BSc Study program: **INFORMATION AND COMMUNICATION TECHNOLOGY**

Overview of Courses in Study Program

1st year: Information and Communication Technology						
1st semester			Hours/week			
No	M/E	Course	L	NE	LE	ECTS
1.	M	Linear Algebra and Calculus 1	3	3	0	7
2.	M	Physics 1	3	1	1	6
3.	M	Fundamentals of Electrical Engineering 1	3	1	1	7
4.	M	Fundamentals of Programming	2	0	2	5
5. *Select one of the following elective courses*						
	E	Technical English	2	1	0	5
	E	Communication Skills	2	1	0	5
	E	German Language	2	1	0	5
	E	Practical Mathematics	2	1	0	5
2nd semester			Hours/week			
No	M/E	Course	L	NE	LE	ECTS
1.	M	Calculus 2	3	3	0	7
2.	M	Physics 2	3	1	1	6
3.	M	Fundamentals of Electrical Engineering 2	3	1	1	7
4.	M	Algorithms and Data Structures	2	0	2	5
5.	M	Digital Circuits	2	1	1	5

2nd year: Information and Communication Technology						
3rd semester			Hours/week			
No	M/E	Course	L	NE	LE	ECTS
1.	M	Calculus 3 and Probability	3	1	0	6
2.	M	Signals and Information	3	2	0	7
3.	M	Electronics	3	1	1	7
4.	M	Internet Technologies	3	0	1	6
5. *Select one of the following elective courses*						
	E	Matlab Practicum	2	0	1	4
	E	Practicum in Labview	2	0	1	4
4rth semester			Hours/week			
No	M/E	Course	L	NE	LE	ECTS
1.	M	Digital Communications	3	1	1	7
2.	M	Electromagnetic fields and waves	3	1	1	7
3.	M	Data Transmission	3	0	2	7
4. *Select one of the following non-technical electives (non-technical electives)*						
	E	ICT Project Management	2	1	0	4
	E	Economics for Engineering	2	1	0	4
5. *Select one of the following technical electives (technical electives)*						
	E	Computer and Mobile Equipment's	2	0	2	5
	E	Application development in C++	1	0	3	5
	E	Web application development	1	0	3	5

3rd year: Information and Communication Technology						
5th semester			Hours/week			
No	M/E	Course	L	NE	LE	ECTS
1.	M	Communication networks I	3	0	1	6
2.	M	Operating Systems for ICT	2	0	2	5
3.	M	Object oriented programming	2	0	2	5
4.	M	Multimedia technologies and systems	3	0	1	6
4.&5. *Select two of the following technical electives (technical electives)*						
	E	Python	2	0	1	4
	E	Application development for Android an iOS	2	0	1	4
	E	Computer games development	2	0	1	4
	E	Matlab Practicum	2	0	1	4
	E	Practicum in LabVIEW	2	0	1	4
6th semester			Hours/week			
No	M/E	Course	L	NE	LE	ECTS
1.	M	Microwave and RF Engineering	2	0	1	4
2.	M	Mobile Communications	2	0	1	4
3.	M	Distributed programming	2	0	1	4
4	M	Communication networks II	2	0	1	4
5	M	Final project				10
6. *Select one of the following technical electives (technical electives)*						
	E	Optical Communications	2	0	1	4
	E	Bioelectromagnetics	2	0	1	4
	E	Communication protocols	2	0	1	4
	E	Animation and Virtual Reality	2	0	1	4

Note: M- Mandatory, E- Elective, L- Lectures, NE- Numerical exercises, LE-Laboratory exercises

Explanation:

- Total number of credits (ECTS) accumulated for one year is 60 ECTS - credits.
- The first year (first and second semesters) is the same for all programs at FECE.
- In all semesters besides the mandatory (M) there are also elective courses (E).
- After choosing the elective course it becomes a compulsory course, the student or the professor will not be able to change the course.
- In the last semester the compulsory course "Final Project" is organized so that the student must complete 125 working hours, in one of the companies with which FIEK

has an agreement and which are an integral part of the Advisory Body.

Comparison of study program with similar programs in the region:

- University of Zagreb, Electrical Engineering and Information Technology, 75-80 % https://www.fer.unizg.hr/en/study_programs

- University of Ljubljana, Faculty of electrical engineering, Information and Communication Technologies program, 70-75% http://www.fe.uni-lj.si/en/education/1st_cycle_academic_study_programme/electrical_engineering/curriculum/

Course content:

Course title: Linear Algebra with Calculus I

Lecturer: Prof. Asoc. Dr. Qefsere Gjonbalaj, Prof. Asoc. Dr. Shqipe Lohaj, Prof. Asoc. Dr. Valdete Rexhëbeqaj Hamiti
Course status: Mandatory, Semester I, 7 ECTS

Course content: In this course will be studied: complex numbers, parts from linear algebra, analytic geometry and functions with one-variable.

Course objectives: Students should be trained so that the knowledge gained through this course can be applied as an ancillary device in electrical and computer studies.

Learning outcomes:
Upon completion of this course the student will be able to:

1. describe, solve and design various problems in the field of his profession when dealing with complex number operations, through matrices and determinants;
2. describe and solve problems related to systems of linear equations;
3. find the functional connections of the magnitudes of various electrical problems and then with differential calculations, describe and examine those functional connections;
4. understand the concept of the derivative and is able to apply it to many problems in Geometry, Electronics, Telecommunication, Informatics and other areas;
5. demonstrate skills of mathematical modelling and problem solving.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, seminar work, intermediate evaluations, final exam.

Evaluation methods: Seminar work and homework (10%), first intermediate evaluation (25%), second intermediate evaluation (25%), final exam (40%).

Concretization tools/IT: Pencil, whiteboard, projector and computer.

Ratio between theoretical and practical part: Ratio between the theoretical and practical part is 2:1.

Literature:

- Hamiti E. - Matematika I, Prishtinë 2008.
- Hamiti E. - Matematika II, Prishtinë 2008.
- Peci H, Doko M. - Përmbledhje detyrash të zgjidhura nga Matematika I, Prishtinë 1997.
- Loshaj Z. – Përmbledhje detyrash të zgjidhura nga Matematika II, Prishtinë 1996.

Course title: Physics I

Lecturer: Dr.sc. Valon Veliu
Course status: Mandatory, Semester I, 6 ECTS

Course content: The course includes basic knowledge of physics necessary to gain general knowledge that is basic in engineering.

Course objectives: Using the physical laws to solve the basic problems of engineering.

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

- Analyze simple mechanical systems and solve equations of motion.
- Apply principles of conservation of energy and momentum to particle collisions.
- Explain the conditions of statics of rigid bodies and the equation of motion for rotation of the rigid body around fixed axis.
- Understand the first law of thermodynamics and analyze thermodynamic cycles.

Teaching methodology: 45 hours of lectures + 15 hours of auditorial exercises + 15 hours of laboratory exercises. Approximately 75 hours of personal study.

Evaluation methods: Seminar 10%, Mid-term exams 30 %, Final Exam 60 %.

Concretization tools/IT: Pencil, whiteboard, projector and computer.

Literature:

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

Course title: Fundamentals of electrical engineering 1

Lecturer: Prof. Dr. Luan Ahma, Prof. Dr. Enver Hamiti, Prof. Dr. Mimoza Ibrani, Prof. Ass. Dr. Vjosa Shatri
Course status: Mandatory, Semester I, 7 ECTS

Course content: Basics of electricity. Fundamental laws of electricity. Electric potential. An electric dipole and flux lines. Electrostatic induction. Electric generator. Polarization in dielectrics. Boundary conditions. Capacitance. Electrostatic networks. Energy and forces in electrostatic fields. Electrostatic field analysis using MATLAB. Concepts, elements and topology of electric circuits. Types of electrical circuits. Elementary DC circuits. Circuit Elements, Electrical resistance- Ohm's law. Construction of circuit model. Voltage and potential in electric circuit. Current source. Kirchhoff's laws. Analysis of a Circuit Containing Dependent Sources. Complex DC circuits. DC circuit analysis using SPICE.

Course objectives: The purpose of the course is to introduce the basic principles of electrical field and DC current circuits.

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

1. Understand fundamental laws of electricity.
2. Apply the fundamental laws of electricity for solving electric field problems.
3. Apply MATLAB software package for solving basic problems in electrical field.
4. Understand and apply methods for DC circuit analysis such as: Kirchhoff's lows, node
voltage method, mesh current method, superposition method, Thevenin's and Norton's theorem.
5. Understand transient response of first order circuits (series RC circuits).
6. Apply PSPICE Software for DC circuit analysis.
7. Apply gained knowledge in other electrical engineering fields.

Teaching Methodology: Presentations, tutorials, discussions, and laboratory works meaning: 60 hours presentations + 15 hours of tutorials, and 15 hours laboratory work.

Evaluation: First assesment:30%, Second assessment: 25%, Home exercises 10%, Attendance: 5%, Final exam, 30%, Total:100%.

Concretization tools: Computer, video projector, and equipped lab with necessary devices to illustrate all teaching material.

Literature:

- Nexhat Orana, Bazat e elektroteknikës 1, Prishtinë, 1994
- M.N. Sadiku, Elements of electromagnetic, Oxford University Press, New York, 2001
- Ch. Alexander, M.N. Sadiku, Electric Circuits, McGraw Hill, New York, 2000.

Course title: Fundamentals of Programming

Lecturer: Prof. Ass. Dr. Avni Rexhepi, Prof. Asoc. Dr.Kadri Sylejmani
Course status: Mandatory, Semester 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 factorial. Array operations and algorithms: sum/product of the array members, counting members, searching and sorting. Matrix manipulations: creation, sum/product of the members, searching, creating 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, parameters 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 auditory/lab exercises. Approximately 65 hours of personal study and exercise including home problems/tasks.

