BSc Study program: **POWER SYSTEMS**

Overview of Courses in Study Program

1st year: Power Systems						
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: Power Systems						
3rd semester			Hours/week			
No	M/E	Course	L	NE	LE	ECTS
1.	M	Calculus 3 and probability	3	2	0	6
2.	M	Electrical materials	2	0	2	4
3.	M	Electrical measurements	3	0	2	5
4.	M	Fundamentals of Power engineering	3	2	0	6
5.	M	Electronics	3	0	1	5
6. *Select one of the following elective courses*						
	E	Fundamentals of automation	2	1	1	4
	E	Signals and Systems	2	1	1	4
	E	Object Oriented Programming	2	0	2	4
	E	Software application in Power engineering	2	0	2	4
4rth semester			Hours/week			
No	M/E	Course	L	NE	LE	ECTS
1.	M	Electrical machines and transformers	3	2	1	6
2.	M	Energy and environment	2	1	1	5
3.	M	Electric Power Plants	3	2	0	6
4.	M	Electromagnetic fields and waves	3	0	1	5
5.	M	Energy Management and Energy Efficiency	2	0	1	4
6. *Select one of the following non-technical electives (non-technical electives)*						
	E	Measurement instrumentation in Power	2	2	0	4
	E	Safety Technique and grounding systems in	2	0	2	4
	E	Data communication	2	0	2	4

3rd year: Power Systems						
5th semester			Hours/week			
No	M/E	Course	L	NE	LE	ECTS
1.	M	Electric power market	2	2	0	5
2.	M	Transmission and Distribution of electricity	2	2	1	5
3.	M	Power system facilities	2	1	1	4
4.	M	Electric instalation and low voltage network	3	2	1	6
5.	M	Renewable energy sources	2	0	1	5
6. *Select one of the following elective courses*						
	E	Solar energy and photovoltaic systems	2	0	1	5
	E	Power electronics	2	1	1	5
	E	Special electrical machines	2	0	1	5
	E	Power networks	2	0	1	5
6th semester			Hours/week			
No	M/E	Course	L	NE	LE	ECTS
1.	M	Electric drives	3	2	1	6
2.	M	Power system protection	2	1	1	5
3.	M	Internship				6
4.	M	Diploma Thesis				6
5. *Select one of the following technical electives (technical electives)*						
	E	Power quality in power systems	2	0	1	4
	E	Wind energy	2	0	1	4
	E	Fundamentals of Smart grids	2	1	1	4
6. *Select one of the following non-technical electives (non-technical electives)*						
	E	Economic assessment of investments	2	1	0	3
	E	Project management and ethics in engineering	2	1	0	3
	E	Entrepreneurship	2	1	0	3

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.
- In the first year of study all subjects are common for all study programs in FECE.
- After electing the elective subject, it becomes a Mandatory subject, the student will not be able to change the subject or the professor.

In semester VI the student must complete the Internship (Professional Practice) with 6 ECTS and the Diploma Thesis with 6 ECTS. A total of 180 ECTS.

Comparability of the proposed program with programs of other universities

When designing the study program BSc in Power systems we are based on the study program of these Universities:

1. "Ss. Cyriland Methodius" University in Skopje: Faculty of electrical engineering and information technologies (65% comparability),
2. University of Zagreb, FER - Faculty of Electrical Engineering and Computing (25% comparability)
3. University of Ljubljana, Faculty of Electrical Engineering (10% comparability),

(Applies to all three cases: our subject names have been adapted to Kosovo's market requirements).

links:

1. https://feit.ukim.edu.mk/en/, Studies - Undergraduate studies, Power Systems: https://feit.ukim.edu.mk/en/power-systems/; Power Engineering, Automation and Renewable Energy Sources: https://feit.ukim.edu.mk/en/power-engineering-automation-and-renewable-energy-sources/.
2. https://www.fer.unizg.hr/en/studies/bachelor/eit, Electrical Engineering and Information Technology, https://www.fer.unizg.hr/issn/1848-3569
3. https://fe.uni-lj.si/en/, Electrical Engineering: https://fe.uni-lj.si/en/education/1st_cycle_academic_study_programme/electrical_engineering/presentation/

   Power Engineering and mechatronics.

Short course descriptions

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

Short course description: 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

Short course description: 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

Short Course description: 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

Course content: 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

Course content: 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

Short course description: 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

Short course description: 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

Short Course description: 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, http://www.agnidika.net/programimiobjekte.pdf
- D. S. Malik, C++ Programming: Program Design Including, Data Structures, Course Technology, Thomson Leraning, Boston, Massachusetts
- 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

Short course description: 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. Shqipe Lohaj
Course Status: Mandatory, Semester III, 6 ECTS

Course description: Basic Concepts of numerical, polynomial, functional Series and Fourie Series. Double, triple, line and surface integrals. Part of vector analysis, gradient, tangent plane, divergence and rotor. And finally probability, random variables and distribution functions.

Course objectives

Students should be trained so that the knowledge gained through this course can be applied as an auxiliary equipment in electrical engineering studies.

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

- solve and formulate various professional problems related to: double, triple, line and surface integrals, vector functions in space, scalar and vector spaces and Furie series;
- describe and solve problems related to mechanics and the theory of electrical circuits. With acquired knowledge the student will be able to do mathematical models related to concrete professional problems;
- Research different electrical occurrences and transform problems from one field to another field to facilitate their solution and interpretation.

Methodology of teaching: Lectures, discussions, exercises, consultations, homework, mid term 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 III, Prishtinë 2008.
- Hamiti E. - Matematika IV, Prishtinë 2008.
- Hamiti E, Lohaj SH.-Përmbledhje detyrash të zgjidhura nga Matematika III, Prishtinë 2008.
- Hamiti E, Lohaj SH.-Përmbledhje detyrash të zgjidhura nga Matematika IV, Prishtinë 2008.

Course: Electrical Materials

Lecturer: Prof. Ass. Dr. Bahri Prebreza
Course status: Mandatory, Semester III, 4 ECTS

Short course description: This course describes the basic knowledge of electrical materials. Electrical and thermal conductivity of the materials. Periodical system of chemical elements. Zone theory and cristals. Conductors-simple model and macroscopic properties. Classification of conductive materials. Application of conductive materials. Semi-conductors, conductance processes and macroscopic properties. Elementary semi-conductors and compounds. Semi-conductors applications. Dielectrics and isolators. Energy losses. Dielectric strenght. Survey and classification of dielectric materials. Applications of dielectric materials. Magnetism, basic terminology. Magnetic hysterezis. Dia- para- and ferromagnetism. Classification on soft and hard magnetic materials, properties and applications. Materials superconductive characteristics-simple model and macroscopic properties. Application of superconductors. Materials optical properties and applications of optoelectronic materials. Special technologies in electrical engineering.

Couse objectives: The course objective for students is to gain insight into the fundamental features of materials used in electrical engineering and to know the dependence of their features on the influences of different forms of external fields.

Learning outcomes: After completion of this course the student will gain and increase:

- knowledge on the microstructure of materials;
- knowledge on the fundamental properties of conductive, semiconductor, dielectric and magnetic materials and
- will be able to make qualitative selection of electro-technical materials, depending on the impacts of various external fields.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, colloquia, team work, preparation of seminars, final exam, etc.

Evaluation methodology: First evaluation 15%, Second Evaluation 15%, Third evaluation 15%, Attendance 5%, Assignments and seminars 10%, Final exam 40%, Total 100%.

Literature:

- W.D. Callister Jr. ”Materials Science and Engineering, An introduction”, John Wiley & Sons Inc. USA, 2007,
- D.R. Askeland, P.P. Fulay, W.J. Wright: ”The Science and Engineering of materials”, USA, 2010,
- W.S.Wong, A.Salleo, Electronic Materials, Flexible Electronics-Materials and Applications, Springer Science+Business Media, New York, 2009,
- A.Abazi and J. Krasniqi: ”Materialet elektroteknike”, Prishtinë, 1997.

Course: Electrical measurements

Lecturer: Prof. Ass. Dr. Bahri Prebreza
Course status: Mandatory, Semester III, 5 ECTS

Short course description: Measuring units and measurement errors. Use of resistance combinations for use in measuring metering schemes such as: voltage divider - potentiometers, current dividers, compenzators and metering bridges. Thermocouples, thermistors and resistant temperature Sensors and mechanical stress sensors. The use of sensors: capacitive, inductive and magnetic for the measurement of different physical and electrical quantities. Methods and instruments for measuring electrical quantities: direct and alternating voltage, direct and alternating current, resistance, impedance and reactance; power and energy in the direct current circuit as well as alternative - one-phase and three-phase. Instrument ethalones. Measurement transformers. Methods and instruments for measuring magnetic quantities (flux, induction, magnetic field strength and iron losses).

Couse objectives: The aim of the course is to provide knowledge about measurement methods and techniques applied in measuring electrical quantities as well as the principles of operation and application of measuring instruments.

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

- use the instruments and methods for measuring electrical quantities, nonelectric quantities and magnetic sizes.
- realize these measurements scientifically and professionally, also considering the uncertainty of the measurement result.
- specifies the band of metered sizes to cover the requirements in industry and manufacturing as well as in scientific research.
- gain knowledge of sensors, amplifiers, and converter of quantities.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, colloquia, team work, preparation of seminars, final exam, etc.

