Program Overview - Computer Engineering

Year I							
Semester I			Hours/Week				
Nr.	M/E	Courses	L	NE	Lab	ECTS	Teacher
1.	M	Mathematics 1	3	3	0	7	Marjan Demaj, Qefsere Gjonbalaj, Zenun Loshaj
2.	M	Physics 1	3	1	1	6	Rashit Maliqi, Skender Ahmetaj
3.	M	Fundamentals of electrical engineering	3	3	0	7	Ruzhdi Sefa, Luan Ahma
4.	M	Programming Language	2	0	2	5	Agni Dika
5.	E	Non-technical courses:					
		1.English Language	1	2	0	5	1.Qerim Spahija, Vjollca Belegu-Caka
		2.German Language	1	2	0	5	2. From UP staff
		3.Communication skills	2	1	0	5	3. From UP staff
Semester II							
1.	M	Electric Circuits	3	3	0	7	Ruzhdi Sefa, Luan Ahma
2.	M	Physics 2	3	1	1	6	Rashit Maliqi, Skender Ahmetaj
3.	M	Mathematics 2	3	3	0	7	Marjan Demaj, Qefsere Gjonbalaj, Zenun Loshaj, Shqipe Lohaj
4.	M	Algorithms and Data Structures	2	0	2	5	Agni Dika
5.	M	Digital Circuits	2	1	1	5	Agni Dika, Sabrije Osmanaj
Year II							
Semester III			Hours/Week				
Nr.	M/E	Courses	L	NE	Lab	ECTS	Teacher
1.	M	Electronics	2	1	1	5	Myzafere Limani
2.	M	Mathematic 3-C	2	2	0	5	Qefsere Gjonbalaj
3.	M	Signals and Systems	3	0	2	5	Ilir Limani
4.	M	Databases	2	0	2	5	Lule Ahmedi
5.	M	Object Oriented Programming	2	0	2	5	Isak Shabani

6.	M	Internet	2	0	2	5	Lule Ahmedi
Semester IV							
1.	M	Computer Architecture	2	0	2	5	Adnan Maxhuni
2.	M	Computer Networking	2	0	2	5	Blerim Rexha
3.	M	Data Security	2	0	2	5	Blerim Rexha
4.	M	Human Computer Interaction	2	0	2	5	Isak Shabani
5.	M	Internet programming	2	0	2	5	Lule Ahmedi
6.	E	Elective courses: 1. Management 2. Project Management	 2 2	 0 0	 2 2	 5 5	 1.From Industry 2.Bernard Nikaj

At 5 th semester, students can choose group of courses from : Databases or Network Security

Databases and artificial intelligence

Year III

Semester V			Hours/Week				
Nr.	M/E	Courses	L	NE	Lab	ECTS	Teacher
1.	M	Microprocessors and microcontrollers	2	0	2	6	Lavdim Kurtaj
2.	M	Operating Systems	2	0	2	6	Isak Shabani
3.	M	Software Engineering	2	0	2	6	Blerim Rexha
4.	M	Data models and query languages	2	0	2	6	Lule Ahmedi
5.	E	Elective courses: 1. Entrepreneurship 2. Microeconomics	 2 2	 0 0	 2 2	 6 6	 1.Bernard Nikaj 2.From Industry
Semester VI							
1.	M	Distributed Systems	2	0	2	6	Isak Shabani
2.	E	Elective courses: 1. Data Mining 2. eCommerce	 2 2	 0 0	 2 2	 6 6	 1. Lule Ahmedi 2. Blerim Rexha

	E	Elective courses: 1. Algorithms Analysis and Design 2. Introduction to Artificial intelligence 3. Information retrieval	2 2 2	0 0 0	2 2 2	6 6 6	1. Agni Dika 2.Nysret Musliu 3. Lule Ahmedi
4.	O	Internship				6	
5.	O	Bachelor Thesis				6	

Computer network security

Semester V Hours/Week

Nr.	M/E	Courses	L	NE	Lab	ECTS	Teacher
1.	M	Microprocessors and microcontrollers	2	0	2	6	Lavdim Kurtaj
2.	M	Operating Systems	2	0	2	6	Isak Shabani
3.	M	Software Engineering	2	0	2	6	Blerim Rexha
4.	M	Internet security	0	0	3	6	Blerim Rexha
5.	E	Elective courses: **1.**Entreprenuership 2.Microeconomics	2 2	0 0	2 2	6 6	1.Bernard Nikaj 2.Nga Industria

Semester VI

1.	M	Distributed Systems	2	0	2	6	Isak Shabani
2.	E	Elective courses: 1.Computer Networking Labs 2.Visual Computing 3.Hardware Modeling (VHDL)	2 2 2	0 0 0	2 2 2	6 6 6	1. Blerim Rexha 2. Isak Shabani 3. Agni Dika
3.	E	Elective courses: 1.Biometrics & Forensics 2.Mobile device programming	2 2	0 0	2 2	6 6	1.From Industry 2.Blerim Rexha, Astrit Ademaj
	M	Internship				6	
	M	Bachelor Thesis				6	