Grading System: Attendance lectures 10%, Attendance lab. 10%, Mid-term problems 30 %, Collocui/Final Exam 50 %
Literature:

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

Course title: Technical English

Lecturer: Lecturer from UP
Course status: Elective, Semester I, 5 ECTS

Short description: The focus of this course is to teach students to use English to clearly communicate and write engineering technical concepts.

Course goals: Enabling student to actively use the English language to communicate, orally and in writing, at the necessary level for the professional field of electrical and computer engineering.

Expected learning outcomes: Upon completion of this course the student will be able to:

1. actively use English in everyday life.
2. communicate both orally and in writing the English language at a desired level, specifically as it pertains to their professional field.
3. ask and answer questions in the field of electrical engineering in English.
4. translate texts related to the field of electrical and computer engineering.

Teaching methodology: 30 hours of lectures, 15 hours of exercises. Approximately 80 hours of independent work, including a seminar.

Assessment: Seminar 10%, Intermediary Evaluations 30%, Final Examination 70%.

Ratio between theoretical and practical parts of studying: 2:1

Primary literature:

- Day, Jeremy, *Cambridge English for Engineering*, Cambridge, UK

Course title: Communication skills

Lecturer: Prof. Dr. Blerim Rexha, Prof. Dr. Sabrije Osmanaj
Course status: Elective, Semester 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. Using social media;
4. write a five-paragraph essay;
5. write different reports (visit r., field r., feasibility r., progress r.);
6. write laboratory reports;
7. use the Internet to find specific information;
8. use the computer to write different reports;
9. write minutes of meetings;
10. write a paper on a particular problem or issue;
11. write CVs and applications for work;
12. hold oral presentations;
13. 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) and Social media. Essays and exam answers. Laboratory reports. Reports. Proposals, specifications and manuals. Final year projects and reports. 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 80 hours of personal study and exercise including home-work.

Grading System: Test 1: 25 %,Test 2: 25 %, Test 3: 25%, Homework (seminar paper) 25 %.

Literature:

- Mike Markel & Stuart A. Selber, Technical Communication, 12th Edition, MacMillan, 2018
- John W. Davies, Communication Skills. A Guide for Engineering and Applied Science Students, Prentice Hall, 2011.
- Miller et al, How the World Changed Social Media, UCL Press, 2016
- Majlinda Nishku, Si të shkruajmë: procesi dhe shkrimet funksionale, CDE, Tiranë, 2004.

Course title: German language

Lecturer: Lecturer from UP

Course status: Elective, Semester I, 5 ECTS

Short description: The focus of this course is to teach students to use German to clearly communicate and write engineering technical concepts.

Course goals: Enabling student to actively use the German language to communicate, orally and in writing, at the necessary level for the professional field of electrical and computer engineering.

Expected learning outcomes: Upon completion of this course the student will be able to:

1. actively use German in everyday life.
2. communicate both orally and in writing the German language at a desired level, specifically as it pertains to their professional field.
3. ask and answer questions in the field of electrical engineering in German.
4. translate texts related to the field of electrical and computer engineering.

Teaching methodology: 30 hours of lectures, 15 hours of exercises. Approximately 80 hours of independent work, including a seminar.

Assessment: Seminar 10%, Intermediary Evaluations 30%, Final Examination 70%.

Ratio between theoretical and practical parts of studying: 2:1

Primary literature:

- Leitner, Arnold, *German Made Simple: Learn to speak and understand German quickly and easily*, New York, USA

Course: Practical Mathematics

Lecturer: Prof. Asoc. Dr. Valdete Rexhëbeqaj Hamiti
Course status: Elective, Semester I, 5 ECTS

Course content: In this course will be studied algebraic expressions, polynomials, equations with an unknown, inequations, arithmetic and geometrical strings, trigonometry and analytic geometry.

Course objectives: Students should be trained so that the knowledge gained through this course can be applied to acquiring knowledge from the following subjects.

Learning outcomes:
Upon completion of this course the student will be able:

- to design and solve different problems in the field of equations with an unknown and their implementation;
- to operate with polynomials;
- to apply basic concepts from analytical geometry and trigonometry to various engineering problems.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, seminar work, intermediate evaluations, final exam.

Evaluation methods: Seminar work and homework (20%), first intermediate evaluation (30%), second intermediate evaluation (30%), final exam (20%).

Concretization tools/IT: Pencil, whiteboard, projector and computer.

Ratio between theoretical and practical part: Ratio between the theoretical and practical part is 1:1.

Literature:

- Hamiti E., Peci H., Loshaj Z., Gjonbalaj Q., Lohaj Sh. - Përmbledhje detyrash nga matematika, Prishtinë 2001.
- M. Berisha, D. Kamberi, R. Gjergji, R. Zejnullahu, Përmbledhje detyrash nga matematika, Prishtinë 1990.

Course title: Calculus II

Lecturer: Prof. Asoc. Dr. Qefsere Gjonbalaj, Prof. Asoc. Dr. Shqipe Lohaj, Prof. Asoc. Dr. Valdete Rexhëbeqaj Hamiti
Course Status: Mandatory, Semester II, 7 ECTS

Course description
In this subject we work: Integral computation and its implementation, functions with two or more variables and ordinary differential equations.

Course objectives
The student should be able to apply the knowledge gained through this course as an auxiliary device in the studies of electrical engineering and computer engineering subjects

Expected results
After completion of the course, student will be able to

1. Understand the concept of indefinite and definite integral as well as their application in the measurement of various measures in Geometry, Electrotechnics, Telecommunication, Informatics and other fields;
2. Generalize concepts related to functions with one variable into multi variable functions and in particular into those with two variables. Also be able to apply every concept related to the differential calculation for the one variable function in the case of two variable functions;
3. Think logically about various differential equations, solve concrete examples step by step and model different practical problems through differential equations.

Methodology of teaching: Lectures, discussions, exercises, consultations, homework, midterm exams, final exams.

Methods of assessment: Homework and seminar (10%), First periodic exams (25%), Second periodic exams (25%), Final exams (40%).

Concretization tools: pencil, whiteboard, projector and computer.

Ration between Theoretical part and exercises: 2:1

References

- Hamiti E. - Matematika I, Prishtinë 2008.
- Hamiti E. - Matematika II, Prishtinë 2008.
- Hamiti E. - Matematika III, Prishtinë 2008.
- Peci H, Doko M. - Përmbledhje detyrash të zgjidhura nga Matematika I, Prishtinë 1997.
- Loshaj Z. - Përmbledhje detyrash të zgjidhura nga Matematika II, Prishtinë 1996.
- Hamiti E, Lohaj SH.- Përmbledhje detyrash të zgjidhura nga Matematika III, Prishtinë 2008.

Course title: Physics II

Lecturer: Dr.sc. Valon Veliu
Course status: Mandatory, Semester II, 6 ECTS

Course content: The course includes basic knowledge of physics necessary to gain general knowledge that is basic in engineering.

Course objectives: 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.

Teaching methodology: 45 hours of lectures + 15 hours of auditorial exercises + 15 hours of laboratory exercises. Approximately 75 hours of personal study.

Evaluation methods: Seminar 10%, Mid-term exams 30 %, Final Exam 60 %.

Concretization tools/IT: Pencil, whiteboard, projector and computer.

Literature:

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

Course title: Fundamentals of electrical engineering 2

Lecturer: Prof. Dr. Luan Ahma, Prof. Dr. Enver Hamiti, Prof. Dr. Mimoza Ibrani, Prof. Ass. Dr. Vjosa Shatri
Course status: Mandatory, Semester II, 7 ECTS

Course content: 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. 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.

Course objectives: The purpose of the course is to introduce the basic principles of magnetic field and AC current circuits analysis.

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

1. Understand fundamental laws of magnetism.
2. Apply the fundamental laws of magnetism for solving magnetic field problems.
3. Apply MATLAB software pavckage for solving basic problems in magnetic field.
4. Understand and apply methods for AC circuit analysis such as: Kirchhof's lows, node voltage method, mesh current method, superposition method, Thevenin's and Norton's theorem.
5. Understand transient response of first order circuits (series RL circuits).
6. Apply PSPICE Software for AC circuit analysis.
7. Apply gained knowledge in other electrical engineering fields.

Teaching Methodology: Presentations, tutorials, discussions, and laboratory works meaning**:** 60 hours presentations + 15 hours of tutorials, and 15 hours laboratory works.

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

Concretization tools: Computer, video projector, and equiped lab with neccessary devices to ilustrate all teaching material.

Literature:

- Nexhat Orana, Bazat e elektroteknikës 2, Prishtinë, 1994
- M.N. Sadiku, Elements of electromagnetic, Oxford University Press, New York, 2001
- Ch. Alexander, M.N. Sadiku, Electric Circuits, McGraw Hill, New York, 2000.

Course title: Algorithms and Data Structures

Lecturer: Prof. Ass. Dr. Avni Rexhepi, Prof. Asoc. Dr. Kadri Sylejmani
Course status: Mandatory, Semester I, 5 ECTS

The goal: The purpose of the course is to help students in advancing their knowledge of 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, inline functions, macro functions, function overloading, templates. User defined types. Object oriented programming. Structures: definition of different structures, with different functions as their components, operating structure components. Classes and objects: class definition, classes and member functions. Using public and private members. Declaring objects and operating with their components. Class constructor and destructor. Inheritance, arrays within objects and arrays of objects. Pointers and functions with pointers. References and functions with references. Algorithms, analysis of algorithms, algorithm's growth rate, classification. Data structures. Stack. Queue. Linked lists, adding/deleting nodes. List searching and sorting. Binary tree, tree traversal algorithms, insertion, search and deletion, BST-binary search tree, heap, balanced trees. Graphs, traversal algorithms, minimum spanning tree (Dijkstra-Prim, Kruskal), shortest path algorithm (Dijkstra). Searching and sorting algorithms (Insertion sort, Selection sort, Bubble sort, Shell sort, Merge sort, Quick sort, Heap sort, Bucket sort, Radix sort).