Evaluation methodology: First evaluation 15%, Second Evaluation 15%, Third evaluation 15%, Attendance 5%, Assignments and seminars 10%, Final exam 40%, Total 100%.

Literature:

- A. Gashi, Matjet elektrike, Lectures, Prishtinë, 2016.
- P. Regtien, F. van der Heijden, M. Korsten, W. Otthius, ”Measurement Science for Engineers”, Elsevier Science & Technology Books, 2004.
- M. Sedláček, V. Haasz, ”Electrical Measurements and Instrumentation”, Prague 2000.

Course: Fundamentals of Power engineering
Lecturer: Prof. Ass. Dr. Arben Gjukaj
Course status: Mandatory, Semester III, 6 ECTS

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

Learning outcomes: On successful completion of the course, students will be able to:
1. explain physical background of energy processes in electric power plants
2. describe direct and indirect energy transformation in electrical energy and useful energy forms
3. analyze open, closed, reversible and irreversible systems and processes
4. calculate efficiency, exergy, ideal and real work output of energy processes
5. analyze basic parameters of energy processes in thermal (fossile, geothermal, nuclear, solar) and hydro power plants
6. analyze basic parameters of energy processes in solar and wind power plants
7. explain three phase system in transmission and distribution system
8. select power plants operation order based on electric power system demands
9. describe environmental impact during energy generation, conversion and usage.

Course content: Importance of energy, energy supply, energy conversion constraints. Energy forms and sources, classification of energy forms. Renewable and non-renewable energy sources. Transformations of primary energy forms into more usable forms and transformation of electrical energy into other forms of energy. Engineering thermodynamics and power cycles. Fossil fuel, nuclear fuel, solar thermal and geothermal energy. Use of hydro and wind energy. Photovoltaics, fuel cells and other direct energy conversions. Electrical energy and power system: generation, transmission, distribution and usage. Planning of electrical energy consumption. Energy efficiency and electrical energy storage. Environmental impact during generation, transformation and consumption of energy (environmental pollution and climate change). Sustainable development and energy.
Methods of teaching: Lectures, exercises during class, individual homework
Grading System:
Attendance 5%; Individual project performed at home 10%; Assessment by tests 40%;Final exam 45%. Total 100%.

Literature:

- George G. Karady & Keith Holbert, Electrical Energy Conversion and Transport, John Wiley,2005.
- Isaak D Mayergoyz (University of Maryland, USA) and Patrick McAvoy (University of Maryland, USA), Fundamentals of Electric Power Engineering,
- Gani Latifi, “Shndërrimi i energjisë elektrike”, Prishtinë 1997

Course title: Electronics

Lecturer: Prof.Asoc.Dr. Qamil Kabashi

Course status: Mandatory, Semester III, 5 ECTS

Course description: 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 prepares 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 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:

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

Course title: Fundamentals of Automation

Lecturer: Prof. Ass. Dr. Drilon Bunjaku

Course status: Elective, Semester III, 4 ECTS

Course description: Introduction. History of automatic control. Basic concepts and definitions. System, experiment, model, simulation, identification. Demo of the experimental platform QET. Principles of automatic control. Systems classifications. Feedback. Steps for designing an automatic control system. Mathematical modeling, analogies, elements for modeling. Model/system types. Modeling examples. Linearization. System order. Systems of order 0, 1 and 2. Concept of states. State equations. Physical state variables. Solving differential equations. Standard input signals. Response and specifications in the time domain. Stability. Solving state equations. Discrete state equations. Laplace transform. Frequency domain. Poles and zeros. Solving differential equations and state equations with Laplace. Systems representations. Block diagrams and signal flow graphs. Frequency domain analysis. Frequency characteristics. Polar diagrams. Nyquist's diagram. Stability. Bode diagrams. System features and stability. Characteristics of the control system. Algebraic criteria for stability. Types of systems (astatism). Steady state errors. Controllers and impact on system behavior. Controllers time and frequency characteristics. Advanced control methods. Digital control. Neural and fuzzy control.

Course objectives: Familiarity with concepts of automatic control. Familiarity with the structure of automatic control system. Familiarity with mathematical methods for systems modeling. Familiarity with time and frequency domain analysis methods. Familiarity with the basic ways to influence the behavior of the system. Basic knowledge of advanced automatic control methods.

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

- be familiar with the concept of automatic control and standard control structures;
- assess the relevance of feedback concept and its impact on the process control;
- find mathematical model of the system and corresponding block diagrams;
- perform analysis on the properties of the system in the time and frequency domain;
- make measurements and draw conclusions about the system from experimental recordings.

Teaching methodology: Combined lectures with simulations and demonstrations, discussions, numerical exercises, laboratory exercises.

Assessment: Laboratory exercises, 10%, Intermediary evaluations 20% + 20%, Final exam 50%.

Concretization tools/TI: Computer, projector, simulator, experimental plants.

Ratio between the theoretical and practical part: 40:60

Literature:

- Farid Golnaraghi and Benjamin C. Kuo, *Automatic Control Systems*, Tenth Edition, McGraw-Hill Education, 2017
- Constantine H. Houpis, Stuart N. Sheldon, *ALinear Control System Analysis and Design with MATLAB*, Sixth Edition, CRC Press, 2014
- John J. D'Azzo, Constantine H. Houpis and Stuart N. Sheldon, *Linear Control System Analysis and Design: Fifth Edition, Revised and Expanded*, Marcel Dekker, 2003

Course title: Signals and Systems

Lecturer: Prof. Ass. Dr. Vjosa Shatri

Course status: Elective, Semester III, 4 ECTS

Course description: Introduction to basic theoretical concepts of signal and systems. Impulse response and convolution. Differential and difference equations. Fourier series and signal decomposition in harmonic components. Fourier transformation, spectrum of continuous signal and its properties. Amplitude modulation and sampling. System analysis in the frequency domain. Ideal filters. Demodulation and reconstruction of sampled signals. Fourier analysis of signals and systems in discrete time. Laplace transformation and its applications in the analysis of signals and systems. z-transform, properties, transfer function, stability and analysis in z domain.

Course objectives: The objectives of the course are to introduce students to the basic concepts of signals, system modeling, and system classification; to develop students' understanding of time-domain and frequency domain approaches to the analysis of continuous and discrete systems; to provide students with necessary tools and techniques to analyze systems; and to develop students' ability to apply modern simulation software to system analysis.

Learning outcomes: After finishing the course:

- Student will learn properties of signals and systems and the ways how to represent them in time and frequency domain.
- Student will be familiar with fundamental methods of signal and system analysis, in time and transform domain, through problem solving and performing corresponding simulations.

Teaching methodology: Combined lectures with simulations and demonstrations, discussions, numerical exercises, laboratory exercises.

Evaluation methods: Laboratory exercises 10%, Intermediary evaluations 25%+25%, Final exam 40 %

Concretization tools: Computer, projector, simulator, experimental plants.

Ratio between the theoretical and practical part: 50:50

Literature:

- Hwei P. Hsu, *Schaum's Outline of Theory and Problems of Signals and Systems*, Second Edition, McGraw-Hill, 2010
- Bonnie S. Heck, Edward W. Kamen, *Fundamentals of signals and systems using the Web and MATLAB*, Third Edition, Pearson Education Limited, 2014
- B.P. Lathi, Principles of Linear Systems and Signals, Second Edition, Oxford University Press, 2009

Course title: Object Oriented Programming

Lecturer: Prof. Dr. Isak Shabani
Course status: Elective, Semester III, 4 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:

10. Understand main concepts of object oriented programming;
11. To write code with classes and use objects;
12. To use inheritance and polymorphism;
13. To be able to predict exceptions and error handling;
14. To be able to create abstract classes and interfaces;
15. 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: 30 hours of lectures + 30 hours of laboratory exercises. Approximately 65 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: Software Application in Power Engineering

Lecturer: Prof. Ass. Dr. Vezir Rexhepi
Course status: Elective, Semester III, 4 ECTS

Course description: Introduction to MATLAB - SIMULINK, the importance of the simulink package, its use in circuit analysis and power systems Modeling of elementary and differential equations in Simulink, M-file writing, script file, etc. Use of the general simulink library. Tools, simulation packages. Utilization of mathematical library, mathematical models and packages and their use for simulations and analysis. Introduction to SimPowerSystem, package and library utilization for simulations and related results. Analysis of electrical circuits in different components. Application of packages and models for simulation Introduction to the phase simulation method, application of the library package for simulations and utilization of their tools. Introduction to power electronics, electronics components, their application and various circuits. Introduction to the analysis of power systems, analysis of the simulation of their components, utilization tools for achieving results, use of the SIMULINK software package Analysis of short circuits in various components of cars and power systems Simulation of asynchronous machines, their parameters, and short-circuits. Simulation of synchronous machines, their parameters, network connection, short circuits Simulation of power transformers, simulation of their components and various short circuits, as well as their losses Simulation of transmission and distribution lines in Power system Simulation of different sources of renewable energy, their parameters, impact in power system during connection.

Course objective: The purpose of the course is for students to gain basic knowledge of applying Matlab-Simulink software in modelling and analysis of Power Systems components.
Learning outcomes: Know the nature of the Matlab-Simulink program, its structure, and how it is used. Know how to structure and present simulation results graphically so that it can analyze, and validate, mathematical models of various electromagnetic devices and processes. To parameterize in Simulink and analyze electrical circuits, linear and nonlinear inductances, power lines and cables, transformers, DC machines, synchronous and asynchronous machines and power electronics. Have basic knowledge of modeling and be able to analyze different processes in Power Systems, such as: Analysis of power flow, short circuits in power system. Renewable energy analysis.