1.1.1. Course description

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: 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 title: Mathematic **3-C** (Mandatory, Sem III, 5 ECTS)
The goal: Knowledge achivedthroughthis coursecan be applyedasanauxiliarydeviceinthestudy of professional coursesofelectrical andcomputer engineering.
Learning outcomes: On successful completion of the course, students will be able to:
1. Understand the role of mathematical logic. 2. Understand the role of infinite sets and relations. 3. Recognize problems related to recurrence relations. 4. Adopte the notion of the graph. 5.Solve some typical problems in graph theory. 6. Understand the nature of periodic functions. 7. Analyze problems in electrical enginnering using Fourier series. 8. Analyze problems in computer enginnering using discrete probability.
Course content: 1. Mathematical Logic. **2.**Sets. **3**.Relations. **4**. Functions.. **5.**Algebraic structure.Algebraic structure with two binary operations. **6**.Graph Theory. Euler and Hamilton paths. **7.** Trees. Minimum spanning trees. **8**. An introduction to discrete propability. Propability theory. **9.** Fourier series. Complex form of Fourier series.
Methods of teaching:30 hours of lectures + 30 hours of exercises. Consultations. Approximately 100 hours of personal study and exercise including seminars.
Grading System:
Mid Term Exams 20 %. Final Exam 30 %. Exam 50 %.
Literature:

1. Qefsere Doko Gjonbalaj “Matematika III-Drejtimi i Kompjuterikës" Universiteti i Prishtinës, Prishtinë 2011.
2. Kenneth H. Rosen; MC GRAW HILL: Discrete Mathematics and its Applications, Fifth Edition 2003, ISBN 0-07-242434-6; USA
3. Kenneth H. Rosen; MC GRAW HILL: Student Solutions Guide for Discrete Mathematics and its Applications, Fourth Edition 2003, ISBN 0-07-289906-9; USA

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: Databases (Mandatory, Sem. III, 5 ECTS)

The goal: Students will be able to apply the basic concepts and techniques for the design and implementation of database applications.

Learning outcomes: After completing this lecture, students will: 1. Know the techniques of describing and managing of a huge set of data based on the relational model. 2. Use the experience gained here to design and implement database projects in the practice. 3. Know the typical problems of databases in the practice, and compare existing systems in order to make the proper solution to overcome those problems. 4. Identify the different relevant aspects during the development of huge projects of databases, and respectively organize the adoption of basic principles.

Course content: A preliminary list of topics cover (mainly based on the audience): Introduction and relational model. Relational algebra. Datalog: Logical rules. SQL: Simple queries, aggregation functions, grouping, set operators, embedded queries, complex data types and embedded tables, database creation and views, population with data. SQL and programming languages. SQL: Integrity and triggers. SQL: Data security. Conceptual design: ER model and transformation into relational model. Formal design: functional dependencies and normal forms. Physical design. Operator / query evaluation. Transaction management. Crash recovery.

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 project work.

Grading System: Active attendance 10%, Project assignment 3 x 10% = 30%, Final Exam 60 %.

Literature:

1. Database Management Systems. Raghu Ramakrishnan, Johannes Gehrke.
2. Database Systems: The Complete Book prej Garcia-Molina, Ullman and Widom
3. A guide to the SQL standard prej J. Date, H. Darwen
4. SQL for Nerds prej Philip Greenspun, në http://philip.greenspun.com/sql/

Course title: Object Oriented Programming (Mandatory, Sem III, 5 ECTS).
The goal: The course aim is to present the basic principles of object oriented programming.
Learning outcomes: On successful completion of the course, students will be able to:
1. Understand main concepts of object oriented programming; 2. To write code with classes and use objects; 3.To use inheritance and polymorphism; 4. Handle errors and to program abstract classes with virtual methods and generic types and methods; 5. Realize e project relating a particular issue using object oriented programming.
Course content: Introduction to object oriented programming, introduction to C# and Java, classes and objects, reference and value types, data access, attributes and methods, operators, delegates and events, class inheritance, polymorphism, abstract classes, interface and pattern, error handling, i/o classes, generic types and methods, class collection, testing object oriented applications, documenting object oriented programming applications.
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. Kurt Nørmark,"Object oriented programming in C# for C and Java programmers", 2010.
2. Paul Deitel, Harvey Deitel , "Visual C# 2012 How to Program", 5th Ed., 2013.
3. John Hunt, "Guide to C# and Object Orientation", Springer Verlag, 2002

Course title: Internet (Mandatory, Sem. III, 5 ECTS)
The goal: Students will be able to understand basic concepts related to programming paradigms actual on the Internet, as well as to provide experience in design and implementation of Web-based systems, with a focus on client-side Web programming.
Learning outcomes: Upon completion of this course, the student shall be able to: 1. Demonstrate fundamental knowledge on traditional as well as cutting-edge concepts and technologies on the World Wide Web. 2. Design and program static Web applications, as well as dynamic ones at the client in practice. 3. Handle security and performance issues of relevance in practice for Web applications at the client-side.
Course content: A preliminary list of topics cover (mainly based on the audience): Introduction to Internet and the WWW. HyperText Markup Language (HTML). Cascading Style Sheets (CSS), HTML5. Document Object Model (DOM). JavaScript. jQuery. JavaScript Object Notation (JSON). Multimedia (more on HTML5). Web 2.0 technologies (wikis, blogs, tagging). Web security (noScirpt). Responsive design, performance, and website re-engineering.
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 project work.
Grading System:
Active attendance 10%, Project assignment 3 x 10% = 30%, Final Exam 60 %.
Literature:

1. Programming the World Wide Web (6th Edition). Robert Sebesta. Addison Wesley, 2010.
2. Learning PHP, MySQL, JavaScript and CSS (2nd Edition). Robin Nixon. O'Reilly Media, 2012.
3. Unleashing Web 2.0: From Concepts to Creativity. Gottfried Vossen, Stephan Hagemann. Morgan Kaufmann, 2007.