Methods of teaching: 30 hours of lectures + 30 hours of auditorial/lab exercises. Approximately 65 hours of personal study and exercise including home problems/tasks.

Grading System: Attendance lectures 10%, Attendance lab. 10%, Mid-term problems 30 %, Collocui/Final Exam 50 %

Literature:

- 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
- D. S. Malik, C++ Programming: Program Design Including, Data Structures, Course Technology, Thomson Leraning, Boston, Massachusetts, ISBN 0-619-03569-2
- H.M. Deitel, P. J. Deitel, How to Program C++, Prentice Hall, Upper Saddle River, New Jersey, ISBN 0-13-111881-1
- Robert Lafore, Object-Oriented Programming in C++, Sams, Indianopolis, Indiana, ISBN-10:0-672-32308-7
- 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

Lecturer: Prof. Dr. Sabrije Osmanaj, Prof. Ass. Dr. Artan Mazrekaj
Course status: Mandatory, Semester II, 5 ECTS

Course content: Number systems and codes: number systems, codes, encoding, error detection and correction. **Boolean algebra:** propositional logic, Boolean variables, basic operations, derived operations, axioms and theorems, proofs of theorems. **Boolean functions and logic gates:** representations, methods of simplification and conversion, Karnaugh map and truth table, logic gates and circuits, functionally complete sets of operations, timing hazards, logic families and technologies and their characteristics.
Combinational logic circuits: encoders and decoders, multiplexers and demultiplexers, comparators, adders, multipliers, arithmetic and- logic units. **Computer-aided digital design:** minimizers, schematic editors, circuit simulators, hardware description languages, PCB layout designers, IC layout designers. **Sequential logic circuits:** latches and flip-flops, truth table and excitation table, registers, counters, shift registers, ring counters, excitation equations, state table and state diagram, analysis and synthesis of sequential logic circuits. **Three-state buffers and buses:** buffer, Schmitt trigger buffers, three-state buffers, serial buses, parallel buses. **Programmable logic circuits:** storage matrix, ROM, PROM, EPROM, EEPROM, Flash, PLA, PAL, GAL, SRAM, DRAM, CPLD, FPGA. Use of hardware description languages for implementation of combinational and sequential logic in CPLD and
FPGA circuits **Additional topics (in case of spare time, but not required in exams):** microcontrollers, microprocessors, analog-digital and digital-analog converters, clock generators.

Course objectives: To gain a basic theoretical understanding of functioning of digital structures. To acquire the knowledge and basic experience of practical design, implementation and testing of digital structures.

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

- describe the basic combinational and sequential structures of digital circuits;
- explain the functioning of such structures;
- describe this functioning in one of the hardware description languages;
- detect flaws in such functioning;
- eliminate the basic among such flaws;
- choose the optimal design of a digital structure, taking into account the requirements of size, cost and reliability of functioning;
- design combinational and sequential circuits using the methods of abstract and structural synthesis;
- build a prototype of the designed structure in the form of a printed circuit board;
- test the functioning of such a prototype;
- Formulate the strengths and weaknesses of the chosen design.

Teaching methodology: Lecture classes with examples of problem solving and tutorials to illustrate the theoretical concepts, laboratory work for acquisition of practical skills in design, implementation and testing of digital structures.

Evaluation methods: Final rating represents the sum of: The successful practical work: 25%, First intermediate evaluation: 15%, Second intermediate evaluation: 20%, Regular attendance and involvement in discussions and seminars 10%, Oral test or final exam: 30%, Total: 100%

Concretization tools/IT: Computer, projector, lab, table.

Ratio between theoretical and practical part: Ratio between the theoretical and practical part is 1:1.

Literature:

- Floyd Thomas L., Digital Fundamentals (10th Edition), Prentice Hall, 2008.
- M. Morris Mano, M. D. Ciletti. Digital Design, 6th ed. Pearson/Prentice Hall, 2017.
- Fundamentals of Digital Circuits, 3rd Edition, by A. ANAND KUMAR, 2014, Delhi.
- S.M. Deokar, A. A. Phadke, "Digital Logic Design and VHDL", Wiles, 2009
- Digital Circuit Analysis and Design with SIMULINK Modeling: And Introduction to CPLDs and FPGAs, Second Edition, Steven T. Karris, Orchard Publications 2007.
- J. F. Wakerly. Digital Design: Principles and Practices, 5th ed. Pearson/Prentice Hall, 2017.
- C. Maxfield. Bebop to the Boolean Boogie, 3rd ed. Newnes, 2009.

Course: Calculus 3 and Probability

Lecturer: Prof. Asoc. Dr. Valdete Rexhëbeqaj Hamiti
Course status: Mandatory, Semester III, 6 ECTS

Course content: In this course will be studied parts from Mathematical Analysis like the basic concepts of numerical series, polynomial series and functional series. Fourier series, Fourier integral and Fourier transformations. Double, triple, line and surface integrals. The special attention is paid to the part of the Probability Theory, where will be studied the basic concepts of probability, discrete and continuous random variables. Numeric parameters of random variables, variance, standard deviation. Then will be explained the discrete and the continuous distributions, the central limit theorem, the law of large numbers, the covariance, the correlation and linear regression. After all, the basic concepts in Statistics will be elaborated.
Course objectives: Students should be trained so that the knowledge gained through this course can be applied as an ancillary device in information and communication technology.
Learning outcomes:
Upon completion of this course the student will be able to:

- solve and formulate various professional problems related to: double, triple, line and surface integrals;
- apply Fourier integral and Fourier transformation into concrete professional problems;
- know the basic concepts of the Probability Theory and Statistics;
- know the basic distributions attributes as well as their application to professional problems;
- apply the central limit theorem;
- make mathematical models related to concrete professional problems, i.e. information and communication technology.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, seminar work, intermediate evaluations, final exam.
Evaluation methods: Seminar work and homework (10%), first intermediate evaluation (25%), second intermediate evaluation (25%), final exam (40%).
Concretization tools/IT: Pencil, whiteboard, projector and computer.

Ratio between theoretical and practical part: 2:1.
Literature:

- Hamiti E. – Matematika III, Prishtinë 2008, Libri shkollor.
- Hamiti E. – Matematika IV, Prishtinë 2008, Libri shkollor.
- Hamiti E, Lohaj Sh. – Përmbledhje detyrash të zgjidhura nga Matematika III, Prishtinë 2008, Libri shkollor.
- Hamiti E, Lohaj Sh. – Përmbledhje detyrash të zgjidhura nga Matematika IV, Prishtinë 2008, Libri shkollor.
- Douglas C. Montgomery, George C. Runger - Applied Statistics and Probability for Engineers-Wiley, 2018.
- S. Ross, A First Course in Probability, 8th edition, Prentice Hall, New Jersey, 2009.

Course title: Signals and Information

Lecturer: Prof. Dr. Enver Hamiti
Course status: Mandatory, Semester III, 7 ECTS

Course content: Continous signals: periodic, non-periodic and random signals. Signal power and correlation between periodic signals. Signal energy and correlation between aperiodic signals. Fourier analyses of periodic and aperiodic signals, signal spectrum. Signal power and correlation between random signals. Signal filtering and convolution. Clasic analog filters. Sampling and reconstruction of bandlimited signals. Pulse transmittion and intersymbol interference, Nyquist theorem. Basic on information theory: events and information measure. Information sources, entropy and source coding. Communication channel model and channel capacity.
The goal : The goal of the course are to introduce students to the basic concepts of signals and informations. To develop student`s understanding of time-domain and frequency domain approaches to the analysis of continuous and discrete signals; understund to gain knowledge of the fundamental concepts of information theory; and to develop student`s ability to apply modern simulation software to signals and information analysis.
Learning outcomes: Student will learn properties of signals and information and the ways how to represent them in time and frequency domain. After finishing the course student will gain knowledge of fundamental methods of signals and information analysis, in time and transform domain, through the problem solving and performing corresponding simulations.
Teaching Methodology: 45 hours of lectures + 30 hours of auditorial exercises . Approximately 100 hours of personal study and exercise including seminars.
Evaluation: Seminar 10%, Mid-term exams 30 %, Final Exam 60 %
Concretization tools: Compjuter, video projector, and equiped lab with software to ilustrate all teaching material.

Literature:

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

Course title: Electronics

Lecturer: Prof. Asoc. Dr. Qamil Kabashi, Prof. Dr. Milaim Zabeli
Course status: Mandatory, Semester III, 7ECTS

Course content: Semiconductors, semiconductor diodes, diode circuits (half and full wave rectifiers), diode circuits for signal processing, Zener diodes and voltage regulators, Photovoltaic (PV) Cell Structure and Operation. Bipolar transistor, characteristics and principle of operation, areas of operation. Thyristor, principle of work and areas of operation. MOSFET transistors, characteristics and principle of operation, areas of operation. Basic BJT amplifier configurations: common emitter, common base, and common collector. Field effect transistor, working principles, small signal patterns. Basic amplifier configurations: with common source, with common gate and with common drain. Operational amplifiers, ideal and realistic features, basic circuits with operational amplifiers, OA applications.

Course objectives: To introduce the basics of semiconductors electronic devices and circuits. This course is one of the fundamental courses for all study programs of electrical engineering and prepare students for advanced courses. Competently communicates with electronics specialists in specifying the technical requirements for electronic equipment.
Learning outcomes: On successful completion of the course, students will be able to:

- understand the basics of electronics within the field of electrical engineering.
- understand the diode circuits and their applications.
- understand PV cell structure and operation.
- Understand Thyristor structure and operation.
- understand circuits with bipolar and MOS transistors and their models;
- analyze and design transistor circuits for small signals;
- analyze and utilize operational amplifiers.
- continue studies in power electronics, electrical drives, and other advanced courses.