Teaching methodology: Lectures, discussions, exercises, quizzes, consultations, homework, mid term exams, final exams.

Evaluation methods: Seminar 20%, Attendance 5%, Quizzes 5%, First and second exams 30%, Final Exam 40 %, Total 100%.

Literature:

- Steven Carris, Circuit Analysis I with Matlab Simulink. Orchard Publication 2009
- Carris, Circuit Analysis II with Matlab Simulink. Orchard Publication 2009.
- Steven Carris, Circuit Analysis I with Matlab Simulink. Orchard Publication 2009.
- S. Sumathi, L. Ashok Kumar, P. Surekha ,Solar PV and Wind Energy Conversion Systems, Springer, 2015

Course title: Electrical Machines and Transformers

Lecturer: Prof.Ass. Dr. Vezir Rexhepi
Course status: Mandatory, Semester IV, 6 ECTS

Course description: Electromechanical conversion of energy, Basic laws and basic principles on which the theory of electric machines and transformers is based. Basic principles of induction, asynchronous and synchronous machines, induction of rotating fields. Construction, working principle and operation of DC generators and motors. Speed control of DC motors. Construction of winding of electrical machines, their connection. Operation of asynchronous machines in different modes. Asynchronous motor tests in different operating modes. Methods of starting and controlling inductive machines. Working principle, aspects of operating synchronous machines in different operating modes. Models of electrical machines circuits, generalizations. Synchronization of synchronous generators and their parallel operation. Controlling the speed and operation of synchronous motors and the efficiency of electric machines. Construction and types of transformers, electromagnetic processes in transformers. Basic parameters and equations of transformers, their ideal and real work. Single-phase, three-phase transformers, and their operation. Operating conditions of transformers and their parallel operation. Autotransformers, their construction and operation.

Course objective: The purpose of this course is to give general knowledge on: working principles of electric machines (inductive, DC, synchronous) and transformers. The principle of their work in different modes of work. Parallel work of synchronous mains. Control electrical machines speed. The working principle of transformers and autotransformers and their parallel operation. Electrical machines operating efficiency.

Learning outcomes: Upon completion of the course the student is able to: To know the working principle of electric machines and the processes that take place in them. To know the operating modes of inductive and synchronous machines and the parallel operation of synchronous generators. To know the specifics of stratification control of inductive and DC machines, as well as synchronous ones. To know the phenomena and aspects of efficiency of electrical machines. To know the aspects of operation and functioning of transformers and autotransformers and their parallel work. Transformers operating modes and efficiency during their operation.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, mid term exams, final exams.
Evaluation method: Seminar 10%, Attendance 5%, homework, quizzes 5%, Mid-term exams 30 %, Final Exam 50 %, Total 100%.
Literature:

- Electrical Machines, S.K. Sahdev, Cambridge University, Press 2018.
- Principles of Electric Machines and Power Electronics, P.C. Sen, Wiley, 2013.
- Electrical Machines, Drives and Power Systems, Theodore Wildi, sixth ed, London, 2014.
- Transformatorët, N. Avdiu, Prishtine 2009.

Course: Energy and Environment

Lecturer: Prof. Ass. Dr. Arben Gjukaj
Course status: Mandatory, Semester IV, 5 ECTS

Course content: This course describes the basics of Climate change, CO2 targets, the Rio and post Kyoto commitments. Natural resources, fossil fuels, reserves, use and sustainable development. The role of conventional and renewable energy. Energy markets, (local, regional and global). Essential information about related EU Directives. Case studies.
The basic ecological concepts, The components of the environment and legislation to protect the environment, Biodiversity, Environmental policy and climate change mitigation, Fundamentals of Environmental Economics and Policy, Environmental Impact Assessment, Air pollution and protection, Pollution by traffic, Land pollution and protection, Water pollution and protection, Waste and impact of landfills, Changes in the atmosphere and climate change, Greenhouse gases and global warming, Ozone layer depletion, Impact on the environment, International agreements to protect the environment, An integrated approach to environmental protection, Environmental Objectives, The subjects of environmental protection, Principles of Environmental Protection, The basic documents of Environmental Protection, Measures and environmental protection procedures, Economic instruments in environmental protection.
Course goal: The aim (goal) of this module is to provide the learner with the necessary knowledge, skill and competence in the broad area of energy and the environmental issues. It enables the student to evaluate the impact of energy in the environmental in technical, economic and political terms.
Learning outcomes: On successful completion of the course, students will be able to:

1. Explain what is ecology, and what environmental protection
2. Identify the fundamentals of environmental protection
3. Describe the elements of the environment (soil, water, air ...) and recognize
4. their protection measures
5. Explain global environmental change
6. Explain Climate Change
7. Explain the concept of sustainable development
8. Explain measures for mitigation and adoption to climate change
9. Demonstrate a general knowledge of the environmental effects of energy production.
10. Be familiar with principle of operations of the main energy types and energy transition

Methods of teaching: Lectures, discussions, exercises, consultations, homework, mid term exams, final exams.
Grading System: Seminar works 40%, A final examination 60%, Total 100%..
Literature:

- Climate Change and Renewable Energy , Martin J. Bush – Markham, ON, Canada, 2020
- Net Zero by 2050 – A Roadmap for the Global Energy Sector, (4th revision) by IEA. October 2021
- National Emission Reduction Plan, Kosovo – 2018

Course: Electric power plants

Lecturer: Prof. Ass. Dr. Bahri Prebreza
Course status: Mandatory, Semester IV, 6 ECTS

Short course description: Importance of energy and power supply, energy constraints. Energy sources, their classification and the need for energy. Renewable and non-renewable energy sources. Transformations of primary forms of energy into more usable forms and transformation of electricity into other forms of energy. Energy systems. Balance of energy. Environmental impact during transformation, generation and energy consumption. Sustainable development and energy. Basic characteristics of power plants: types, power capacities, power generation. Hydropower plants, coal power plants, nuclear power plants, wind and solar power plants. Main systems and equipment of power plants. Types of water, steam and gas turbines. Nuclear reactor as a source of heat. Heat balance diagrams and power generation cycles for different power plants. Other sources of electricity. Synchronous generators in power plants. Energy and Ecology.

Couse objectives: Gain knowledge about the various technologies of electricity production. Understanding the basic principles and characteristics of different types of power plants. Achieving the level of knowledge for use in any other study and for further education in the field of electrical engineering.

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

Develop an intuitive understanding of energy processes in the energy systems, with particular emphasis on physical explanations using thermodynamic methods, fluid mechanics and electrical engineering.

Analyze and calculate the basic parameters of energy processes in coal power plants, hydropower plants, nuclear power plants, solar power plants and wind power plants.

Calculate entropy changes for reversible and irreversible energy processes, calculate losses of exergy (maximum mechanical work),

Calculate the exergy, ideal, reversible and real work of energy processes; describe the direct transformation of energy into electricity (thermoelectric, thermoionic and photoelectric transformation, fuel cells and magnetohydrodynamic generators) and transformation of electricity into other (useful) energy forms.

Develop energy balance and anticipate increased electricity consumption. Describe the environmental impact of energy use, transformation and consumption (environmental pollution and climate change).

Combine independent learning, analytical skills and problem solving that need to be implemented in different career paths.

Describe the main power plants, explain the operation of main equipment in hydropower plants, explain the operation of key equipment in coal power plants, identify specific operational requirements for nuclear power plants, describe the performance characteristics of wind power plants and solar power plants.

Calculate the main parameters for different types of power plants.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, colloquia, team work, preparation of seminars, final exam, etc.

Evaluation methodology: First evaluation 15%, Second Evaluation 15%, Third evaluation 15%, Attendance 5%, Assignments and seminars 10%, Final exam 40%, Total 100%.

Literature:

- Allen J. Wood, Bruce F. Wollenberg, Gerald B. Sheblé, Power Generation, Operation and Control, John Wiley & Sons, 2013,
- A.J. Pansini, K.D. Smalling, Guide to Electric Power Generation, The Fairmont Press, Inc, 2005,
- G.J. Aubrecht ”Energy”, Pearson Prentice-Hall, 2006,
- M.M. El-Wakil, ”Power plant Technology”, McGraw Hill, 1984.

Course: Electromagnetic Fields and Waves

Lecturer: Prof. Dr. Mimoza Ibrani
Course status: Mandatory, Semester IV, 5 ECTS

Course description: Vector Analysis: Gradient, Divergence and Curl, Laplacian operator. Electrostatics: Maxwell's equations, Charge and current distributions, Gauss Law, Electrical scalar potential, Electrical properties of materials, Method of images, Electrostatic potential energy. Magnetostatics: Magnetic forces and torques, Maxwell's magnetostatic equations, Vector magnetic potential, Boundary conditions, Inductance, Magnetic energy. Maxwell's equation for time varying fields: Faraday Law, Displacement current, Retarded potentials. Electromagnetic Waves: Derivation of the wave equation, solution of wave equation for TEM case, plane wave concepts, wavelength, attenuation and phase constants, propagation of waves in lossless and lossy media. Transmission Lines: Derivation of transmission line parameters, attenuation and phase coefficients, characteristic impedance, SWR definition, lossless and lossy lines and matching techniques.