4. JavaScript: The Definitive Guide. David Flanagan.
5. A number of resources on the Web.

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", 8thEdition, Prentice Hall, 2010.
2. Linda Null and Julia Lobur, "The essentials of Computer Organization and Architecture", Jones and Bartlett Publishers, 2003.

Course title: **Computer Networking** (Mandatory, SemIV. 5 ECTS)
The aim of the course (module): Introduction to ISO model layers, familiarity with communication protocols, description and operation of services at the application, transport, network, and physical layers.
Learning outcomes: After completing this course (course) the student will be able: (1) gain a basic knowledge of protocol layers and services, (2) have basic knowledge of TCP / IP protocols (3) be able to apply protocols, (4) be able to make network configuration, (5) have a basic knowledge of distributed applications in networks, (6) to be able to make management networks, (7) to understand applications based on TCP / IP protocols.
Course content: layer protocols and services, Internet Service Provider (ISP), Internet History. Principles of network applications, Web, HTTP, FTP, email, DNS and web server. Introduction to the transport layer services, multiplexing and de-multiplexing, reliable data transfer, TCP Protocol, wireshark tool for monitoring traffic, routing, network service model, virtual circuits and datagram networks, ports, IP protocol, routing algorithms, routing in the internet, link layer services, error detection codes, CRC, MAC, LAN, Ethernet Hubs & Switches, PPTP protocol, CDMA, WiFi, Mobile IP, cellular architecture, small offices home office network configuration (SOHO)

Methods of teaching: 30 hours for lectures, 15 hours for numerical exercises and 15 hours for laboratory exercises. Approximately 90 hours of independent work including seminar paper.
Grading System: Attendance and classroom activity: 10%, intermediate evaluations 30%, final exam 60%
Literature:
1. James F. Kurose & Keith W. Ross, "Computer Networking", 6th Ed., Pearson Inc.., 2012
2. Douglas Comer, "Internetworking with TCP / IP, Principles, Protocols, and Architecture"

Course title: Data Security (Mandatory, Sem. IV, 5 ECTS)
The goal: To provide students with practical survey of principles and practice of cryptography and data security, smart cards and their practical use.
Learning outcomes: On completion of this course, students should: (1) Have basic knowledge about cryptography, (2) have knowledge about symmetric and asymmetric encryption (3) be able to apply different cryptographic algorithms, (4) • have basic knowledge about smartcards and their usage in real life applications, (5) be able to manage public keys, and (6)be able to analyze application that use cryptographic algorithms.
Course content: Will include: Symmetric encryption algorithm: Data Encryption Standard (DES), Advanced Encryption Standard (AES), Asymmetric encryption algorithm: Rivest Shamir Addelman (RSA) , elliptic curve, Public key infrastructure (PKI), digital signatures, User authentication, e-mail security , Smart cards, Threats and virus handling, attacks, malware, and buffer overflow attacks, spoofing, Hands on: digital certificates X.509 and PKI,
Methods of teaching: 30 hours of lectures + 20 hours of tutorials exercises + 10 hours of laboratory exercises. Approximately 100 hours of personal study and exercise including seminars.
Grading System: Classroom Assessment 10%, Projects 15%, Practice 15 %, Final assessment 60 %
Literature:
1. Bruce Schneier, Applied Cryptography, ISBN=0-471-12845-7, 1996
2. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanston, Handbook of Applied Cryptography , ISBN: 0-8493-8523-7 1996
3. H.X. Mel & Doris Baker, Cryptograpfy Decrypted, 2004
4. Mtthew MacDonald & Erik Johansson: C# Data Security, 2003

Course title: Human Computer Interaction (HCI) (Mandatory, IV 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: Internet programming (Mandatory, Sem. IV, 5 ECTS)
The goal: This course covers Web programming at the server side, as well as the most recent advanced Web programming concepts and techniques.
Learning outcomes: Upon completion of this course, the student shall be able to: 1. Become familiar with distinct existing architectures of distributing the software of the Web on the current Internet, and how they well align with the domain of application which he/she develops. 2. Design and program rich Web applications at the server side including the Social Web 3. Finalize the Web engineering process with testing and performance tuning, including the prevention against security attacks.
Course content: A preliminary list of topics cover (mostly influenced by the audience): XML and RSS. Basic concepts in PHP. Object-oriented PHP. PHP and regular expressions. PHP and session control, cookie-s. PHP and databases in MySQL. Advanced concepts in PHP. Asynchronous client-server communication: AJAX. Social networking. API-s. CSS3 and Mobile Web. Node.js. Cloud and scalability. Testing. Security revisited.
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 project work.
Grading System: Active attendance 10%, Project assignment 3 x 10% = 30%, Final Exam 60 %.
Literature:

1. PHP and MySQL Web Development (4th Edition). Luke Welling, Laura Thompson. Addison-Wesley Professional, 2008.
2. Learning PHP, MySQL, JavaScript and CSS (2nd Edition). Robin Nixon. O'Reilly Media, 2012.
3. Head First Ajax. Rebecca Riordan, O'Reilly Media, 2008.
4. Programming the Mobile Web (2nd Edition). Maximiliano Firtman. O'Reilly Media, 2013.
5. A number of resources on the Web.