Teaching methodology: 45 hours of lectures, problem-solving examples as well as 15 hours of laboratory exercises. Approximately 70 hours of personal study including assignments and seminar papers.
Evaluation method: Test 1: 25%, Test 2: 25%, Attendance to lectures 10%, Laboratory exams 10%, Final exam 30%. Success in preliminary assessments is a prerequisite for the final exam.

Ratio between the theoretical and practical part: 40:60
Literature:

1. Adel S. Sedra, Kenneth C. Smith, *Microelectronic Circuits*, 8th edition. Oxford University Press, 2019,
2. Thomas L. Floyd, *Electronic devices*, 10th edition. Pearson, 2018
3. Myzafere Limani, Qamil Kabashi, *Elektronika*, Universiteti i Prishtinës, ligjërata të autorizuara, 2018.

Course: Internet Technologies

Lecturer: Prof. Dr. Mimoza Ibrani
Course status: Mandatory, Semester III, 6 ECTS

Course content: Fundamentals of information and communication systems. Information society and digital transformation. Users and information communication service and content providers, services and their application. Internetworking. Communication systems, technologies, hardware and software. Communication channel model. Digital data transmission. Purpose of layered models and communication protocols, protocol data units. Signalization and intelligence in networks and systems. OSI and TCP/IP reference models. Architectures of Internet and communication networks: access and core networks. Examples and operation of selected systems and technologies in communication services provisioning: Ethernet, xDSL, wireless and mobile networks, Internet systems with TCP/IP, satellite networks. Broadband concept, mobility, and multimedia. Fundamentals of Web and Web technologies. Client-server operation. Traditional Internet services and applications. Internet of things – concept and application examples. Convergent interactive Internet applications. Fundamentals of convergent Internet multimedia components and services, and broadcasting systems. Internet standards world.

Course objectives: The main objective of the course is to introduce fundamental knowledge about operation and application of information and communication systems and Internet. The course combines theoretical background with practical applications and real-world examples. The topics build an integral whole, which is of interest and necessary for professional courses in the continuation of the study.

Learning outcomes: After successful completion of the course, students should be able to:

- List the key technologies in Internet, including wired, wireless and mobile network technologies
- Sketch the architecture and explain the operation of Internet and other IP based communication systems
- Differentiate among purposes of communication protocols at various layers of TCP/IP
- Explain the concept and possible use cases of the Internet technologies
- Configure and test a simple network, information and or/communication system

Teaching methodology: Lectures for theoretical aspects, laboratory exercises and team-work for real-case scenarios and problem solving. Case studies and industry invited lecturers.

Evaluation methods and criteria: Evaluation of practical/laboratory exercises. 30%, Homework and attendance 10 %, Mid-term evaluation 30%, Final evaluation 30%, Total: 100 %

Concretization tools/ IT: Computer, projector and different apps for lectures. State of the art computer communication lab for laboratory exercises.

Ratio between theoretical and practical part: Ratio between practical/theoretical 50%/50%

Literature:

- Curose James, Ros Keith (2016). Computer Networking. Pearson. 7th edition.
- William Stallings (2013). *Data and Computer Communications*, (10th ed.). Pearson.
- Janevski, T. (2015). *Internet Technologies for Fixed and Mobile Networks*. Artech House.
- Tanenbaum, A.S., Wetherall, D.J. (2011). *Computer Networks*, 5th, 2011. Pearson Education, Inc.
- Sauter, M., From GSM to LTE-Advanced: An Introduction to Mobile Networks and Mobile Broadband, John Wiley & Sons, Chichester, 2014

Course: Matlab Practicum

Lecturer: Prof. Asoc. Dr. Bujar Krasniqi
Course status: Elective, Semester III, 4 ECTS

Course content: This course describes the basics of programming in Matlab. At the beginning student learn vectors, matrix and graphical representation of functions. The next part focuses on saving the data in files, function definition, use of Simulink and toolboxes.
Course objectives: The purpose of this course is that the student during lectures and laboratory exercises expand and deepen their knowledge to apply Matlab programming language ICT problem solving and analysis.
Learning outcomes: Upon completion of this course the student will be able to:

- distinguish the use of vectors and matrix in Matlab
- formulate function and loops
- demonstrate appropriate knowledge for data visualization by graphical representation
- implement examples from communication systems using simulink and Toolbox-es
- solve ICT problems using Matlab software

Teaching methodology: Lectures, Discussion, Laboratory work.
Evaluation methods: The successful practical work: 70%, First intermediate evaluation; 10%, Second intermediate evaluation:10%, Regular attendance and involvement in discussions 10%, Total: 100 % .
Concretization tools/IT: Computer, projector, laboratory equipped for ICT
Ratio between theoretical and practical part: Ratio between the theoretical and practical part is 25:75

Literature:

- S. Chapra (2019): Essential MATLAB for Engineers and Scientists, 7th Edition, Publishing House "Elsevier", USA.
- O. Ibe (2017): Applied Numerical Methods with MATLAB for Engineers and Scientists, 4th Edition, Publishing House Mc Graw Hill, USA

Course title: Practicum in LabVIEW

Lecturers: Prof. Ass. Dr. Hena Maloku
Course status: Elective, Semester III, 4 ECTS

Course description: this course is designed to provide the students with fundamental knowledge for labview software. This course also provide others activities and examples in order to demostrate the students the techniques for identifying other information resources about labview
Course goal: the aim of this course is to teach the students the main concepts of labview software. The goal of this course is also to provide the students with knowledge of techniques of conecting measurement devices with PC, data analysis etc. SCADA systems programming and programmable logic controller communication are also the focus of this course.
Learning outcomes After successful completion of the course, students should be able to:

- Write LabVIEW scripts called Vis;
- Use different techniques for problem solving;
- Formulate and store Vis in order to be used as subclasses;
- Store the data in a file and display them in a graph;
- Develop applications that use GPIB (General Purpose Interface Bus) or plug-in DAQ boards;
- Optimize the speed and performance of LabVIEW programms;
- Use advanced techniques in LabVIEW;
- Control the created programms and publish them in internet using LabVIEW commands

Teaching methodology: Lectures, discussions, practical work, seminars
Evaluation methods and criteria: practical work: 40%, first mid-term exam 20%, attendance 10%, final exam 30%.
Concretization tools/ IT: Computer, projector, laboratory, white board.
Ratio between theoretical and practical part: Ratio between practical and theoretical part 50/50%.

Literature:

- Labview for everyone. J. Travis, J. Kring, 2007. Pentince Hall
- Labview Programming, Data Acquisition and Analysis. J. Beyon, 2001. Prentice Hall
- Labview Graphical Programming. G. Johnson, R. Jennings, 2006. McGraw Hill

Course title: Digital Communications

Lecturer: Prof. Dr. Enver Hamiti
Course status: Mandatory, Semester IV, 7 ECTS

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.
The goal: The purpose of the course is to introduce the basic principles of digital communications.
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.

Teaching Methodology: 45 hours of lectures + 15 hours of auditorial exercises + 15 hours of laboratory exercises. Approximately 100 hours of personal study and exercise including seminars.
Evaluation: Seminar 10%, Mid-term exams 30 %, Final Exam 60 %
Concretization tools: Compjuter, video projector, and equiped lab with neccessary devices to ilustrate all teaching material.

Literature:

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

Course: Electromagnetic fields and waves

Lecturer: Prof. Dr. Mimoza Ibrani
Course status: Mandatory, Semester IV 7 ECTS

Course content: The course starts with brief explanations of waves and phasors, the nature of electromagnetism, travelling waves and presentation of electromagnetic spectrum. The general concepts of transmission lines are explored, including: the role of wavelength and propagation modes, transmission line equations, concepts of wave propagation on transmission lines, ending with special cases of transmission lines such as: short-circuited line, open-circuited line, quarter-wave transformer and impedance matching. The basic concept of Vector calculus, gradient, divergence, curl and Laplace operator are covered. Maxwell's equations for Electrostatics, Magnetostatics and Time-Varying fields are analyzed and compared, followed with practical application in engineering. The main topic of the course is Propagation of plane waves. Complex permittivity, plane wave propagation in lossless mediums, different types of wave polarizations and their applications will be elaborated. The comparative analysis between: Plane wave propagation in low loss dielectric and good conductor will be presented. Electromagnetic power density for plane wave propagation in lossless and loss mediums will be calculated. Wave reflection and transmission at normal incidence, at oblique incidence, Snell' law and Brewster angle will be covered. The transmission and reflection coefficient will be derived for different practical wave propagation examples. Few of radio frequency propagation models and path loss for different environments will be studied.
Course objectives: To provide students with the background necessary to understand the concepts of time varying electromagnetic fields, the electromagnetic wave properties and its propagation in different media through various junctions
Learning outcomes: After successful completion of the course, students should be able to:

- Apply vector calculus to analyse the behavior of static electric fields and magnetic fields in standard configurations;
- Describe the parameters of time varying fields, guided and free space wave propagation and the underpinning role of Maxwell's equations.
- Illustrate and analyse transmission lines and wave propagation for different practical scenarios;
- Analyse the application of radio frequency propagation models and path loss for different environments

Teaching methodology: Lectures for theoretical aspects, laboratory exercises, numerical exercises and tutorials for practical part and engineering problem solving.
Evaluation methods and criteria: Homework and practical exercises 20 %, Mid-term evaluation 40%, Final evaluation 40%, Total: 100 %
Ratio between theoretical and practical part: 40%/60%
Literature:

- 1.Ulaby, F. T., Michielssen, E., & Ravaioli, U. (2010). *Fundamentals of applied electromagnetics* 6e. Boston, Massachussetts: Prentice Hall.
- Magdy F. IIskander (2012) "*Electromagnetic Fields and Waves* ", Illinois Waveland: Press,