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

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

Apply vector calculus to analyze the behavior of static electric fields and magnetic fields in standard configurations;

Describe the parameters of quasistatic and time varying fields, guided and free space wave propagation and the underpinning role of Maxwell's equations.

Explain examples of the interaction between waves and media and to be able to relate these to engineering design considerations and function;

Illustrate and analyze transmission lines;

Practice calculation of electromagnetic filed to solution of practical problems.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, mid term exams, final exams.

Evaluation methods: Assignment 15%, Mid-term exam 35 %, Final Exam 50 %

Literature:

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

Course: Energy Management and Energy Efficiency Auditing

Lecturer: Prof. Ass. Dr. Bahri Prebreza
Course status: Mandatory, Semester IV, 4 ECTS

Short course description: Energy efficiency in power supply. Energy and pollution sources; Strategic approach to energy and environmental management; Basic principles of energy efficiency. The role of energy efficiency in energy policy, the underlying factors for the implementation of energy efficiency policy. Energy consumption measurements. Energy efficiency and energy management program. Energy management in industry in general and organization of energy efficiency program. Electricity systems. Energy management in buildings. Project management. Project planning for energy saving and company policies. Energy efficiency project in Kosovo and systematic energy management in cities. Technical and economic calculations. The role and methodology of energy efficiency audit. Realization of energy audit. Reporting the results of the energy audit. Measures to increase energy efficiency and examples of their implementation.

Couse objectives: The purpose of the course is for students to acquire the necessary theoretical and practical knowledge in the management and audit of energy efficiency. To anticipate and monitor the financial impact of changes in practice and investment in energy efficient technologies. This course includes information that will enable students to acquire knowledge, skills and competences to investigate, analyze and evaluate, develop and implement energy management strategies in different energy sectors. This enables students to understand the techniques to develop a professional role in energy management and energy efficiency auditing, in addition to financial assessments.

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

explain and apply the principles of energy management in the industry and the organization of the energy management program, the management of energy from production to the energy consumption in the world and in Kosovo, as well as the role of energy efficiency.

Assess the role and methodology of energy efficiency audits.

Analyze electricity consumption and electricity costs.

Recognize the most important energy systems in the industry.

Analyze energy consumption and energy efficiency in buildings.

Apply and use measuring instruments for measuring electrical and non-electrical quantities.

Apply the infrared thermography method to energy.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, colloquia, team work, preparation of seminars, final exam, etc.

Evaluation methods: First evaluation 15%, Second Evaluation 15%, Third evaluation 15%, Attendance 5%, Assignments and seminars 10%, Final exam 40%, Total 100%.

Literature:

- B.L. Capehart, W.C. Turner, W.J. Kennedy, ”Guide to Energy Management”, Sixth Edition, Fairmont, 2008.
- Thumann, W.J. Younger, T. Niehus, ”Handbook of Energy Audits”, Eighth Edition, CRC Press, 2009.
- Z. Morvay; D. Gvozdenac, ”Applied Industrial Energy and Environmental Management”, John Wiley & Sons Ltd, United Kingdom, 2008.

Course: Measurement instrumentation in power engineering

Lecturer: Prof. Ass. Dr. Arben Gjukaj
Course status: Elective, Semester IV, 4 ECTS

Course goal: The course objectives are for students to achieve basic theoretical and practical knowledge of dynamic characteristics and errors, alternative metering bridges, dividers and filters. Analog processing of the measured quantities and digital processing of the measured quantities.

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

1. Understand the roles of management system elements
2. Distinguish between nonlinear and linear elements
3. Understand the physical principles of action of the elements
4. Understand problems in automatic control systems
5. Define dynamic characteristics and errors.
6. Have knowledge about the use of dividers, bridges and passive alternating current filters.
7. Recognize the use of an operational amplifier for building schemes that are used for analog quantity processing.
8. Have knowledge of bistable circuits and flip-flops for digital quantity processing.
9. Have knowledge about converting A/D and D/A. For virtual instruments and metering systems

Course content: This course describes the characteristics and dynamic errors of instruments. Use of dividers, bridges and passive filters of alternative current. Operational amplifier and its use as amplifier and comparator for the implementation of various measurement schemes as well as the metering amplifier. The use of bistable circuits and flip-flops for the construction of counters, recorders and the implementation of the scheme to the display. Status machine - processor and memory. Analog and digital analog converters in analog and digital types used in instrumentation. Virtual Instruments. Introduction to Lab-View at the level for realization of basic metering schemes. High Distributed Control System (DCS) and SCADA (Supervisory Control and Data Acquisition).

Methods of teaching: Lectures, discussions, team work, preparation of seminars

Grading System:

First evaluation 15%, Second Evaluation 15%, Third evaluation 15%, Attendance 5%, Assignments and seminars 10%, Final exam 40%, Total 100%..

Literature:

- Reza Langari, Alan S. Morris ,"Measurement and Instrumentation Theory and Application ", by Elsevier Inc.- 2012
- John G. Webster, Halit Eren,"Measurement, Instrumentation, and Sensors Handbook", Second Edition CRC Press; 2014;
- A. Gashi, "Instrumentacioni matës", lectures, 2016

Course title: Safety Technique and grounding systems in power networks
Lecturer: Prof. Ass. Dr. Arben Gjukaj
Course status: Elective, Semester IV, 4 ECTS

Course content: General knowledge on safety technique. The action of current on the human body. First aid in case of electric shock. Propagation of electricity in the ground. Analysis of the risk of damage from electricity in various electrical networks. General safety measures in electrical installations. Protective earthing. Defensive nullification. CEI norms and the world in the field of technical insurance. Protection against the risk of high voltage switching on the lower voltage circuit. Defensive disconnection. Protective equipment in electricity and organization of high-risk installation Protection of man from the action of the electromagnetic field of industrial frequency in high voltage electricity.

Course goal: Understanding the dangers of touch and step voltages in accordance with the regulations in the country and the world, as well as capacity for calculation, sizing and design of grounding and grounding systems.

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

16. give students general knowledge on safety technique in power plants.
17. give knowledge of the operation of electricity and the provision of first aid.
18. give practical knowledge in these areas.
19. knowledge of earthing and protective grounding,
20. knowledge on measures and actions to be taken to avoid and in case of contact with electricity
21. knowledge of norms and legislation in force in the field of security, etc.

Methods of teaching: Lectures, exercises during class using different materials, group work of 2-3 students in a project (freelance work), individual homework.

Grading System:
The successful practical work: 30%, First intermediate evaluation; 30%, Second intermediate evaluation 30%, Regular attendance and involvement in discussions 10%.

Literature:

- L. L. Grigsby, The Electric Power Engineering Handbook, part: Substation Grounding, CRC PRESS, IEEE PRESS – 2001
- M. Jorgoni, Teknika e sigurimit në impiantet elektrike, Tiranë 2000,
- Institute of Electrical and Electronics Engineers, IEEE Guide for Safety in AC Substation Grounding, IEEE Std. 80-2000, IEEE, Piscataway, NJ, 2000.
- IEEE 80, Guide for Safety in AC Substation Grounding

Course title: Data Communication

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

The goal: The purpose of the course is to teach students to understand and apply data communication.
Learning outcomes: On successful completion of the course, students will be able to: 1. To describe data networks and apply data communication over them. 2. Be able to understand the basic concepts and terminology of data transmission. 3. To classify transmission media and common use possibilities. 4. Become familiar with architecture and functionality of fixed networks (Optical, HFC-Hibrid Optical Coax) and mobile (2G, 3G, 4G and 5G) for data communication. 5. To recognize wireless sensor networks, personal based on Bluetooth and WLAN. 6. Explain QoS (Quality of Service) and dependency of services on QoS parameters. 7. To be able to describe and apply IoT (Internet of Things) technology for data communication.

Contents: Data communication, data network and internet. Concepts and terminology of data transmission. Transmission media. Multiplexing techniques. Fixed optical and hybrid optical networks. Mobile networks (2G, 3G, 4G and 5G). Wireless sensor networks. Personal area networks based on Bluetooth technology and WLAN. Quality of Service (QoS). Services offered by fixed and mobile networks. Internet of Things (IoT). Applying IoT for data communication.
Methods of teaching: **30** hours of lectures + 15 hours of auditorial exercises and 30 hours of laboratory exercises. Approximately 75 hours of personal study and exercise including projects.
Grading System: Presence 10%, Projects 40 %, Final Exam 50 %

Literature:

- William Stallings "Data and Computer Communications", Tenth edition Pearson 2014
- S. Cirani, G. Ferrari, M. Picone, L. Velteri "Internet of Things, Architecturesm, Protocols and Standards", Wiley, 2019
- S. Vijayalakshmi, S. Muruganand ''Wireless Sensor Networks, Architecture, Applications, Advancements'' Mercury Learning and Information 2018

Course: Electric Power Market

Lecturer: Prof. Ass. Dr. Vezir Rexhepi
Course status: Mandatory, Semester V, 5 ECTS

Course description: Entry into the power market. Basic concepts of energy economics. Basic concepts of enterprises and types of markets. Management of electricity markets, procedures. Participation in electricity markets. Competition in electricity markets. Risk and security of operation of participants in the electricity market. Procedures and acquaintance with the activation of ancillary services within the electricity market. Transmission networks and their role in the electricity market. Economic dispatching and its implementation procedures in the electricity market. Calculation of losses in relation to the operation of the electricity market. Investments in generating capacities to increase the security of the electricity market. Investments in the transmission operator in order to increase the credibility of the electricity market. Integration of renewable resources in the electricity market. Electricity Market in Kosovo, Liberalization, Challenges and the Future. Kosovo's challenges in the liberalization of the electricity market and its role in the joint bloc with Albania, etc. Understanding the new structures of energy enterprises. Knowledge about the role of Generation, Transmission, Distribution System Operator, small traders, consumers. The importance of liberalization and opening up the electricity market. Understanding the link between ancillary services market design and ensuring stable and secure operation of the power system. Market operation security and Kosovo's challenges in the electricity market and its role in the joint bloc with Albania.