Course Title : Project Management (Elective, Sem IV, 6 ECTS)
Course/Module aim: This module aims to introduce students to the basic concepts of project management and offer them the opportunity that through practice they apply these concepts.
Expected results : At the end of this course, students will be able to: Identify projects and distringuish them from other activities in the organization. Understand the importance of project planning and activities required for good planning. Understand the complex natyre of managing project activities. Use different techniques for project management (such as PERT). Identify required skills for a good project manager. Understand concepts of project costs, project budgets and activities required for their management. Identify and manage project risks. Understand the importance of project audit and monitoring.
Course contents: Introduction to project management. Project phases and life cycle. Project team management. Cost and time planning. Project planning and scheduling. Resource alocation. Risk Management. Project monitoring and control. Project auditing.
Teaching methodology: 30 hours of lectures and 30 hours of practice. Approximately 100 hours of independent work including term presentation.
Grading: Presentation 20%, Wikipedia project 10 %, Final exam 70 %
Literature :

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

"Databases and artificial intelligence"

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

1. D. V. Hall, *Microprocessors and digital systems*, McGraw-Hill

2. S. MacKenzie, *The 8051 microcontroller*, Prentice-Hall
3. Kenneth J. Ayala, *The 8051 microcontroller: Architecture, Programming and Applications*, West Carolina University, 1991
4. David Calcutt, Fred Cowan, Hassan Parchizadeh, *8051 Microcontrollers: An Applications-Based Introduction*, Newnes, 2004
5. Muhammed Ali Mazidi, *The 8051 Microcontroller And Embedded Systems Using Assembly And C*, Pearson Education, 2007
6. Vinod G. Shelake, Rajanish K. Kamat, Jivan S. Parab, Gourish M. Naik, Exploring C for Microcontrollers: A Hands on Approach, Springer, 2007
7. Producer User Manuals for microprocessors and microcontrollers

Course title: Operating Systems (Mandatory, Sem V, 6 ECTS).
The goal: Course aim is to train students understand basic concepts and get knowledge in modern operating systems.
Learning outcomes: On successful completion of the course, students will be able to: 1. To understand main concepts and the structure of operating system; 2. To compare and make distinction among different operating systems; 3.To manage with process conflicts and executing threads; 4. To manage with memory, processor and input/output units; 5. To analyze operating systems and implement a paperwork relating particular issues with operating systems.
Course content: Introduction to operating systems. Operating system structure, Process management: process concepts, threads, process scheduling, process synchronization, deadlocks. Memory management: memory management strategy, virtual memory management. I/O Management: file system, file system implementation, structure of disk data saving into. I/O systems, Operating System Protection. Operating System Security. Analysis and Studies on operating systems: UNIX, Linux, Windows, Minix, Mach, Android.
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. Abraham Silberschatz, Peter Baer Galvin dhe Greg Gagne ,"Operating System Concepts", 8th Edition, 2009.
2. Andrew S. Tanenbaum, "Modern Operating Systems", 3rd Edition, 2008.

Course title: Software Engineering (Mandatory, Sem. V, 6 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: Data models and query languages (Mandatory, Sem. V, 6 ECTS)
The goal: This course covers databases as they adjust to the Web of Data which is replacing the actual Web of Documents.
Learning outcomes: After completing this lecture students will: 1. Demonstrate familiarity with traditional and new technologies in the WWW. 2. Be able to model and manipulate data on the Web, as well as develop information systems on the Web based on XML. 3. Be able to interconnect Web resources through syntactic links, and resolve those links. 4. Be able to compare and correlate traditional relational database management systems with XML.
Course content: A preliminary list of topics cover (mainly based on the audience): XML data model, language; DTD and XML Schema; XPath: a navigation and addressing language for XML; The query language: XQuery; The transformation language: XSLT; DOM/SAX model, the C/C++/Java/PL-SQL APIs and XML; XML Applications; An outlook: the actual trends and future perspectives (noSQL, Semantic Web, GML, Web Services, etc.).
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 project work.
Grading System: Active attendance 10%, Project assignment 3 x 10% = 30%, Final Exam 60 %.
Literature:

1. An Introduction to XML and Web Technologies. A. Moller, M. Schwartzbach. Addison Wesley, 2006.
2. XSLT Programmers Reference, 2nd Edition. Michael Kay; Wrox Press, June 2003.
3. XQuery from the Experts. Don Chamberlin, Denise Draper, Mary Fernandez, Howard Katz, Michael Kay, Jonathan Robie, Michael Rys, Jerome Simeon, Jim Tivy, Philip Wadler; Addison Wesley, 2004.

