used protocols of each layer, in particular for the IPv4 and IPv6 protocols. 4. Will have a good understanding of the routing protocols. 5. Will be able to set up network models for different topologies and configure these networks using Packet Tracer software package. 6. Will be able to analyze protocols on real TCP/IP networks using Wireshark protocol analyzer.
Course content: *Communication networks*. Basic concepts and terminology. Components of the communication networks. Types of the communication networks. *Protocol architecture*. Basic principles of protocol hierarchical structure. *The OSI reference model*. Seven layers of the OSI model. *The TCP/IP reference model*. TCP/IP protocol stacks. *Physical layer*. Examples of the physical layer protocols: Ethernet and WLAN underlying networks. *Data Link Layer*. Example of a Data link layer protocol: HDLC protocol. *Network* layer. IPv4, IPv6, and Routing protocols. *Transport Layer*. Connection oriented TCP and connectionless UDP protocol. *Application Layer*. Examples of the application layer protocols: DHCP. *Software packages*: Packet Tracer and Wireshark.
Methods of teaching: 30 hours of lectures + 15 hours of auditorial exercises + 15 hours of computer exercises. Approximately 100 hours of personal study and exercise including assignments.
Gradig System: Assignment 15%, Mid-term exams 25 %, Final Exam 60 %
Literature:

1. A. S. Tanenbaum and D. J. Wetheral, "Computer networks", 5th Ed., Pearson., 2011.
2. J. Kurose and K. Ross, "Computer networking", 5th Ed, Addison –Wesley, 2010.
3. W. Stalling, "Data and Computerl Communications", 7th Ed., Pearson., 2016.

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.

"Bio-Communications"

Course title: Introduction to Biomedical Engineering *(*Mandatory, Sem. VI, 5 ECTS)
The goal: The main objective of the course is to present to the students an introduction to the discipline. In particular, the course should allow the students: - to understand, through a series of examples, the notions of biotechnology, biosystems, biomaterials, medical imaging, clinical

engineering, bio lectromagnetics, modelling of biological systems, etc. - to, later on, apply these concepts in order to solve elementary problems in the field of biomedical engineering.
Learning outcomes: On successful completion of the course, students will be able to:
1.Explain and discuss what biomedical engineering is, current development trends and professional challenges ;2. Summarize fundamental principles in the areas of bio technology, biomaterials, biocomputing, bioimaging and clinical engineering.3. Demonstrate knowledge on interaction of electromagnetic fields with human body on different range of frequencies (focus: LF and RF) 4. Document through a written assignments and an oral presentation the technical knowledge related to the course content and independent interpretation of biomedical engineering case studies
Course content: This course will provide an overview of the discipline including scope, basic principles , on-going challenges and possible new opportunities in biomedical engineering.
Biomedical Engineering: Definition, a historical perspective, ethical issues and development trends. Introduction of an electrical engineering methodology, laws, systems, technologies applicable to biomedical problems. Overview talks in biomedical engineering areas: -Biomaterials and Tissue Engineering, -Biocomputing, -Medical Imaging, -Bioelectromagnetics. Safety standards, exposure limits, ethics and privacy issues related to biomedical engineering
.**Methods of teaching:** 30 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. John Enderly and Joseph Bronzino, " Introduction to Biomedical Engineering", Academic Press; 3 edition , 2011
2. Biomedical Engineering (Cambridge Texts in Biomedical Engineering), 2009

Course title: Electromagnetic fields and living systems (Mandatory, Sem VI, 5 ECTS)
The goal: The aim of the course is to provide students with necessary information on interaction between electromagnetic fields and living systems. Students will also be able to understand and explain such interaction through real-life case studies
Learning outcomes : On successful completion of the course, students will be able to: 1. Explain background, definition and fundamentals of how electric and magnetic field interact with the living systems; **2.** Understand and describe the details of electromagnetic field behavior and their interactions where the wavelength varies with the size of the object; 3. Understand and explain the concept of bio electromagnetic dosimetry; 4. Understand the overall potential and challenges for bio electromagnetic in medicine; 5. Understand and describe bio electromagnetic effects
Course content: Basic concepts of electric and magnetic fields**.** Sources of electric and magnetic fields. Wave properties in lossless and lossy materials. Boundary conditions in lossless and lossy materials. Energy absorption. Electromagnetic behavior as a function of size and wavelength. EM behavior when the wavelength is large compared to the object size. Low frequency approximation. Displacement current. In vitro electrode stimulation. EM behavior when the wavelength is about the same size as the object. Waves in lossless media. Wave reflections. Wave in lossy media. Transmission lines and waveguides. EM behavior when the wavelength is

much smaller than the object size. Ray propagation effect. Propagation of laser beams. Scattering from particles. Photon interactions with tissues. Bio electromagnetic dosimetry. Polarization. Electrical properties of the human body. Human models. Electromagnetics in medicine. Fundamental potential and challenges. Magnetic effects. Proposed bio electromagnetic effects.