Course objective: Understanding the new structures of energy enterprises. Knowledge about the role of Generation, Transmission, Distribution System Operator, small traders, consumers. The importance of liberalization and opening up the electricity market. Understanding the link between ancillary services market design and ensuring stable and secure operation of the power system. Market operation security and Kosovo's challenges in the electricity market and its role in the joint bloc with Albania.

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

1. Define the most important terms relevant to the electricity market.
2. Distinguish the vertical and horizontal organization of energy enterprises.
3. Importance and describe the market, regulated and potential market activities.
4. Explain the different design and organization of the market.
5. The importance of market participants and describe their role in the market environment.
6. Describe the functioning of the ancillary services market.
7. Liberalization and development trends of markets and open trading platforms.
8. Describe the current market and the challenges facing Kosovo and the future.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, mid term exams, final exams.

Evaluation methods: During the semester two tests are organized, 30%, seminars 10%, attendance 5%, quizzes 5%, final exam 50%, Total 100 %.

Literature:

- Daniel S. Kirschen, Goran Strbac, "Fundamentals of Power System Economics", John Wiley & Sons, Ltd, 2004.
- Bernd M. Buchholz, Zbgniew Styczynski, Smart Grids – Fundamentals and Technologies in Electricity Networks, 20014.
- S. Tešnjak, E. Banovac, I. Kuzle (2009). Tržište električne energije, Graphis, Zagreb, Hrvatska,
- M. Shahidehpour, M. Alomoush (2001). Restructured Electrical Power Systems, Marcel Dekker, Inc., New York, USA.
- S. Stoft. Power System Economics - Designing Markets for Electricity, IEEE, Press/John Wiley&Sons, New York, USA, 2002.
- G. Rothwell, T. Gomez (2003). Electricity Economics: Regulation and Deregulation, IEEE.
- Power Economics in the Liberalized Electricity Markets, RWTH Aachen.
- European directives in the energy sector,
- Kosovo legislation in the energy sector,

Course: Transmission and Distribution of Electricity

Lecturer: Prof. Asoc. Dr. Gazmend Pula
Course status: Mandatory, Semester V, 5 ECTS

Course description: General concepts of transmission and distribution of electric energy. Importance and main features of transmission of electrical energy and various transmission systems. Determination of transmission line parameters. Approximate equivalent schems of power lines. Theory of electric power transmission. Power transmission processes in ideal and real transmission lines. Equivalent schemes of generators and transforms in power systems. Numerical calculation in transmission and distribution systems. Per unit methods and methods of reduced admittances. Voltage control in power lines. Short circuit faults, types and calculation methods. Power and energy transmission losses. Steady stated and dynamic stability.

Course objective: The objective purpose of the course is the introduction of the basic principles of transmission and distribution of electric energy in power systems from generating to consumer points

Learning outcomes: Upon successful completion of the course, students are expected be able to:

Be acquainted and familiar with basic concepts of transmission and distribution of electric energy

Know and identify easily characteristics and basic features of transmission and distribution lines

Know equivalent schemes of electric power lines and the theory of transmission lines as well as the related calculation procedures for processes in transmission and distribution lines

Know main methods of numerical solutions to problems and issues of power line transmission and distribution.

Teaching Methodology: Lectures, discussions, exercises, consultations, homework, mid term exams, final exams.

Evaluation methods: First midterm evaluation: 25%; Second midterm evaluation: 25%; Homework and seminars: 10%; Regular attendance 5%; Final exam: 35%.

Literature:

- H. Saadat, Power System Analysis, 2nd ed., McGraw Hill, New York, NY, 2004
- B. Stefanini, Bartja dhe Shperndarja e Energjise Elektrike, ETF Zagreb, 1978
- G. Pula, Bartja dhe Shperndarja e Energjise Elektrike, ETMM, Prishtine, 1984

Course: Power Sytem Facilities

Lecturer: Prof. Ass. Dr. Arben Gjukaj
Course status: Mandatory, Semester V, 5 ECTS

Course goal: This course provides knowledge of power system facilities and their design.

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

1. Define basic parts of electric facilities and their purposes
2. Identify basic parts of electric facilities on field
3. Describe current-voltage conditions in balanced and unbalaced systems
4. Solve short circuit problem on simple power system example
5. Distinguish between different arc interrupting techniques
6. Argue about utilization of given electric product in specific location in the system
7. Employ software tool for power system.

Course content: Introduction to electric power systems. Voltage and current stresses in switchgear and industrial systems. Symmetrical and unsymmetrical three-phase systems. Symmetrical components. Sequence impedances. Short circuit currents in three-phase AC systems. International Standards and specifications for calculation of short circuit currents. Short circuit current components (peak short circuit current, breaking current, thermal and dynamic short circuit strength). Substations and switchgear systems design. Selection criteria and planning guidelines for switchgear and distribution systems. Electric power transformers. Measuring (current and voltage) transformers. Main circuit assemblies. Electric facilities and distribution networks protection. Overvoltage protection. Reactive power compensation. Grounding systems. Protection against electric shock (direct and indirect contact).

Methods of teaching: Lectures, exercises during class using different materials, group work of 2-3 students in a project (freelance work), individual homework.

Grading System:
The successful practical work: 30%, First intermediate evaluation; 30%, Second intermediate evaluation: 30%, Regular attendance and involvement in discussions 10%.

Literature:

- J.D. McDonald (2003). Electric Power Substations Engineering, CRC Press (http://ocw.mit.edu/index.html)
- MIT OpenCourseWare (2005). Introduction to Electric Power Systems, MIT
- S. Krajcar; M. Delimar (2011). Transparencije s predavanja (www.fer.hr/zvne), FER

Course title: Electrical Installation and Low Voltage Network

Lecturer: Prof. Ass. Dr. Arben Gjukaj
Course status: Mandatory, Semester V, 6 ECTS

Course goal: Acquisition of basic knowledge and application of software tools for the design of low voltage electrical installations and lighting in residential, commercial, industrial and public buildings.
Learning outcomes: On successful completion of the course, students will be able to:

1. knows the construction of electrical components and compares the function of different components to select them for electrical installations.
2. knows the rules for the implementation of electrical installation and national standards.
3. to select the electrical competencies and connect the facility to the electricity distribution network.
4. knows the functions and elements of telecommunication installations. Sound installations, fire protection installations, intercom installations, etc.
5. have knowledge of earthing in electrical installations, as well as the propagation of current in the ground by the earthing as well as knowledge of protection measures from indirect and direct touch.
6. have basic knowledge of telecommunications installations, computer networks, as well as sound installations, fire protection installations, intercom installations.
7. be able to do the design of photovoltaic installation (PV) in residential buildings.

Course content: Marking of installation and power cables. Systems for electrical installations. Elements of electrical installation (fuses, automatic installation switches, current protection device, arc fault detection device, gauge and controller of isolation, devices for protection against surges). Protection against electric shock in normal exploitation conditions and in case of failure. Sizing of cables. Protection of facilities against Lightning. Construction of low voltage electrical installations. Installations in buildings, commercial and industrial buildings. Installations in facilities with the possibility of fire and explosion. Safety and backup power supply. Software tools for the design of electrical installations, making schemes. Making project for electrical installation.
Methods of teaching: ◎ Lectures, exercises during class and work in group of 2-3 students, independent work or individual homework.
Grading System:
Student attendance 5%; Individual project performed at home 15%; Assessment by tests 40%; Final exam 40%, Total 100%..
Literature:

- Ray C. Mullin, Phil Simmons, Electrical Wiring Residential, 18E, Cengage Learning – 2015
- Stephen L. Herman, Electrical Wiring Industrial, 15th Edition, Cengage Learning – 2015
- G. Seipe, Electrical Instalations Handbook, Third Edition,Siemens, Wiley, 2000
- Qazim Zaimi, Shperndarja e Energjise Elektrike, Maluka-2009

Course: Renewable Energy Sources

Lecturer: Prof. Ass. Dr. Vezir Rexhepi
Course status: Mandatory, Semester V, 5 ECTS

Course description: Energy and sustainable development. Renewable energy supply basics. Solar radiation processes. Wind energy. Geothermal energy. Biomass. Solar power plants, tower, parabolic, etc. The principle of energy generation by photovoltaic systems. Photovoltaic cells and modules. Photovoltaic effect on the cell. Efficiency of photovoltaic cells. The principle of wind energy generation. Air circulation and wind speed measurement. Types of wind turbines. The principle of generating energy from water. Estimation of resources for small power plants. Soil structure and heat balance at the earth surface. Basic economic and environmental analysis of renewable resources.

Course objective: Understanding the new structures of energy enterprises. Knowledge about the role of Generation, Transmission, Distribution System Operator, small traders, consumers. The importance of liberalization and opening up the electricity market. Understanding the link between ancillary services market design and ensuring stable and secure operation of the power system. Market operation security and Kosovo's challenges in the electricity market and its role in the joint bloc with Albania.