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.

Course title: Distributed Systems (Mandatory, Sem VI, 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 mining (Elective, Sem. VI, 6 ECTS)
The goal: Data mining is a relatively young but rapidly growing field that is concerned with developing techniques to assist businesses to make intelligent use of their repositories. For example a supermarket might gather data on customer purchasing habits. Using data mining techniques, the supermarket can determine which products are frequently bought together and use this information when planning their business. This course will examine methods on

recognizing patterns and relationships among available data, and making predictions from an applications perspective. Experimentation with algorithms for data mining using easy-to-use software will also be provided.
Learning outcomes: At the end of this course, students will: 1. Gain theoretical background on traditional, as well as more advanced approaches of data mining, in particular of mining data which dominate the Web. 2. Get familiarized with different technologies of data mining.
Course content: Topics include but are not restricted to classification, prediction, clustering, association rules, and recommender systems (e.g. book recommendations by Amazon), and mining of stream data.
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 project work.
Grading System: Active attendance 10%, Project assignment 3 x 10% = 30%, Final Exam 60 %.
Literature:

1. Mining of Massive Datasets. Anand Rajaraman, Jeffrey D. Ullman, Cambridge University Press, 2011.
2. Principles of Data Mining. Hand, Mannila, and Smyth. Cambridge, MA: MIT Press, 2001.
3. Mastering Data Mining. Berry and Linoff. New York, NY: Wiley, 2000.
4. Data Mining Explained. Delmater and Hancock. New York, NY: Digital Press, 2001.

Course title: E-Commerce (Elective, Sem. VI, 6 ECTS)
The goal: Course provides a conceptual view about Electronic Commerce (EC)
Learning outcomes: On successful completion of the course, students will be able to: 1. Know basic concept of information society and make difference different models of Electronic Commerce; 2. Acquire basic knowledge about the innovative field of Web Science; 3. Know relationship between Information Technology and Organization, competition, strategy and pricing issues, electronic search and e-marketing, social marketing, personalization and recommender systems, evaluation and benchmarking; 4. Know how to design business models and use respective tools; 5. Know electronic markets and networks including inter-organizational systems, auctions and intermediaries; 6. Know principles of mobile commerce
Course content: Introduction (Information society, E-commerce classification, Diffusion, Web Science - Intro). Enterprise (IT and organization, Competition, strategy and pricing issues, Search and e-marketing, social marketing, Personalization, Recommender systems, Evaluation and benchmarking).
Business Models (Business Model vs. Strategy, The 3 views of a Business Model, Business Modelling vs. Business Process Modelling, e3-Value, Artifacts & Syntax of e3-Value, e3-Value example, Tool support, Other ontologies). Market and networks (Inter-organizational systems, Markets, hierarchies and networks, Auctions, Intermediaries). Mobile commerce (History and Trends, Definition of M-Commerce, Mobile Usage, Mobile Commerce Value Chain, Technology Stack, Mobile Apps, Unique Properties, Mobile Marketing, Examples)
Methods of teaching: 30 hours of lectures + 30 hours of laboratory exercises. Approximately 100 hours of personal study and exercise including seminars.
Grading System: Attendance 10%, Mid-term exams 30 %, Final Exam 60 %
Literature:

1. Timmers, Paul: Electronic Commerce, John Wiley, 2001.

2. Werthner, H. Bichler, M.: Lectures in E-commerce, Springer, 2001.
3. Werthner, H., Klein, S.: IT and Tourism A challenging relationship, Springer, 1999

Course title: Algorithms Analysis and Design (Elective, Sem. VI, 6 ECTS)
The goal : The purpose of the course is to enable students to design algorithms and to do their detailed analysis, regarding efficiency, sustainability, time and space complexity and processor and memory requests. Algorithms for different problems will be defined in C# and/or C++.
Learning outcomes: On successful completion of the course, students will be able to design efficient algorithms based on main parameters for problem solution and to analyse algorithms in detail.
Course content: Algorithm design. Basic analysis of algorithms, input classes, space complexity. Searching and selecting algorithms, sequential search, binary search, selection. Sorting algorithms, design and analysis: insertion sort, bubble sort, selection sort, shell sort, radix sort, heap sort, merge sort, quick sort, polyphase merge sort. Numerical algorithms, calculating polynomials, matrix multiplication, linear equations. Matching algorithms, string matching, Knuth-Morris-Pratt algorithm, Boyer-Moore algorithm, approximate match algorithm. Graph algorithms, graph terminology, graph data structures, depth-first traversal, breadth-first traversal, minimum spanning tree, shortest-path first (Dijkstra's algorithm). Nondeterministic algorithms, NP problems. Other algorithmic techniques, approximation algorithms, TSP Problem, Bin-packing problem, back-pack problem, Graph-Colouring problem.
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: Seminar 40%, Final Exam 60 %
Literature:
1. Jeffrey J. McConnell, "Analysis of Algorithms, An Active learning approach", Jones and Bartlett Publishers, ISBN: 0-7637-1634-0, 2001.
2. Steven Skiena, "The Algorithm Design Manual", Springer Verlag New York Inc., ISBN: 0-387-94860-0.