Course: Data Transmission

Lecturer: Prof. Asoc. Dr. Bujar Krasniqi
Course status: Mandatory, Semester IV, 7 ECTS

Course content: This course describes the basics of data transmission, beginning with analog and digital communication, continuing with efficiency of transmission media as result of multiplexing and switching. In the second part the students learn the communication network with wirer (optical and hybrid optical) and without wires (2G, 3G, 4G and 5G), as well as multiple access techniques that are used for data transmission. At the end of the course the multimedia services and their quality for data transmission is covered.
Course objectives: The purpose of this course is that the student during lectures and laboratory exercises expand and deepen their knowledge for data transmission, networks used for data transmission and needed quality of service for data transmission.
Learning outcomes: Upon completion of this course the student will be able to:

- understand analog and digital data transmission
- demonstrate necessary knowledge for wired networks (optical and hybrid optical) and wireless networks (2G, 3G, 4G and 5G) for data transmission
- interpret quality of service parameters for multimedia services transmission

Teaching methodology: Lectures, Discussion, Laboratory work.
Evaluation methods: The successful practical work: 40%, First intermediate evaluation; 25%, Second intermediate evaluation:25%, Regular attendance and involvement in discussions 10%, Total: 100 % .
Concretization tools/IT: Computer, projector, laboratory equipped for ICT
Ratio between theoretical and practical part: Ratio between the theoretical and practical part is 60:40

Literature:

- B. Forouzan (2013): Data Communication and Networking, 5th Edition, Publishing House"Mc Graw Hill", USA.
- O. Ibe (2018): Fundamentals of Data Communication Networks, Publishing House Wiley, USA
- M. Sauter (2017): From GSM to LTE-Advanced and 5G, An introduction to mobile networking and mobile broadband, 3rd Edition, Publishing House Wiley, USA

Course title: ICT project management

Lecturer: Prof. Asoc. Dr. Isak Shabani
Course status: Elective, Semester IV, 4 ECTS

Course content: Introduction to project management. Project integration and scope management. Project time management. Project cost management. Project quality management. Project Human Resources and Communication Management. Project risk management. Agile project management. Different project management methodologies. Components of Scrum. Process: sprints. Reporting. Comparison of different Agile methodologies.

Course goal: In this course, students will learn the fundamentals of financial management, cost accounting and budgeting. There by they are able to calculate competitive prices for products and services, budget the projects and manage the finances of an enterprise.

Learning outcomes: Upon successful completion of this module, student will be able to:1. Understand and are able to explain project management processes; 2. Understand and are able to explain different Agile methodologies (SCRUM, Kanban, Extreme Programming, Lean). Knows advantages and disadvantages of these methodologies.; 3. Have deep understanding of the Scrum project management method. Correctly use project management terminology. 4. Choose appropriate project management methods depending on the project; 5. Plan project activities regarding time and budget; 6. Apply the SCRUM methodology in practice and use Planio.io tool; 7. Use MS Project package for classical project management processes; 8. Smoothly and suggestively express project and its idea; 9. Prepare project documentation; 10. Communicate with each other through group work; 11. Work in a team, assume responsibility for the quality of assigned task; 12. Manage project team, responsibly assess the team leader, the members; 13. Understand the importance of development skills for their professional growth, 14. Develop the need to independently improve their project management skills.

Methods of teaching: 30 hours of lectures + 15 hours of auditorial exercises + 15 hours of laboratory exercises. Approximately 90 hours of personal study and exercise including seminars.
Grading System: Seminar 10%, Mid-term exams 30 %, Final Exam 60 %
Literature:

- Schwalbe, K. (2015). Information Technology Project Management. 8th edition. Cengage Learning
- Robert, K. Wysocki (2013). Effective Project Management: Traditional, Agile, Extreme. 7th Edition. Wiley.
- Kenneth, S., R. (2012). Essential Scrum: A Practical Guide to the Most Popular Agile Process. Addison-Wesley.

Course title: Economics for engineering

Lecturer: From industry
Course status: Elective, Semester IV, 4 ECTS

Course description: during this course the students will acquire knowledge about fundamentals of economics and legal and engineering environment of a project. The main topics of this course are: engineering profession, engineering ethics, intellectual property, problem solving engineering approach, teamwork, organization and leadership.

Course goal: the main goal of this course is to teach the students the main concepts in economics and provide them with knowledge for understanding the tools that economists use for addressing different economics issues and using these tools for solving engineering problems.

Learning outcomes After successful completion of the course, students should be able to:

- Identify the complex environment of engineering;
- Explain ethical issues of engineering;
- Understand the basis of intelectual property;
- Apply basic principles in teamwork;
- Explain the importance of leadership;

Teaching methodology: Lectures, seminars, discussions.
Evaluation methods and criteria: Research assignment 25 %, first mid-ter exam 15 %, second mid-term exam 20%, attendance 10%, final exam 30%.
Concretization tools/ IT: Computer, projector, white board, laboratory..
Ratio between theoretical and practical part: Ratio between practical and theoretical part 50/50%.

Literature:

- B.S. Dhillon, *Engineering and Technology Management Tools and Applications*, Artech House, 2002.
- S.P. Robbins, M. Coulter, *Management – ninth edition*, Prentice Hall, 2007
- Dominick Salvatore, *Ekonomija za menadžere u svjetskoj privredi*, Mate d.o.o. 1994.
- Lessard B., Lessard J., Project Management for Engineering Design, Morgan&Clypool, 2007.

Course: Computer and Mobile Equipment's Architecture

Lecturer: Prof. Asoc. Dr. Bujar Krasniqi
Course status: Elective, semester IV, 5 ECTS

Course content: This course describes the basics of computers, processor and memory architecture, input/output systems. The second part of the course is focused on architecture of smartphones, base station, communication systems and network equipment's (switch, router, access point), including hardware, communication, processor and memory parts.

Course objectives: The purpose of this course is that the student during lectures and laboratory exercises expand and deepen their knowledge for computer architecture. Moreover, the student become familiar with mobile and networks equioments architecture.

Learning outcomes: Upon completion of this course the student will be able to:

- understand data representation in computer systems
- describe architecture of a simple computer system and mobile equipments
- quantify processors, memries and their funtionality
- clasiffy input/oputput units in computer system
- interpet communication parts of mobile equipments

Teaching methodology: Lectures, Discussion, Laboratory work.

Evaluation methods The successful practical work: 50%, First intermediate evaluation; 20%, Second intermediate evaluation:20%, Regular attendance and involvement in discussions 10%, Total: 100 % .

Concretization tools/IT: Computer, projector, laboratory equipped for ICT

Ratio between theoretical and practical part: Ratio between the theoretical and practical part is 50:50

Literature:

- L. Nul, J. Lobur (2019): The Essentials of Computer Organization Architecture, 5th Edition, Publishing House "Jones &Barlet Learning", USA.
- D. Patterson, J. Hennessy (2017): Computer Organization and Design, The Hardware/software Interface ARM Edition, Publishing House Elsevier, USA
- J. Aweya (2018): Switch/Router Architectures: Shared-Bus and Shared-Memory Based Systems, Publishing House IEEE Wiley, USA

Course: Application development in C++

Lecturer: From Industry
Course status: Elective, semester IV, 5 ECTS

Course description: During this course the students will accquire knowledge for developing applicatons in C++ language. Some of the topics that will be covered in this course are:
The basics of C++ as a procedural language. Integer and floating-point data types, identifiers; and arithmetic, relational, and logical operators, object-oriented features, Polymorphism.

Course goal: The main goal of this course is to teach the students the main features of C++ language and make them capable of application development with C++.
Learning outcomes : After successful completion of the course, students should be able to:

- Write scripts in C++;
- Use different functions;
- Debug the applications;.

Teaching methodology: Lecturs, Research-based learning, presentations
Evaluation methods and criteria: Project assignment 25 %, first mid-ter exam 15 %, second mid-term exam 20%, attendance 10%, final exam 30%.
Concretization tools/ IT: Computer, projector, white board, laboratory.
Ratio between theoretical and practical part: Ratio between practical and theoretical part 50/50%.

Literature :

- Richard Johnsonbaugh, Martin Kalin, *Applications Programming in C++*, 1st Edition.
- H.M. Deitel, P. J. Deitel, How to Program C++, Prentice Hall, Upper Saddle River, New Jersey, ISBN 0-13-111881-1
- Robert Lafore, Object-Oriented Programming in C++, Sams, Indianopolis, Indiana, ISBN-10:0-672-32308-7

Course: Web Application Development

Lecturer: Prof. Ass. Dr. Zana Limani
Course status: Elective, semester IV, 5 ECTS

Course content: Internet and Web Protocols, Client-Server Architecture, Web Software, Development Technologies, HTML, Active Server Pages, VBscript, Databases, Interfacing with Databases, Web Application Components, Authentication, User Registration, uploading content, Emailing, Design Principles, Web Application Design, Performance and Reliability, Purpose of Web Application Infrastructure. Server-side technologies of Active Server Pages (ASP) and ASP.NET. Application of connectivity issues with databases. Web server management. Hypertext Preprocessor (PHP) essentials.
Course objectives: The course provides the knowledge and skills necessary to create dynamic web applications, and prepares students for relevant advanced courses in computer technologies.
Learning outcomes: After successful completion of the course, students should be able to:

- Comprehend and propose Web Application infrastructure.
- Apply client/server communication techniques such as server, application, session variables, cookies and server behaviours.
- Determine the needs for web database and connectivity.
- Apply code reuse with templates, libraries, and snippets.
- Evaluate several alternatives in the design of a web application.
- Develop a functional web application.