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

- Have knowledge about renewable energy sources such as: wind, sun, water, geothermal energy, etc.
- Have knowledge about the possibility of using solar energy through photovoltaic systems and solar power plants.
- To have knowledge about the possibility of using wind energy in wind power plants, water energy in small hydropower plants, geothermal energy, etc.
- Have knowledge about renewable resources and their potential in Kosovo.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, mid term exams, final exams.

Evaluation methods: During the semester two tests are organized, 30%, seminars 10%, attendance 5%, quizzes 5%, final exam 50%, Total 100 %.

Literature:

- B. K. Hodge, Alternative Energy Systems and Applications, John Wiley & Sons, Ltd. 2017.
- J. Twidel, Tony Weir, Renewable energy resources, Taylor & Francis, London New York, 2006,
- Gilbert M. Masters, "Renewable and Efficient Electric Power Systems", John Wliey & Sons, 2004, New Jersey, 2004.
- M. Kaltschmitt, W. Streicher, A. Wiese, Renewable Energy: Technology, Economics and Environment (Hardcover), Springer, 2007 Berlin Heldinberg, New York.
- R. Messenger, J. Ventre, Photovoltaic Systems Engineering, Second Edition, CRC Press LLC, 2004.

Course: Solar Energy and Photovoltaic Systems

Lecturer: Prof. Ass. Dr. Vezir Rexhepi
Course status: Elective, Semester V, 4 ECTS

Course description: Introduction, application and types of photovoltaic (PV) systems. Characteristics and components of solar radiation. Databases with meteorological data. Processes in the conversion of solar energy into electricity in a PV cell. Current characteristics - PV cell voltage and temperature influence. Types of PV cells and their characteristics. Construction of PV generator. PV systems connected in a network. Autonomous PV systems. PV hybrid systems. Electrical connection of components and their topology. Load structures and selection of a favorable location for installation of PV systems. Technical-economic analysis of PV systems. Methods for sizing PV systems. Impact of PV systems on the environment.

Course objective: The purpose of the course is that students gain basic knowledge of photovoltaic systems. Application of PV systems. To know about characteristics and components of solar radiation. To know methods about connection to network. Design of the PV systems.

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

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

- Have knowledge of PV systems.
- Have knowledge of the possibility of using solar energy through photovoltaic systems and solar power plants.
- Have knowledge of the possibility of using PV systems on network.
- Have knowledge to autonomous PV systems.
- Have knowledge about PV connection to network.
- To have knowledge about Techno-economic analysis of PV systems.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, mid term exams, final exams.

Evaluation methods: During the semester two tests are organized, 30%, seminars 20%, attendance 5%, quizzes 5%, final exam 40%, Total 100 %.

Literature:

- Heinrich Haberlin, Photovoltaics System Design and Practice, 2016.
- Planning and Installing Photovoltaic Systems. DGS/Berlin, 2008.
- Photovoltaic Using Matlab, John Wiley & Sons Ltd. 2016.
- B.K Hodge, Alternative energy systems and applications, 2013, Ars Lamina.

Course: Power electronics

Lecturer: Prof. Dr. Sabrije Osmanaj
Course status: Elective, Semester V, 4 ECTS

Course content: Power semiconductor diodes, rectifiers, Thyristors, converters three-phase converters, thyristor's commutation techniques, power transistors, inverters, inverters with supplementary switching, alternative converters (AC/AC), Cycle converters, DC / DC converter, UPS (uninterruptable power sources), Static switches.

Course objective: To provide knowledge on theoretical and applied power electronic devices and power electronic switches, expansion of knowledge on the theory and applications of power convertors, understand the concepts of application of thyristors, analyze and design various power converter circuits (DC/AC, A /AC and DC/DC and AC/DC).

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

understand the power electronic devices, power rectifiers,

have sufficient knowledge for the analysis and implementation of different types of thyristors;

be able to describe the operational principles of various circuits such as power converters, inverters, AC/AC and DC/DC transducers and,

to be able to analyze the characteristics and to draw the voltage and currents wave forms for different working conditions,

be able to analyze,

discuss and design different types of power converters to meet the required specifications.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, mid term exams, final exams.

Evaluation methods: First exams 15%, Second exams 15 %, Final test 20%. Final Exam 50 %.

Literature:

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

Course: Special electrical machines

Lecturer: Prof. Dr. Nysret Avdiu
Course status: Elective, Semester V, 4 ECTS

Short course description: General knowledge of special machines and small power machines. Constructive aspects and theoretical basis. Micro-electric machines without collectors. Step motors, parameters. Theory and construction of permanent magnet micromotors. Mathematical models of micromachines.

Couse objectives: The purpose of this course is to provide general knowledge on small power electric machines that are applied in many branches of industry and automated control.

Learning outcomes: After completion of this course the student:

will be familiar with the types of small machines as well as special (special) machines,

will gain knowledge about the electromagnetic parameters and the working characteristics of these special machines.

Teaching methodology: Lectures, discussions, team work, preparation of seminars etc.

Evaluation methods: First evaluation 15%, Second Evaluation 15%, Third evaluation 15%, Attendance 5%, Assignments and seminars 10%, Final exam 40%, Total 100%.

Literature:

- J.F. Gieras, R.J. Wang, M.J. Kamper, ”Axial Flux Permanent Magnet Brushless Machines”, Kluwer Academic Publishers, Dordrecht, 2004.
- S.A. Nasar, I. Boldea, L.E. Unnewehr, ”Permanent Magnet, Reluctance, and Self-Synchronous Motors”, CRC Press, London, 1993.
- T.J.E. Miller, ”Brushless Permanent-Magnet and Reluctance Motor Drives”, Oxford Science Publications, Oxford, 1989.
- S.E. Lyshevski, ”Electromechanical Systems, Electric Machines, and Applied Mechatronics”, CRC Press, Boca – Raton – London – New York – Washington D.C., 2000.
- B.S. Guru, H.R. Hiziroğlu, ”Electric Machinery and Transformers”, 3rd Edition, Oxford University Press, New York – Oxford, 2001.

Course title: Power Networks
Lecturer: Dr.sc. Nuri Berisha
Course status: Elective, Semester V, 4 ECTS

Course goal: Acquiring knowledge on power networks. Familiarity with power network elements and their equivalent circuits. The student will become familiar with the functions of main power network elements and will be able to independently model and determine the parameters of the power system elements and devices. Mastering methodologies for solving radial and meshed networks, as well as dimensioning of power networks.
Learning outcomes: On successful completion of the course, students will be able to:

1. Will be familiar with the types of Power networks
2. Will gain knowledge about the networks' different types of configurations.
3. Will gain knowledge about the network parameters and calculation methods, voltage drop and reactive power flow calculation.
4. Develops knowledge on: application of relevant parameters to use of various methods for calculating lines and electrical networks for different voltage levels. Voltage drops and losses on power system elements such as lines and transformers.
5. Knowledge the methods of voltage regulation in electrical networks.

Course content: This course describes General knowledge of Power networks. Classification of Power networks. Topological forms of connection of transmission and distribution networks. Power network elements and their equivalent circuits. Mechanical and electrical parameters of overhead power lines. Substation HV/MV. Loads. Daily load diagram. Circuit parameters, voltage drop and power losses of Power transformers. Calculation of voltage drops and power losses in radial networks and meshed networks. Solving radial and meshed networks. Classical and matrix Methods. Node potential method. Method of contour currents. Fast decoupled power flow solution. Dimension of conductors in radial Power networks. The method of cross section conductors dimensioning according to the constant cross section criteria and to the constant current density criteria. The method of conductors dimensioning according to the minimum material consumption criteria in meshed distribution networks. Design of power networks. Single line Diagram solving. Voltage regulation and reactive power flow control. Energy losses in power networks. Cost-benefit analysis.
Methods of teaching: 30 hours of lectures + 15 hours of laboratory exercises. Approximately 55 hours of personal study and exercise including homework.
Grading System: First evaluation 15%, Second Evaluation 15%, Seminar work/project, presentation: 20%, Activity and participation 10%, Final exam 40%, Total 100%.
Literature:

- J. Duncan Glover, Mulukutla S. Sarma, Thomas Overbye, Power system analysis and design, Thomason Learning 2008
- Hadi Sadat, Power System Analysis, PSA Publishing LLC; 3rd edition (2011)
- Kiessling, F., Nefzger P., Nolasco J.F., Kaintzyk U., Overhead Power Lines: Planning, Design, Construction, Springer Verlag, 2003.

Course: Elecrical drives

Lecturer: Prof. Ass. Dr. Bahri Prebreza
Course status: Mandatory, Semester VI, 6 ECTS

Course Content: The general structure of the electromotor drive system. Concepts, definitions, movement equation. Components of electric drives: motors, power converters, transmission mechanisms, working mechanisms, power supplies, etc. Classifications of the drives and characteristics. Characteristics of working mechanisms. Definitions of electric drives according to IEC norms. Electric drives with direct current motor (DC), asynchronous alternating motor and synchronous motors. Static states of electromotor drives. The basics of dynamic states. Release, braking and reversion. Basic knowledge of regulated electric drives. Control of the speed of rotation and efficiency. Basic knowledge of electrical protection of electric drives.

Course objective: The purpose of the course (module) is: to provide knowledge about the electric drives, its construction and characteristics related to their application.