Course title:Introduction to Artificial intelligence (Elective, Sem. VI, 6 ECTS)
The goal: The aim of this course is to teach some fields of artificial intelligence (AI). The course will introduce basic intelligent techniques used for problem solving in artificial intelligence and will teach the fundamentals of knowledge representation.
Learning outcomes: A student completing this course should: be able to explain basic concepts of intelligent agents**;** be able to explain and use basic tree search techniques in artificial intelligence**;** understand and apply basic heuristic techniques used in problem solving**;** be able to explain and use game playing techniques used in artificial intelligence **;** understand fundamental concepts of knowledge representation
Course content: History of AI, intelligent agents, problem solving, uninformed search, heuristic search, constraint satisfaction, game playing, logical agent, inference in prepositional logic, first-order logic, inference in first-order logic.
Methods of teaching: Lectures, labs, demonstration of artificial intelligence applications, assignments/projects.

Grading System: Mid-term exam (20%), Final exam (40%), Assignments/Projects (40%)
Literature:

1. Artificial Intelligence: A Modern Approach (Third Edition) by Stuart Russell and Peter Norvig; 2009

Course title: Information retrieval (Elective, Sem. VI, 6 ECTS)
The goal: This course is an introduction to the traditional text Information Retrieval (IR) and the basics of Web IR.
Learning outcomes: At the end of this course, students will: 1. Gain solid knowledge in traditional information retrieval from text. 2. Be capable to design, implement, and evaluate IR systems in the Web, like search engines. 3. Understand the theories behind modern Web search engines, like Google, Swoogle, Clusty, Hakia etc.
Course content: Topics include: Boolean retrieval, vector space model, as well as tolerant retrieval; The Web size estimation and duplicate detection; Link analysis and crawling; Applications of classification and clustering in the IR domain. Additional possible topics: Text-centric XML indexing and ranked retrieval, user interfaces for IR. The course will also be accompanied with demonstration of how these IR concepts and techniques are implemented in modern search engines like Google, AltaVista, Bing, and Clusty.
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 project work.
Grading System: Active attendance 10%, Project assignment 3 x 10% = 30%, Final Exam 60 %.
Literature:

1. Introduction to Information Retrieval. Christopher Manning, Prabhakar Raghavan and Hinrich Schtze, Cambridge University Press. 2008; on-line at http://www-csli.stanford.edu/~schuetze/information-retrieval-book.html
2. Information Retrieval (online book), by C. J. van Rijsbergen, (available online here): http://www.dcs.gla.ac.uk/Keith/Preface.html
3. Search Engines: Information Retrieval in Practice by W. B. Croft, D. Metzler, and T. Strohman, Pearson Education, 2009.

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.

"Computer Network Security"

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

1. D. V. Hall, *Microprocessors and digital systems*, McGraw-Hill
2. S. MacKenzie, *The 8051 microcontroller*, Prentice-Hall

3. Kenneth J. Ayala, *The 8051 microcontroller: Architecture, Programming and Applications*, West Carolina University, 1991
4. David Calcutt, Fred Cowan, Hassan Parchizadeh, *8051 Microcontrollers: An Applications-Based Introduction*, Newnes, 2004
5. Muhammed Ali Mazidi, *The 8051 Microcontroller And Embedded Systems Using Assembly And C*, Pearson Education, 2007
6. Vinod G. Shelake, Rajanish K. Kamat, Jivan S. Parab, Gourish M. Naik, Exploring C for Microcontrollers: A Hands on Approach, Springer, 2007
7. Producer User Manuals for microprocessors and microcontrollers

Course title: Operating Systems (Mandatory, V semester. 6 ECTS).
The goal: Course aim is to train students understand basic concepts and get knowledge in modern operating systems.
Learning outcomes: On successful completion of the course, students will be able to: 1. To understand main concepts and the structure of operating system; 2. To compare and make distinction among different operating systems; 3.To manage with process conflicts and executing threads; 4. To manage with memory, processor and input/output units; 5. To analyze operating systems and implement a paperwork relating particular issues with operating systems.
Course content: Introduction to operating systems. Operating system structure, Process management: process concepts, threads, process scheduling, process synchronization, deadlocks. Memory management: memory management strategy, virtual memory management. I/O Management: file system, file system implementation, structure of disk data saving into. I/O systems, Operating System Protection. Operating System Security. Analysis and Studies on operating systems: UNIX, Linux, Windows, Minix, Mach, Android.
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. Abraham Silberschatz, Peter Baer Galvin dhe Greg Gagne ,"Operating System Concepts", 8th Edition, 2009.
2. Andrew S. Tanenbaum, "Modern Operating Systems", 3rd Edition, 2008.