Teaching methodology: Lectures, class discussions, and review of real-world cases based on specific theoretical concepts. Laboratory sessions, involving training and practice in developing web applications.
Evaluation methods and criteria: Programming exercises 10%, Exams 30%, Web Demo 20% and final Web demonstration 40%, Total: 100%.
Concretization tools/ IT: Computer, projector and different apps for lectures. Multimedia Laboratory for web design and development.
Ratio between theoretical and practical part: Ratio between practical and theoretical part 60%/40%

Literature:

- Ralph F. Grove PhD, Web Based Application Development, ISBN-13: 9780763759407, 2010
- Joseph W. Lowery, Adobe Dreamweaver CS5 Bible, ISBN: 978-0-470-58586-3, May 2010•
- Learning PHP, MySQL, and JavaScript: A Step-By-Step Guide to Creating Dynamic Websites (Animal Guide) by Robin Nixon and Nixon Robin (Paperback - Jul 22, 2009)

Course: Communication Networks I

Lecturer: Prof. Dr. Mimoza Ibrani
Course status: Mandatory, Semester V, 6 ECTS

Course content: Computer networks fundamentals: Services, protocols, delays, loss, packet switching, circuit switching, services and reference models. Application layer: Principles of network applications, network application architectures. Web and HTTP, cookies, web cashing, File transfer applications. DNS and electronic mail. Peer to peer applications and socket programing. Transport layer services. Multiplexing and demultiplexing. Principles of reliable data transfer (ARQ). Connection oriented transport (TCP). Connectionless transport (UDP). Principles of congestion control. Forwarding and routing. Virtual circuits and datagram networks. Router and routing. The IP (Internet protocol). IPv4 and IPv6. Routing algorithms (Link state and Distance vector). Inter and intra autonomous system routing. Broadcast and multicast routing. The link layer: links, access networks and LANs. The services provided by link layer. Error detection and correction techniques. Multiple access links and protocols. Ethernet, Token Ring, FDDI, WLAN.
Course objectives: Understand the principles and concepts on computer networks. Gain familiarity with communication protocols, description and operation of services at the application, transport, network, data link and physical layers
Learning outcomes: After successful completion of the course, students should be able to:

- Demonstrate concept of packet-switching, and identify and analyze the different types of packet delay in packet-switched networks
- Use IP addressing and apply routing algorithms to find shortest paths for network-layer packet delivery
- Explain principles of reliable data transfer and congestion control
- Describe and compare data link layer services and multiple access techniques
- Use networking tools to observe and analyze behaviors of networking protocols
- Explain knowledge of protocol layers and services

Teaching methodology: Lectures for theoretical aspects, laboratory exercises and teamwork for real-case scenarios and problem solving through project work.
Evaluation methods and criteria: Evaluation of practical/laboratory exercises 30%, Homework and attendance 10 %, Mid-term evaluation 30%, Final evaluation 30%, Total: 100 %
Concretization tools/ IT: Computer, projector and different apps for lectures. Computer communication lab for laboratory exercises. Software tools: Packet Tracer, GNS 3.
Ratio between theoretical and practical part: Ratio between practical and theoretical part 50%/50%

Literature:

- Kurose, J. F., & Ross, K. W. (7th Edition) (2016). *Computer networking: a top-down approach*.
- Tanenbaum, A.S., Wetherall, D.J. (2011). *Computer Networks*, 5th, 2011. Pearson Education, Inc.
- Computer networks tutorials and case-studies

Course: Operating Systems for ICT

Lecturer: Prof. Asoc. Dr. Bujar Krasniqi
Course status: Mandatory, Semester V, 5 ECTS

Course content: This course describes the basics of operating systems for ICT such us memory, processes, files and network management. Moreover, the focus of the course is on operating systems that are in use by mobile and network equipment's.

Course objectives: The purpose of this course is that the student during lectures and laboratory exercises expand and deepen their knowledge for operating systems functionality in general while learning the basic concepts as well as to know in practice the use of UNIX, Windows, Linux and Android. Also, the student will become familiar with operating systems that are in use in communication network equipment's: switch, router, exchange point, access point and end user devices.

Learning outcomes: Upon completion of this course the student will be able to:

- understand memory, process, file and end user equipment management
- describe basic concepts the basic concepts of network organization and functionality
- apply in practice the most used operating systems in ICT such as Unix, Windows, Linux and Android
- apply in practice base station, network equipment's such as switch, router, access point operating systems
- analyze and monitor the performance of operating systems for practical problem solution

Teaching methodology: Lectures, Discussion, Laboratory work.
Evaluation methods: The successful practical work: 40%, First intermediate evaluation; 25%, Second intermediate evaluation:25%, Regular attendance and involvement in discussions 10%, Total: 100 % .
Concretization tools/IT: Computer, projector, laboratory equipped for ICT
Ratio between theoretical and practical part: Ratio between the theoretical and practical part is 60:40

Literature:

- A. McHoes, I. Flynn (2018): *Understanding Operating Systems*, 8th Edition, Publishing House "Cengage", USA.
- A. Silberschatz, P. Galvin, G. Gagne (2018): *Operating System Concepts*, 10th Edition, Publishing House Wiley, USA
- K. Dooley, I. Brown (2009): Cisco IOS Cookbook, Publishing House O'Reilly, USA

Course title: Object Oriented Programming

Lecturer: Prof. Dr. Isak Shabani
Course status: Mandatory, Semester V, 5 ECTS

Course goal: This course enables students to prepared and successfully apply the concepts and techniques of programming with objects, enabling students to apply object-oriented techniques in software projects. The purpose of the course is to prepare students with modern knowledge in "thinking in object programming", a precondition necessary for complex software systems based on 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. To be able to predict exceptions and error handling; 5. To be able to create abstract classes and interfaces; 6. Realize e project relating a particular issue using object-oriented programming.

Course content: Introduction to object oriented programming. Introduction to Java. Classes and objects. Java packages. Constructors and destructors. Reference and value types, Data access. Attributes, methods and operators. Delegates and events. Encapsulation, class inheritance, polymorphism. Abstract classes, interface and pattern. Exceptions and error handling. i/o classes, Generic types and methods. Class collection. Testing applications based on object oriented programming. Documenting object oriented programming.
Methods of teaching: 45 hours of lectures + 30 hours of laboratory exercises. Approximately 90 hours of personal study and exercise including homework.
Grading System:
Attendance 10%, Practical project 30 %, Final Exam 60 %

Literature:

- C. Thomas Wu , "An Introduction to Object-Oriented Programming with Java", 2009, Publisher: McGraw-Hill Education; 5th edition
- Daniel Liang, "Introduction to Java Programming", 2014, 10th Edition, Armstrong Atlantic State University
- Danny Poo, "Object-Oriented Programming and Java", 2007, Second Edition 2nd Edition
- Richard Naoufal, "Java: Object-Oriented Programming Concepts", 2018.

Course title: Multimedia technologies and systems

Lecturer: Prof.Ass.Dr. Hena Maloku
Course status: Mandatory, Semeseter V, 6 ECTS

Course description: Multimedia systems. History of multimedia systems. Software tools in multimedia. Video editing. Technical design. Data display in multimedia. Voice digitalization. MIDI. Fundamentals of digital video. Information theory elements. Computer networks. Independent lab work.

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

Learning outcomes: After completing this course the student will be able to: essentially to know the nature of the text, image, sound, video and animation; Have knowledge for creating, editing and storage of various media; Have knowledge to implement digitization and compression in multimedia: To have knowledge and skills to use the tools for creating multimedia products, have knowledge of web-based multimedia systems: to use and develop various software packages for the design of multimedia presentations that complement and expand those requirements.
Methods of teaching: 30 hours lectures, 30 independent works in lab. Approximately 80 hours of personal study and exercise.
Grading System: • Presetation 1: 20 % • Presetation 2: 20 % • Presetation 3: 20 % • Tests (3) : 50%
Concretization tools/IT: Computer, projector, laboratory.
Ratio between theoretical and practical part: Ratio between the theoretical and practical part is 60:40
Literature:

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

Course title: Python

Teacher: From Industry
Course Status: Elective, Semester V, 4 ECTS

Course Description: Python is a general-purpose interpreted programming language in many fields, including web programming, writing, scientific processing, artificial intelligence, machine learning, and complex data analysis. It's a language with simple syntax and powerful libraries**.**
Course goal: Students attending this course will expand their knowledge in Python programming language during lectures and laboratory exercises. This course will describe the principles of programming in Python - including data types, data structure, application development, algorithm development, program design, and functions. The course also includes object-oriented programming as well as data processing and information processing techniques.
This course will be of great interest to all students who would like understanding of the basic components of computer programming using the Python language, as well as a very good start to applying this knowledge in other fields.
Expected Learning Outcomes:

- Understand the basic concepts of working with Python and the support system for this language
- Understand and use the syntax programming language
- Understand data types, processing and working with them
- Develop functions and call them
- Know and use the programing language libraries
- Develop object-oriented programming
- Understand the programming elements with Python
- Develop applications for data analysis and data processing in various fields
- Enable the student to start her/his own studies, and to open a path to the developer's career

Teaching Methods: Lectures, exercises during class using laptops and supported applications, individual and group homework.
Assessment Methods:

- Student Attendance 20%
- Individual and group assignments completed at home 40%
- Two tests 20% + 20%
- Final exam 60%
- Total 100%.

Tools / IT: Computer, projector, table, and lab equipped with other equipment according to projects and tasks.
The ratio between the theoretical and practical part of the study: The ratio between the theoretical and practical part is 1: 3.
Literature

- Kenneth A. Lambert, Fundamentals of Python: First Programs 1st Edition, Publisher: Course Technology, Cengage Learning, ISBN-13: 978-1-111-82270-5
- Charles Severance, Python for Everybody: Exploring Data Using Python 3, 2016
- Allen Downey, Think Python, O'Reilly, 2015

Course: Application Development for Android and IOS

Lecturer: From Industry
Course status: Elective, semester V, 4 ECTS

Course content: Mobile device architecture, Characteristics of mobile applications, History of mobile application frameworks, Overview of mobile application development languages: Objective-C and Java. Application models of mobile application frameworks, User-interface design and app distribution, Client Hardware (Desktop vs. Mobile), Android Development w/ Java, iOS Development w/ Swift; RESTful and Non-RESTful applications, Managing application data. Integrating with cloud services. Integrating networking, the OS and hardware into mobile-applications. Addressing enterprise requirements in mobile applications: performance, scalability, availability, and security. Mobile sensors, Security and Trust Management, Privacy and Ethics, Usability and Accessibility.