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

describe the basic structure of electric drive,

define the fundamental coneots of electric drives;

explain the basic characteristics of electric drives and to predict the behavior of an electric drive under typical working conditions; calculate the energy losses and the respective coefficient of utilization;

prepare the basic parameters of the motor selection according to the given conditions;

define the most appropriate application and arrangement depending on the requirements of electrical drives.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, colloquia, team work, preparation of seminars, final exam, etc.

Evaluation methods: Seminar labour 10%, presence on lectures and exercises 10%, First exam 15%, second exam 15% and the final exam 50%.

Literature:

- Boldea, S. A. Nasar, Electric drives, CRC Press, 2016,
- Modern Electrical Drives Editors: Ertan, H.B.,Üçtug, M.Y.,Colyer, R.,Consoli, A. (Eds.), 2013,
- Ned Mohan (2001.), *Electric Drives, an integrative Aproach*, MNPERE, Minneapolis, USA,
- M. Rashid, "Power Electronics, circuits, devices and applications", prentice-Hall International, Inc 1995.

Course: Power System Protection

Lecturer: Prof. Ass. Dr. Vezir Rexhepi
Course status: Mandatory, Semester VI, 5 ECTS

Course description: Introduction to the protection of power systems. Types of faults and their effects. Basic components of power system protection. Relay protections and SCADA. SCADA components, and communication networks. Voltage and current transformers, their characteristics and parameterization. Calculation of fault currents, symmetrical and asymmetric components The source of faults and their dynamic modeling through computers. Characteristics and principles of relay protections and measurement of protection parameters. Overcurrent, differential, backup protection and their characteristics. Protection from ground faults and other faults by other short currents to the electrical components. Protection of power transformers. Characteristics and types of their protections. Protection of AC motors. Setting considerations. Protection of generators and generator-transformer block. Transmission line protection. Different schemes for protecting transmission lines from various short circuits. Bus bar protection. Characteristics and types of their protections.

Course objective: After successfully completing the module, students will be able to demonstrate knowledge and understanding of the basic concepts of power system protection, transmission and distribution network protection, protection of generators, motors, relay testing. Technical requirements and design of relay protections.

Learning outcomes: Upon successful completion of the course, students are expected be able to:

- To determine the type of faults and their characteristics,
- Select and setting relay protection in transmission networks,
- Select and determine the relay protection of transformers,
- Select and determine the relay protection of generators,
- Solve and define the motors protection,
- Testing and setting the operation of relay protections.

Teaching methodolgy: Lectures, discussions, exercises, consultations, homework, mid term exams, quizzes, final exams.

Evaluation methods: First evaluation 15%, Second evaluation 15 %, Attendance 5%, Quizzes 5%, Seminars 10%, Final exam 50%. Total 100%.

Literature:

- J.C. Das, Power Systems Protective Relaying, Taylor & Francis Group, LLC, 2018.
- A. Gashi, Mbrojtja rele, ligjëratat dhe prezantimet 2013.
- J.L. Blacburn, Protective relaying-Principles and applications, Taylor and Francis Group, 2003, London.
- J. Lewis Blackburn, Thomas J. Domin, Protective Relaying; Principles and Applications, CRC Press, New York, 2006.

Course: Professional Practice (Internship)
Lecturer: Prof. Ass. Dr. Arben Gjukaj
Course status: Mandatory, Semester VI, 6 ECTS

Course goal: Students to gain professional experience, depending on the field of study, in any of the companies in the country, also to demonstrate the ability to analyze the given problem from a theoretical and practical point of view, to provide a solution by applying the knowledge gained in many subjects as well as from the literature.

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

1. Describe organization of work in a company
2. Describe principles of project organization and team work
3. Identify the application areas of knowledge gained during the undergraduate study for solving real-world problems
4. Apply knowledge and skills acquired during the undergraduate study to solve simpler engineering assignments
5. Describe the necessity of interdisciplinary team collaboration in development of the product ready for market
6. Generate documentation and internship report.

Course content: The course objective is to enable students a direct contact with business and industrial environment during their undergraduate studies through solving the engineering assignments under the guidance and supervision of mentors in companies. The companies propose internship topics that students choose according to their preferences. The company assigns mentor to student who is in charge to supervise and oversee the student's work. Student prepares internship report that has to be confirmed by the mentor in company. The course teacher with associates review the confirmed internship report and decide whether the internship was successfully finished. Through the internship students are familiarized with the organization of work in company, principles of project organization and team work, they work on solution of simpler engineering assignments, and prepare the internship report..

Methods of teaching: 120 hours work in a company and for writing the seminar.
Grading System:
Seminar Work 40%, Defense 60%. TOTAL: 100%.

Course title: Diploma Thesis

Course status: Mandatory (Semester VI, 6 ECTS)

Course objectives: Diploma thesis is a comprehensive and independent assignment, where student has to demonstrate the capability to analyze the problem from theoretical or practical aspect., in order ot provide a solution by applying acquired knowledge from different courses and literature.

Learning outcomes: On successful completion of this module student will be able:

- To gain confidence on acquired knowledge
- To get skills for further study from literature
- To consult with the supervisor
- To present their work in a written form, and standard language
- To present their findings in an oral evaluation.

Course Content: Diploma thesis topic may be proposed by the supervisor, or be chosen by the student. It has to be compatible with the qualification profile of the student.

Methods of teaching: Determined by the regulation for diploma thesis of the faculty.

Literature:

1. Depending on the topic of the diploma thesis, literature will be provided by the supervisor.

Course: Power Quality in Power Systems

Lecturer: Prof. Ass. Dr. Vezir Rexhepi
Course status: Elective, Semester VI, 4 ECTS

Course description: Introduction to the quality of the power system, use of modern technological equipment for their monitoring, SCADA, smart grids, etc. Terminology and classification of phenomena related to the quality of power systems. Harmonics and resonance. Their phenomena and impact on power system Voltage fluctuations, disturbances, defects and jumps, short-term and long-term outages. Transient surges. Surges during synchronizing of the overhead lines. Asymmetry of voltages, vibrations, and other forms of disturbances, etc. Standard low, medium, and high voltage of power systems. Low, medium, and high voltage standards in power systems Earthing and electrical installations of electricity quality factor, power lines, transformers. Monitoring the quality of electricity in power systems, power lines, transformers, generators, SCADA (EMS, DTS) systems and other intelligent grid applications for monitoring the quality of power systems. Use of SCADA, measuring equipment, adjustment and selection of measured quantities for energy cycle monitoring. SCADA monitoring (EMS, DTS) of the quality of power systems, transmission, distribution. Monitoring of parameters and diagnosis of power system components through SCADA of frequency, voltage disturbances, Impact of disturbances on power systems. Reliability of power systems. Calculation of the state estimation of the parameters in power systems. Monitoring state estimation by SCADA. Standards (EN 50160, IEEE 519). Application of modern methods and their functioning for monitoring standards for the quality of power systems. Application standards (EN, 50160) in Kosovo.

Course objective: The aim of the course is that students to gain basic knowledge about the quality of the power system, the parameters of the power system, monitoring the quality of power systems through smart systems such as SCADA (EMS, DTS). Diagnosis and monitoring of disturbances with modern methods for the operation of safe and reliable power systems.

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

- Have knowledge of components of power systems, disturbances and defects of power systems.
- Have knowledge of the possibility of causing disturbances in the components of power systems.
- To have knowledge about the use of smart systems and especially SCADA (EMS, DTS) in monitoring the distances and generally the quality parameters of power systems.
- Have knowledge of the analysis of these different distances, defects and breakdowns using different methods and SCADA applications.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, mid term exams, final exams.

Evaluation methods: During the semester two tests are organized, 30%, seminars 20%, attendance 5%, quizzes 5%, final exam 40%, Total 100 %.

Literature:

- Roger C. Dugan/Mark F. McGranaghan, Surya Santoso, H. Wayne Beaty, Electrical Power Systems Quality, McGraw-Hill, 2006.
- Mini, S. Thomas, John D. McDonald, Power system SCADA and Snart Grids, Taylor & Francis Group, 2015.
- Risto Achovski, Electricity Quality, FEEIT, 2013.
- Mohammad A. S. Masoum, Power Quality in Power Systems and Electrical Machines, Elsevier, 2015.

Course: Wind energy

Lecturer: Prof. Ass. Dr. Bahri Prebreza
Course status: Elective, Semester VI, 4 ECTS

Short course description: The aim of the course is to provide knowledge about wind energy as a renewable energy source and environmentally friendly energy source, wind energy conversion basics, wind turbine aerodynamics, wind and wind measurement, Analysis of wind data and energy calculation of wind regimes, wind energy conversion systems, wind farms, offshore farms and wind pumps, performance of wind conversion systems, environmental benefits of wind energy, wind energy environmental problems, wind energy economy, wind energy cost and wind energy benefits. Interest in wind energy and other forms of renewable energy as a substitute for energy from fossil fuels is growing, due to growing concerns about environmental pollution, energy security, and global warming issues. Wind energy can provide suitable solutions because the use of wind energy eliminates CO2, SO2 and other hazardous waste emissions, which are subject to traditional coal-fired power plants. In this regard, wind energy increases energy security, is the most promising source of renewable energy and is expected to take a much higher share in electricity generation in the coming decades. Demand for energy and environmental protection is also growing and this has increased interest in wind energy.