Teaching methodology 45 hours lecture, 45 hours tutorial, and 45 independent work.

Assessment: First assesment:25%, Second assessment: 25%, Home work 15%, Attendance: 5%, Final exam, 30%, Total:100%

Literature :

1. C. Furse, D. Christensen, C. Durney, *Basic introduction to electromagnetics,* CRC Press, 2009
2. R. Habash, "*Electromagnetic Fields and Radiation : Human Bioeffects and Safety*", CRC Press, 2001

Course title: Laboratory on Bio-Communications (Mandatory, Sem. VI, 3 ECTS)

The goal: To offer students hands-on experience in various aspects of bio-communications engineering. This laboratory course is designed to teach laboratory skills, experimental design, and interpretation of data, technical writing and ethical issues relevant to laboratory work on bio communication engineering

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

1. Perform experiments on bio-communication. 2. Describe the approval process involved in animal protocol and human subject studies. 3. Collect, analyze and interpret data collected 4. Write comprehensive experimental reports 5.Work in a team environment to perform experiments and solve bioengineering problems

Course content: Fundamentals of bio inspired communications. The role and importance of laboratory course on engineering. Phases of laboratory work on bio-communications. Introduction to data acquisition, data analysis and writing a report. Ethics issues in laboratory work. Introduction to the measurement and analysis of biological systems using engineering tools and techniques. Software tools : SEMCAD student version. Measurement equipments: EME SPY 140, EMR 300, Spectran etc.

Methods of teaching:15 hours of lectures + 30hours of laboratory exercises. Approximately 50 hours of personal study and exercise including assignments.

Grading System: Labs evaluation 80 %, Final Exam 20 %

Literature:

1. John Enderly and Joseph Bronzino, " Introduction to Biomedical Engineering", Academic Press; 3 edition , 2011

G. Webster (ed.), Medical Instrumentation: Application and Design, 4th edition, 2009, John Wiley & Sons, ISBN# 978-0-471-67600-3 Handouts.

Course title: Human Computer Interaction (HCI) (Elective, VI semester. 5 ECTS).

The goal: The aim of the course is to train students and enable them to understand the human-computer interactions' concepts and techniques.

Learning outcomes: On successful completion of the course, students will be able to:
1. Understand main concepts of human-computer interactions; 2. To know and identify main characteristics of virtual reality, 3D and human-computer; 3. To understand basic concepts on interactions design; 4. To understand human-computer communication paradigms; 5. Draft and implement a project for issues related to human-computer interaction.
Course content: Introduction to human-computer interaction. Human. Thinking. Computer. Computer devices. Virtual reality. Interaction, 3DInteraction, human-computer interaction. Norman Phases. HCI Paradigm. InteractionDesign. HCI in software. Implement GUI in Java/C# programming languages. Programming techniques in Tcl/Tk programming language. Implement GUI in Tcl/Tk programming language.
Methods of teaching: 30 hours of lecture, 30 hours of auditoria exercises and laboratory exercises. Approximately 100 hours of personal study and exercise including project.
Grading System:
Attendance 10%, Project 30 %, written tests or final exam 60%.
Literature:

1. Alan Dix, Janet Finaly, Gregorey D. Abowd, Russell, "Human Computer Interaction", 2005.
2. Keith Andrews, "Human-Computer Interaction", Graz University of Technology Inffeldgasse 16c A-8010 Graz, 2012.
3. Kristin Klinger, Kristin Roth, Jennifer Neidig,JamieSnavely"Human Computer Interaction:Concepts, Methodologies,Tools, and Applications", Panayiotis Zaphiris, City University of London, UK, Published in the United States of America by Information Science Reference, 2009.

Course title :Interference in communication systems (Elective, Sem VI, 5 ECTS)
The goal: To provide students with basic concepts of electromagnetic compatibility (EMC) and electromagnetic interference (EMI)
Learning outcomes: Upon completion of this course, students will be able to: Understand basic concepts; of EMC and EMI, Recognize EMI sources; Develop skills in methods of preventing and reducing of EMI in communication systems;
Course Content: Basic concepts of electromagnetic compatibility and electromagnetic interference. Problems that arise in the electromagnetic compatibility. The phenomenon of electromagnetic interference. Natural sources of electromagnetic interference. Interference from apparatus and electric circuits. Modeling of electromagnetic interference. Classification of interferences. Statistical and physical models of interference. Radiated electromagnetic interference. Protections for interference. Electromagnetic filters.
Teaching methodology: 45 hours lecture, 45 hours tutorial, dhe 40 independet work.
Assesment: Firsa assesment: 25%, Second assesment: 25%, Home work 10%, Attendance: 5%, Final exam, 30%, Total:100%
Literature :

1. Clayton Paul,*Introduction to electromagnetic compatibility***,** Second Edition, John Wiley & Sons, 2006
   V. Kodali, *Engineering electromagnetic compatibility*, IEEE Press, 2001

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.