Course objectives: This course focuses on the creation of mobile applications for various modern platforms, including major mobile operating systems. Understand the mobile device architecture, different programming languages used for application development, user interface design, and application distribution

Learning outcomes: After successful completion of the course, students should be able to:

- Demonstrate knowledge of the technology and business trends impacting mobile applications
- Demonstrate programming skills with Java & Swift
- Be competent with the characterization and architecture of mobile applications.
- Be competent with designing and developing mobile applications using one application development framework.

Teaching methodology: Classroom lectures, Laboratory exercises where the students will be involved actively and team-based projects.
Evaluation methods and criteria: Android Mini App 11%, iOS mini app 11%, Project Proposal 3%, Final course project 25% , Midterm Exam %20 , Final Exam 20% , Class Activities and Participation 10 % , Total: 100%
Concretization tools/ IT: Computer, projector and different apps for lectures. Android phone and Apple iOS phone for students to check out for development issues.
Ratio between theoretical and practical part: Ratio between practical and theoretical part 50%/50%

Literature:

- Simon Ng, Beginning iOS 10 Programming with Swift. AppCoda
- Android Cookbook Problems and Solutions for Android Developers 2nd Edition

Course: Computer Games Development

Lecturer: From Industry
Course status: Elective, Semester V, 4 ECTS

Course content: A Brief History of Video Games, Games and Society, Terms and principles of Game Design and development, Structure and duties of development Teams and Processes, Programming and scripting languages to develop particular games, Animation production and creation tools. Debugging Games, Game Architecture, Memory and I/O Systems, Mathematical Concepts needed for Game development, Physics needed to design computer games, Collision Detection and Resolution, Graphics, Artificial Intelligence developing computer games, Networks and Multiplayer Mode issues involved in games development.
Course objectives: Introduce the fundamentals of programming 3D games in existing game engines. Gain familiarity with the API library of a chosen game, and appreciation of the technology and the algorithms that form these games.
Learning outcomes: After successful completion of the course, students should be able to:

- Illustrate an understanding of the concepts behind game programming techniques.
- Implement game programming techniques to solve game development tasks.
- Build familiarity and appreciation of the programmatic components of an industry standard game development engine.
- Understand mathematical analysis, physical analysis, graphics, multimedia and how they incorporate in game development.

Teaching methodology: Lectures for theoretical aspects as well as practical coding examples, In the labs, review learning from the previous weeks by discussing solutions and reasoning with classmates.
Evaluation methods and criteria: Programming excercises 10%, Exams 30% , Game Demo 20% and Game final demonstration 40%, Total: 100%.
Concretization tools/ IT: Computer, projector and different apps for lectures. Multimedia Laboratory for game design and development.
Ratio between theoretical and practical part: Ratio between practical and theoretical part 60%/40%

Literature:

- Rabin, S. (2010). Introduction to Game Development, 2nd ed. Boston, MA: Charles River Media.
- Unity in Action, Second Edition :Multiplatform game development in C#
- C# Cookbook, 2nd Edition (O'Reilly)

Course: Matlab Practicum

Lecturer: Prof. Asoc. Dr. Bujar Krasniqi, Prof. Ass. Dr. Zana Limani
Course status: Elective, Semester V, 4 ECTS

Course content: This course describes the basics of programming in Matlab. At the beginning student learn vectors, matrix and graphical representation of functions. The next part focuses on saving the data in files, function definition, use of Simulink and toolboxes.

Course objectives: The purpose of this course is that the student during lectures and laboratory exercises expand and deepen their knowledge to apply Matlab programming language ICT problem solving and analysis.
Learning outcomes: Upon completion of this course the student will be able to:

- distinguish the use of vectors and matrix in Matlab
- formulate function and loops
- demonstrate appropriate knowledge for data visualization by graphical representation
- implement examples from communication systems using simulink and Toolbox-es
- solve ICT problems using Matlab software

Teaching methodology: Lectures, Discussion, Laboratory work.
Evaluation methods: The successful practical work: 70%, First intermediate evaluation; 10%, Second intermediate evaluation:10%, Regular attendance and involvement in discussions 10%, Total: 100 % .
Concretization tools/IT: Computer, projector, laboratory equipped for ICT
Ratio between theoretical and practical part: Ratio between the theoretical and practical part is 25:75

Literature:

- S. Chapra (2019): Essential MATLAB for Engineers and Scientists, 7th Edition, Publishing House "Elsevier", USA.
- O. Ibe (2017): Applied Numerical Methods with MATLAB for Engineers and Scientists, 4th Edition, Publishing House Mc Graw Hill, USA

Course title: Practicum in LabVIEW

Lecturers: Prof.Ass. Dr. Hena Maloku
Course status: Elective, Semester V, 4 ECTS

Course description: this course is designed to provide the students with fundamental knowledge for LabVIEW software. This course also provide others activities and examples in order to demostrate the students the techniques for identifying other information resources about LabVIEW
Course goal: the aim of this course is to teach the students the main concepts of labview software. The goal of this course is also to provide the students with knowledge of techniques of conecting measurement devices with PC, data analysis etc. SCADA systems programming and programmable logic controller communication are also the focus of this course.
Learning outcomes After successful completion of the course, students should be able to:

- Write LabVIEW scripts called Vis;
- Use different techniques for problem solving;
- Formulate and store Vis in order to be used as subclasses;
- Store the data in a file and display them in a graph;
- Develop applications that use GPIB (General Purpose Interface Bus) or plug-in DAQ boards;
- Optimize the speed and performance of LabVIEW programms;
- Use advanced techniques in LabVIEW;
- Control the created programms and publish them in internet using LabVIEW commands

Teaching methodology: Lectures, discussions, practical work, seminars
Evaluation methods and criteria: practical work: 40%, first mid-term exam 20%, attendance 10%, final exam 30%.

Concretization tools/ IT: Computer, projector, laboratory, white board.
Ratio between theoretical and practical part: Ratio between practical and theoretical part 50/50%.

Literature:

- Labview for everyone. J. Travis, J. Kring, 2007. Pentince Hall
- Labview Programming, Data Acquisition and Analysis. J. Beyon, 2001. Prentice Hall
- Labview Graphical Programming. G. Johnson, R. Jennings, 2006. McGraw Hill

Course title: Microwave and RF Engineering
Lecturer: Prof. Dr. Enver Hamiti
Course status: Mandatory, Semester VI, 4 ECTS

Course content: Basic features of radio communication systems. Transmission lines. Smith charts and scattering parameters. CAD tools - Microwave Office, Ansoft, Python. 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.

The goal: Present principles of operation and analysis methods for microwave, 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.
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%, Projects (homework) 30 %, Final Exam 60 % (Course to minor changes).
Concretization tools: Compjuter, video projector, and equiped lab with neccessary devices to ilustrate all teaching material.

Literature:

- David M. Pozar "**Microwave Engineering** ", Copyright, 2012, John Wiley & Sons Inc.
- D. M. Pozar, **Microwave and RF Design of Wireless Systems,** John Wiley & Sons, 2001
- Kai Chang, **Radio Frequency Circuit Design**, John Wiley & Sons, 2001
- E. Hamiti, **Qarqet komunikuese analoge**, ligjërata të autorizuara, Prishtinë 2009

Course title: Mobile communications

Lecturer:

Course status: Mandatory, Semster VI, 4 ECTS

Course description: *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.

Course 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.

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 %

Concretization tools: Compjuter, video projector, white board.

Literature:

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

Course title: Distributed programming

Lecturer: Prof. Ass. Dr. Dhuratë Hyseni
Course status: Mandatory, Semester VI, 4 ECTS

Course goal: The aim of this the course is to enable and prepared students to understand and apply distributed system techniques.
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.

Methods of teaching: 45 hours of lectures + 30 hours of laboratory exercises. Approximately 90 hours of personal study and exercise including homework.
Grading System:
Attendance 10%, Practical project 30 %, Final Exam 60 %

Literature:

- George Coulouris, Jean Dollimore, Tim Kindberg, Peter Baer Galvin dhe Greg Gagne, "Distributed Systems – Concepts and Design", 5th Edition, 2012.
- Andrew S. Tanenbaum, "Distributed Systems – Concepts and Paradigms", 2rd Edition, 2007.
- Manish Varshnev and Shanoo Agarwal, "Concepts of distributed system", 2016

Course: Communication Networks II

Lecturer: Prof. Dr. Mimoza Ibrani, Prof. Ass. Dr. Zana Limani
Course status: Mandatory, Semester VI, 4 ECTS

Course content: Networking Types, Routing and Switching, Comparative analysis OSI and TCP/IP Reference Model, Ethernet Technologies and Cabling, MAC layers of Ethernet and 802.11 wireless networks, Management of Ethernet LANs, WLAN networks, Address Resolution Protocol (ARP), Virtual LANs, Collision Domains, Broadcast networks, Trunk Ports, Encapsulation dot1Q, Link-Layer Addressing, The Internet Protocol, IP Addressing and Subnets, Private and Public IP addresses, Subnetting Variable Length Subnet Masks (VLSM), Static, Default and Dynamic Routing, Forwarding and Addressing in the Internet, Intra-Domain Routing, Distance Vector and Link State, Open Shortest Path Protocol (OSPF) and Routing Information Protocol (RIP), Routing Table algorithms, Multi-Area OSPF, RIPv2, Inter-Domain Routing, Autonomous Systems, Hierarchical routing architecture used in the internet, Border Gateway Protocol (BGP), Label Distribution Protocol (LDP), Virtual Private Network (VPN), Multi-Protocol Label Switching (MPLS) and Link Virtualization.
Course objectives: Gain practical knowledge of computer networking issues through hands-on experiments and simulations with network equipment and services. The course starts with lectures/labs at the physical layer and continues up the protocol stack to the application layer.
Learning outcomes After successful completion of the course, students should be able to:

- Design and implement an IPv4 address plan over a multi-LAN environment.
- Configure an Access Point (AP) to implement a wireless LAN.
- Manage an Ethernet switch and configure virtual LANs spanning multiple switches
- Configure Inter-VLAN routing with encapsulation dot1Q.
- Demonstrate clear understanding and configuring of interior IP routing protocols, namely RIP and OSPF, as well as the shortest path algorithms adopted by them, i.e. distance vector and link state.
- Explain how routing between different Autonomous Systems works.