Course title: ***Software Engineering*** (Mandatory, Sem. V, 6 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: Internet Security (Mandatory, Sem. V, 6 ECTS**)**
The goal: Introducing the forms of attacks, algorithms for encryption / decryption, protocols for sending data in secure way through network, Firewalls, Viruses / Trojans, Wireless Security, IPsec.
Learning outcomes: On successful completion of the course, students have knowledge about:
(1) forms of attacks, theft of passwords, Social Engineering, Authentication Failures, Protocol Failures, Active and Passive Attackers; (2) Symmetric / Asymmetric algorithm and to make the analysis of the safety of these algorithms; (3) protocols for sending data in the safe mode, using of digital certificates, Internet Mail Architecture; (4) Characteristics of firewall, Types of firewall, Firewall Location and Configuration, Proxy servers; (5) Trojans, Viruses, Worms, Protection; (6) Security in Wireless LAN, Architecture models, Operation Phases, WAP architecture, Cryptographic Algorithms; (7) Applying IP Security, Benefits of IPsec, IP Security policies.
Course content: Introduction to Cryptography, Terminology, types of attacks. Symmetric algorithms: DES/T-DES/AES. Non-symmetric algorithms: Principles of Cryptosystems with Public Key, RSA, Diffie-Hellman, Elliptic Curve, Hash functions (one way functions): MD5, SHA-1, SHA-12, Digital Signatures: Security in the Transport layer, Functionality of MIME and S / MIME, Architecture of Internet Mail, DKIM Strategy, E-mail Threats. Firewall Characteristics, Needs for firewall, Firewall configuration, Creation of a firewall to filter through a Linux PC, De-militarized Zone (DMZ), VPN. What is a virus, types of viruses, what is architecture of a virus, what are Trojans, virus protection steps. Introducing Network Components and Architecture Model, Services, Operation phases, Authentication phases, Key Management phases, Data transfer protection phases, WAP architecture, WAP End-to-End Security. Introduction to IP Security and benefits, IPsec documentation, IPsec Services, Anti-Replay Service, Transport and Tunnel Mode, Internet key exchange.
Methods of teaching: 30 hours of lectures + 20 hours of tutorials exercises + 10 hours of laboratory exercises. Approximately 100 hours of personal study and exercise including seminars
Grading System: Classroom Assessment: 10%, Projects 15 %, Practice 15 %, Final assessment 60 %.
Literature:

1. Cryptography and Network Security, by William Stallings, ISBN=0-13-187316-4, published by Prentice Hall, 2006.
2. Internet Security, by Man Young Rhee, ISBN=0-470-85285-2, published by John Willey & Sons, 2003.
3. Applied Cryptography, by Bruce Schneier, ISBN=0-471-12845-7, or ISBN=0-471-11709-9, published by John Willey & Sons, 1996.
4. C# Data Security, by Mathew MacDonald and Erik Johansson, ISBN=1-86100-801-5, Wrox Press, 2003.

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.

Course title: Distributed Systems (Mandatory, Sem. VI, 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: Computer Networking Labs (Elective Sem VI, 6 ECTS)
The aim of the course (module): The course is designed to raise the level of knowledge and experience of students to design, build and maintain computer networks of small and medium enterprises. This will result in two purposes: (1) to facilitate students will employment relationship and (2) will create the basis for further education in the field of computer networks.
Learning outcomes: (1) Develop skills necessary to work with: PC hardware and software, build cable for connection PC's tonetwork, install structured cabling, use the device for testing of cables. (2) Understand the basic concepts in networks, OSI model, equipment networking, IP addressing and subnets, media and topologies LAN, structured cabling, (3) Identify the reasons why the industry has introduced multi-layer model, (4) Identify and describe the functions of each of the seven layers of the OSI reference model, (5) Describe the main devices in the network and determine which layer of the OSI model they work, (6) Describe the steps in the conversion of data encapsulation, (7) Learning the theory of routing, router components, routing and routed protocols, (8) Describe addresses data-link layer and the network and what the main differences between them, (9) Describe the function of MAC addresses (10) Identify functions and protocols TCP / IP, (11) Describe the different classes of IP addresses and sub-netting, (12) Describe and identify the two parts of the network address, (13) Learn the basics of creating network documentation, engineering blog, techniques management of network cabling.
Course content: Basics of computer networks, media and materials in the nets, testing cables, cabling WAN and LAN Ethernet technology basics, TCP / IP protocols, IP addressing, routing basics, subnets, transport and application layer, Configuration The router, the Packet Tracer simulation.
Methods of teaching:0 hours for lectures, 0 hours for numerical exercises and 45 hours for laboratory exercises. Approximately 90 hours of independent work as preparation for labs.
Grading system:Attendance and classroom activity: 10%, laboratory exercises: 90%.
Literature:
1. Cisco Network Academy Website: http://cisco.netacad.net
2. Lorenz, Jim. Cisco Networking Academy Program: CCNA 1 and 2 Companion Guide Revised Third Edition. Indianapolis, Cisco Press. ISBN 1-58713-150-1.
3. Lorenz, Jim. Cisco Networking Academy Program: CCNA 1 and 2 Lab Companion Revised Third Edition. Indianapolis, Cisco Press. ISBN 1-58713-149-8.
4. Lorenz, Jim. Cisco Networking Academy Program: CCNA 1 and 2 Engineering Journal and Workbook Revised Third Edition. Indianapolis, Cisco Press. ISBN 1-58713-151-X.
5. Spurgeon, Charles Ethernet, the Definitive Guide. Sebastopol: O'Reilly Press. ISBN 1-56592-660-9.