Couse objectives: The aim of the course is to introduce the basics of wind energy; Give wind characteristics and its impact on site selection; Introduce wind energy conversion systems; Introduce the implementation of economic and environmental decisions regarding wind energy equipment.

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

- analyses wind energy sources and their sustainability;
- identify and explain a wind power project's phases;
- identify and evaluate factors affecting wind energy development;
- show how the terrain influence the wind resources;
- calculate and analyses wind resources and energy production for a wind turbine from wind speed distribution, wind shear and power curve;
- describe the design of typical wind turbines;
- explain the main differences between horizontal and vertical axis wind turbines, regarding design and properties;
- make some dimensioning calculations for wind turbines;
- describe typical control methods for wind turbines;
- make a simple economic analysis of a wind turbine facilities;
- give an account of how wind turbines influence the environment.

Teaching methodology: Lectures, discussions, exercises, consultations, homework, colloquia, team work, preparation of seminars, final exam, etc.

Evaluation methods: First evaluation 20%, Second Evaluation 20%, Attendance 5%, Assignments and project 15%, Final exam 40%, Total 100%.

Literature:

- S.Mathew: Wind energy, Fundamentals, Resource Analysis and Economics, Springer-Verlag Berlin Heidelberg, 2006.
- V.Nelson: Wind energy, Renewable Energy and the Environment, CRC Press, New York, 2009
- J.F.Manwell, J.G.McGowan, A.L.Rogers: Wind energy explained, Theory, Design and Application, University of Massachusetts, Amherst, USA, John Wiley&Sons Ltd, 2002.

Course title: Fundamentals of Smart Grids

Lecturer: Prof. Ass. Dr. Arben Gjukaj, Dr.sc. Nuri Berisha
Course status: Elective, Semester VI, 4 ECTS

Course goal: The course is developed to provide basic knowledge of the principles of Smart Grids, their characteristics, operation and technical and economic impact to the power systems.
Learning outcomes: On successful completion of the course, students will be able to:

1. Will be familiar with the Smart Grids concepts.
2. Will gain knowledge about Smart grids implementation in transmission and distribution network.
3. Will gain knowledge about smart meters and smart energy market

Course content: This course describes general knowledge of Smart Grids concepts and definitions. Constructive aspects and theoretical basis. Vision and Strategy for the Electricity Networks of the Future. Smart Generation: Resources and Potentials. Modern Technologies and the Smart Grid Challenges in Transmission Networks. Design of Distribution Networks and the Impact of New Network Users. Smart Grids concept and definitions. Smart Grids development – technologies on transmission and distribution level. Role of DG and consumers in Smart Grids. Smart Grids control (centralized vs decentralized approach). Control hierarchy. Smart Meters and SmartGrids: an Economic Approach. Implementation of distribution management systems (DMS) and SCADA in Smart Grids. Smart Grids concepts: microgrids, virtual power plants, electric vehicles, Smart House. Design of the Smart Energy Market. Advanced Information and Communication Technology: The Backbone of Smart Grids. The Regulation of SmartGrids. Smart Grid Worldwide.
Methods of teaching: 30 hours of lectures + 30 hours of laboratory exercises. Approximately 40 hours of personal study and exercise including homework.
Grading System:
First evaluation 15%, Second Evaluation 15%, Seminar work/project, presentation: 20%, Activity and participation 10%, Final exam 40%, Total 100%.
Literature:

- Bernd M. Buchholz, Zbigniew Styczynski Smart Grids – Fundamentals and Technologies in Electricity Networks Springer 2014
- Nouredine Hadjsaïd, Jean-Claude Sabonnadière "Smart Grids" Wiley-ISTE, Year: 2012.
- Ali Keyhani, Muhammad Marwali, Smart Power Grids, Springer-Verlag Berlin Heidelberg 2012.
- Ramasamy Natarajan, Smart Grids: Infrastructure, Technology, and Solutions, CRC Press 2012.

Course title: Economic Assessment of Investments
Lecturer: From Industry
Couse status: Elective, Sem. VI, 3 ECTS

Course goal: This course is designed to provide basic knowledge in the methods for economic assessment. The students will be trained to perform cost benefit and risk analysis of investments.

Learning outcomes: On successful completion of the course, students:

6. will be familiar with the methods of economic assessment
7. Will gain knowledge cash flow, liquidity and shares.
8. Will be able to analyse risk in economic assessment.
9. Develops knowledge on calculation of cost of capital and investment returns.

Course content: This course describes General knowledge of Economic assessment. Introduction to financial analyses. Classification of costs. Time value of money. Cash flow. Liquidity. Shares. Risk factor of investments. Calculation of Weighted average cost of capital (WACC). Methods for economic assessment: Net present value method, Internal rate of return method, Minimal cost method, Equivalent annual value method, Period of return of investments. Financial and economic profitability of investments. Risk analysis in economic assessment. Evaluation of investment programs.

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

Grading System:
First evaluation 15%, Second Evaluation 15%, Seminar work/project, presentation: 20%, Activity and participation 10%, Final exam 40%, Total 100%.

Literature:

- Daniel Kirschen, Goran Strbac, Fundamentals of Power System Economics, John Wiley & Sons 2004
- Paul A. Samuelson, William D. Nordhaus Economic McGraw-Hill / Mate, 2011
- Donald G. Newnan, Ted G. Eschenbach, Jerome P. Lavelle, Engineering Economic Analysis, Oxford University Press, 2004
- Hisham Katib, Economic evaluation of projects in the Electricity Supply Industry, Institution of Engineering and Technology, London, United Kingdom, 2003

Course title: Project Management and Ethics in Engineering

Lecturer: From Industry
Course status: Elective, Semester VI, 3 ECTS

Course goal: Scientific and professional approach in learning of the projects and project skills for planning, organizing, leading and controlling projects. Defining and evaluation of the ethical values in engineering projects

Learning outcomes: On successful completion of the course, students:

1. Will be familiar with types of project classification
2. Will gain knowledge about business plan.
3. Will be able to analyse innovation on projects especially on engineering projects.
4. Develops knowledge on Project management and technical documentation of tender documents
5. Will be familiar with types of ethics in project management, engineering projects.

Course content: Project management definition. Classification of the projects. Project stakeholders. Project selection. Criteria for project success. Innovations in engineering projects. Innovating projects incorporate in organizational project portfolio. Business plan. Discussion in accordance with the PMBOK (PMI). Project Initiation Documents (PID), Project Charter documents. Project planning. Organizing, leading and controlling the projects. Cost-Benefit Analysis in projects. Technical and economic project analysis. Economic criteria for project selection in engineering. Project manager. Leadership in projects. Investor and Project Company. Project documentation. Basic technical documentation. Tender documents. Offers. Contracts. Examples of successful and unsuccessful projects. Project management Ethics. Universal ethics in multicultural environment. Business ethics. Ethics in professional health and safety. Ethics in engineering. Ethics in project management.

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

Grading System:
First evaluation 15%, Second Evaluation 15%, Seminar work/project, presentation: 20%, Activity and participation 10%, Final exam 40%, Total 100%.

Literature:

- Cathy Lake, Mastering Project Management , Thorogood, 1999
- Financial Times –authors,Writing a business plan Pearson, 2011
- Ralph Kliem, PMP, Ethics and Project Management, CRC Press, 2012

Course: Entrepreneurship

Lecturer: Prof. Ass. Dr. Sevdie Alshiqi
Course status: Elective, Semester VI, 3 ECTS

Course content: Promoting a culture of creativity, innovation and collaboration. Promoting entrepreneurial culture both professional and student. Generating, disseminating and sharing knowledge on innovation and entrepreneurship. Develop strategic alliances with agents that structure the innovation ecosystem and entrepreneurship. Building transnational networks with emblematic actors. Know the tools and strategies that will be applied to startups and projects. Applying new concepts and theoretical frameworks own strengths and knowledge. Managing creativity and innovation. Failure and learning from failure. Understanding and managing innovation processes and their impacts on the environment.
Course objectives: In this course students will learn about the context of customer development in real life and acquire the skills to develop their business idea all the way from conceptual to market stage to their entrepreneurship and innovation. This course articulates an innovation space that aims to be the successor to Kosovo's entrepreneurial incubation projects. The purpose of this course is for students to be able to realize their dreams and develop the skills to achieve them in Innovation and Entrepreneurship. The course is designed to encourage students' ability to think differently about developing new products, services and organizations.
Learning outcomes:

- Interdisciplinary work, real and virtual environments;
- Teaching abroad in a multicultural environment;
- Transfer of knowledge into day-to-day mentoring by leading experts;
- Experience in learning about innovation;
- Learning together with entrepreneurs;
- The creativity imposed on excellent management of time and resources;
- Creating and utilizing an invaluable network of like-minded ambitious talents.

Teaching methodology: 30 hours of lectures and approximately 45 hours of independent work including seminar work.
Evaluation methods: Regular attendance and involvement in discussions and seminars 10%, intermediary evaluations: 30%, Final exam: 60%.
Concretization tools/IT: Computer, projector, different software.
Ratio between theoretical and practical part: 40:60

Literature:

- John Bessant, "Entrepreneurship and innovation", 2019, Publisher: John Wiley & Scons Inc.
- Peter F. Drucker, "Innovation and Entrepreneurship, 2006

- Charles Hampden-Turner, "Teaching Innovation and Entrepreneurship", 2009, Cambridge University Press
- Lubar and Halpern, "Leadership Presence", 2004 Process. Addison-Wesley.