Teaching methodology: Few lectures for theoretical aspects, laboratory exercises through hands-on experiments and simulations with network equipment and services. This is lab oriented hands-on course.

Evaluation methods and criteria: Evaluation of practical/laboratory exercises 50%, Mid-term evaluation 20%, Final evaluation 30%, Total: 100 %.
Concretization tools/ IT: Computer, projector and different apps for lectures. Computer communication lab for laboratory exercises.
Ratio between theoretical and practical part: Ratio between practical and theoretical part 70%/30%
Literature:

- *Computer Networking: A Top-Down Approach (7th Edition)* by James Kurose and Keith Ross (2016).
- CCNA Routing and Switching.
- Lab manual.

Course: Final project (Internship + presentation)

Lecturer: From the department

Course status: Mandatory, Semester VI, 10 ECTS

Course description: 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. The final project 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.

Course goal: The students gain professional experience, depending on the field of study, in one of the local companies, also the student has to demostrate 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 completion of this course the student will be able to:

- Be qualified for professional work, in the relevant field of study, and to be more prepared for the labor market.
- Gain confidence in gained knowledge
- Have theability tofurther studies o fmandatory oradditional literature
- Consult with mentor with questions well prepared and structured;
- Present their work in written form, withastandard languageand guidelines for this typeof work, witha volume ofat least 30 sheetsof A4 format
- Presentthe work in time of ten minutes with presentation prepared in PowerPoint

Teaching methodology: 120 working hours in the company, 150 hours for preparation of the final project and 30 working hours for preparation of the final presantationt.

Evaluation methods: Writing presantation 40%, Oral presantation: 60%.

Ratio between theoretical and practical part: Ratio between the theoretical and practical part is 50:50

Literature :

- It is depended from the final project, will be provided from the mentor.

Course: Optical Communications

Lecturer: Prof. Asoc. Dr. Bujar Krasniqi
Course status: Elective, Semester VI, 4 ECTS

Course content: This course describes the basics of optical spectrum and light characteristics as electromagnetic wave. The focus of the course is in the optical communication network for different configurations, for local optical networks and wide networks. Also, in this course student practice optical measurements for definition of wavelength and losses in optical fibers (multi-mode, single-mode, polarization and chromatic dispersion).
Course objectives: The course is designed to offer basic knowledge for optical network and its components. The purpose of this course is that the student during lectures and laboratory exercises expand and deepen their knowledge for optical signal transmission over optical fibers. Moreover, student distinguish sources of light, receivers and other basic elements for an optical communication link.
Learning outcomes: Upon completion of this course the student will be able to:

- understand basic principles of optical commmuication systems as transmission characteristics, modulation, multiplexing and switching
- sketch optical communication links for diverse capacities as GPON, EPON, HFC and FTTH
- organize measurment campains in existing optical networks and identify faults in the network
- demonstrate necessary knowledge for optical communication systems as a precondition for beeing incorporated in optical network industry

Teaching methodology: Lectures, Discussion, Laboratory work.
Evaluation methods: The successful practical work: 40%, First intermediate evaluation; 25%, Second intermediate evaluation:25%, Regular attendance and involvement in discussions 10%, Total: 100 % .
Concretization tools/IT: Computer, projector, laboratory equipped for ICT
Ratio between theoretical and practical part: Ratio between the theoretical and practical part is 50:50

Literature:

- John M. Senior. (2009): Optical Fiber Communications: Principles and Practice. Third Edition, Publishing House: Prentice Hall, London.
- R.Ramaswami, K.Sivarajan, G. Sasaki: (2010) Optical Networks: Apractical Perspective 3rd Edition, Publishing House: Elsevier, USA
- Keigo Iizuka. (2002): Elements of Photonics, Publishing House:Wiley, USA
- Bostjan Batagelj. (2017): OPTIČNE KOMUNIKACIJE Laboratorijske vaje, Ljubljana.

Course: Bioelectromagnetics

Lecturer: Prof. Dr. Mimoza Ibrani
Course status: Elective, Semester VI, 4 ECTS

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.

Course objectives: To provide students with basic information on interaction between electromagnetic fields and humans

Learning outcomes: After successful completion of the course, students should be able to:

- Explain background, definition and fundamentals of Bioelectromagnetics;
- Describe mechanisms and parameters that quantify interaction between humans and electromagnetic fields;
- Compare different human exposure scenarios through case –studies;
- Assess compliance of human exposure with general safety standards and guidelines;
- Demonstrate knowledge of measurement of field strength techniques and protocols

Teaching methodology: Lectures for theoretical aspects, laboratory exercises and project teamwork for case-studies
Evaluation methods and criteria: Mid-term evaluation 30%, Final evaluation 30%, project based work 40 %, Total: 100 %
Concretization tools/ IT: Computer, projector and different applets and software demonstration for lectures. Applied electromagnetics lab for laboratory exercises.
Ratio between theoretical and practical part: Ratio between practical and theoretical part 50%/50%

Literature:

1. Furse, C., Christensen, D. A., & Durney, C. H. (2009). *Basic introduction to bioelectromagnetics*. CRC press.
2. Habash, R. W. (2001). *Electromagnetic fields and radiation: human bioeffects and safety*. CRC Press.
3. Luan Ahma, Mimoza Ibrani "*Hyrje në bioelektromagnetikë*", dispencë, UP, 2010

Course title: Communication Protocols

Lecturer: From Industry

Course status: Elective, Semester VI, 4 ECTS

Course description: *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.

Course 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.

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 %

Concretization tools/ IT: Computer, projector, laboratory and different software tools for lectures.

Ratio between theoretical and practical part: Ratio between practical and theoretical part 50/50%.

Literature:

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

Course: Animation and Virtual Reality (VR)

Lecturers: Prof. Ass. Dr. Hena Maloku,
Course status: Elective, Semester VI, 4 ECTS

Course description: This course focuses on Maxon's Cinema 4D, an intuitive 3D package that is becoming the standard for 3D Motion Graphics work. The class will include demonstrations on the fundamentals of Cinema 4D Lite and CINEWARE, a powerful bridge between After Effects and C4D. Tutorial topics will include: User Interface, Navigation, Modeling, Materials, Textures, Lighting, Camera Tracking, Rendering and Compositing.
The aim of the course is to teach students the principles and multidisciplinary features of virtual reality; to teach students technology for interactivity and multimodal perception of users in VR, in particular visual and audio interface and behavior; to teach VR technology for VR large-scale real-time environmental management; to provide students with an introduction to VR system and development tools.
Course goal: Students will acquire a 3D foundation skill set in Cinema 4D including basic knowledge of modeling, materials, textures, lighting, compositing, camera tracking and rendering.
This course primarily helps develop the skills to apply knowledge of computing and mathematics to solve complex computer science disciplines and the ability to use current techniques, skills and tools necessary for computerization practice with a sense of limitations.
Learning outcomes After successful completion of the course, students should be able to:

- Understand the animation process as: User Interface, Navigation, Modeling, Materials, Lighting, Visualization and Composition
- Understand real time VR technology
- Manage VR system development tools
- Create Motion Graphics animations, and illustrative 3D imagery inside of Cinema 4D Lite and After Effects

Teaching methodology: Lectures, discussion, practical work and presentations
Evaluation methods and criteria: Practical seminar: 40%, First mid-term exam; 20%, second mid-term exam: 20%, attendance: 10%, final exam: 30%,
Concretization tools/ IT: Computer, projector, laboratory and different software tools for lectures.
Ratio between theoretical and practical part: Ratio between practical and theoretical part 50/50%.

Literature:

- Lightning Fast Animation in Element 3D: Master the intricacies of Element 3D, the fast-rendering Adobe After Effects plugin. Ty Audronis, Packt Publishing, 2014. ISBN: 978-1-78355-938-1.
- Cinema 4D Apprentice: Real-World Skills for the Aspiring Motion Graphics Artist. K. McQuilkin, Routledge 2015, ISBN-10: 9781138018624. ISBN-13: 978-1138018624.
- Stop Motion: Craft Skills for Model Animation. S. Shaw, Routledge 2017, ISBN-10: 1138779318. ISBN-13: 978-1138779310.
- Echoes of other worlds : sound in virtual reality past, present and future. Garner, T. A, Palgrave Macmillan 2018. ISBN: 978-3-319-65708-0, 3319657089, 978-3-319-65707-3

- Augmented Reality and Virtual Reality: Empowering Human, Place and Business", T. Jung, M. Claudia tom Dieck, Springer 2018, ISBN: 978-3-319-64026-6, 978-3-319-64027-3
- Future Presence: How Virtual Reality Is Changing Human Connection, Intimacy, and the Limits of Ordinary Life", Peter Rubin, Harper One 2018. ISBN: 9780062566720
- G. Mather, "Foundations of Sensation and Perception" Psychology Press; 2nd Edition, 2009.