Course title: **Visual Computing** (Elective, Sem. VI, 6 ECTS)
The aim of the course (module): The aim of the course is to prepare the student for independent work in computer graphics, data visualization and image processing.
Learning outcomes: After completing this course the student should be able to: 1.Recognize the graphics hardware devices. 2. To be able using programming languages (eg. C #, Java) to write different codes for graphics processing. 3. Be able to analyze programs and modify them. 4. To be able to use Open Source software as Open GL for graphics data processing. 5. To be able to create 2D and 3D applications and create animations. 6. To be able for image processing.
Course contents: Software application for CAD and technical documentation. Hardware units for graphical presentations. Raster-Scan system. The color system. Halftoning approximation. Colors diagram: CIE, RGB, YIQ. Programming primitive objects. Objects: GRAPHICS, POINT, RECTANGLE, COLOR, FONT, PEN, GRAPHICSPATH, BRUSH, SOLIDBRUSH, etc. Drawing different shapes. Permanent drawing. Drawing methods: DRAWLINE, DRAWRECTANGLE, DRAWELLIPSE, DRAWPIE, DRAWPOLYGON, DRAWCURVE, DRAWBEZIER, DRAWSTRING, etc. Algorithms for drawing 2D objects. DDA algorithm. Algorithm middle point of the line. Algorithm midle point of the circle. Two dimensional geometric transformations. Moving, Scaling, Rotation. Homogeneous coordinates for matrix presentation of transformations. 3D graphics. Animations. Tasks and problems solved in C # and OpenGL. Data visualization.
Methodology of teaching: 30 hours of lectures, 30 hours of laboratory exercises. Approximately 80 hours of independent work including independent projects.
Grading System: Attendance 10%, Projects 30% , Final Exam 60%
Literature:
1. Donald Hearn, M. Pauline Baker, "Computer Graphics - C Version", Prentice-Hall International, 1997
2. Peter Shirley, "Fundamentals of computer graphics", 3rd edition, 2009
3. T. Theoharis, G. Papaioanou, N. Square there, N. Patrikalakis, "Graphics & visualization - principles & Agorithms" A v. Peters, Ltd.. In 2008.

Course title (the subject): Hardware Modeling –VHDL (Elective, Sem VI, 6 ECTS)
The aim of the course (module): In this course students will learn the hardware modeling language, through concrete examples of digital circuit modeling languages VHDL and Verilog.
Learning outcomes: After completing this course the student should be able to: 1. Write programs in VHDL language. 2. Use a simulator to write and execute programs in VHDL language. 3. Analyze digital circuits in terms of their work and data flow within the circuit. 4. Analyze the performance of different combining circuits, such as encoders, decoders, code converters, comparators, multiplexers, de multiplexers, arithmetic circuits etc 5. Describe through VHDL language basic memory elements (Flip-Flop), and various synchronous and asynchronous sequential circuits.
Contents: Principles of writing programs in the hardware modeling languages. Use of a Simulator for hardware description. Analysis of circuits on several levels: the behavior of circuits, data flow and data structures. The structure of code in VHDL language. Basic code units of VHDL language: libraries, entities and architecture. Data types, operators and attributes. Description of logical elements and circuits: coder, decoder, code converters, comparators, multiplexers, demultiplexers, arithmetic circuits etc, through VHDL language.

Ways of representing memory elements in VHDL language, and the various digital sequential circuits.
Methodology of teaching:30 hours of lectures and 30 hours of laboratory exercises. Approximately 80 hours of independent work including independent projects.
Evaluation: Attendance 10%, Project Evaluation 30%, Final Exam 60%
Literature:

1. Kenneth L. Short. **VHDL for Engineers**. Pearson, Prentice Hall. Upper Saddle River, New Jersey. USA.
2. J. Bhasker. **VHDL Primer**. PHI Learning.

Course title: Biometrics & Forensics (Elective, Sem. VI, 6 ECTS)
The goal: To provide students with actual biometric technologies utilized by personal documents, actual standards and regulations as well as cybernetic crimes and their detection and protection from them
Learning outcomes: On completion of this course, students will be able to:
1. Apply biometric technologies for digital identity and modern symmetric encryption algorithms, 2. Apply and understand the latest legal and technical standards on identification documents, 3. Apply public key algorithms, use and understand digital signatures and public key infrastructure, 4. Have knowledge about latest cyber-attacks and 4. Use different forensic tools.
Course content: Will include: Concepts and trends in document identity, Biometric properties, legal and technical standards, ICAO and IEC, Secure communication protocols, EU experience in eID security, Computer forensics, Preparing the environment, Evidence gathering, Data extraction, Encryption and password policy, Forensic tools and final reports.
Methods of teaching: 30 hours of lectures + 10 hours of tutorials exercises + 5 hours of laboratory exercises. Approximately 100 hours of personal study and exercise including seminars.
Grading System: Classroom Assessment 10%, Projects 15%, Practice 15 %, Final assessment 60 %
Literature:

1. Walter Fumy, Manfred Paeschke, Handbook of eID Security , ISBN=078-3-89578-379-1, 2011
2. Michael Solomon, Diane Barett & Neil Broom, Computer Forensics , ISBN=0-7821-4375-X, 2005
3. George Mohay, AlisonAnderson at el. Computer and Intrusion Forensics, ISBN=1-58053-369-8, 2003

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.