Semester 1		
Polytechnic graduate professional study programme specialization in Electrical Engineering elective courses		
P:mr.sc. Sanja Bračun dipl.oec. A:mr.sc. Sanja Bračun dipl.oec.	Asset Management	ECTS:4.0
P: Ivica Vuković P:dr. sc. Anđa Valent viši predavač A: Ivica Vuković A:dr. sc. Anđa Valent viši predavač	Mathematics	ECTS:6.0
P:mr.sc. Sergej Lugović MBA P: Ljiljana Matuško Antonić A: Ljiljana Matuško Antonić	Bussiness Ethics and Law	ECTS:4.0
P: Maja Pauković A: Maja Pauković	Applied Statistics	ECTS:5.0
P:v.pred. Aleksander Radovan , dipl. ing. L:v.pred. Aleksander Radovan , dipl. ing.	Introduction to object-oriented programming	ECTS:4.0
P:doc. dr. sc. Sanja Morić predavačica A:doc. dr. sc. Sanja Morić predavačica	The Protection of the Environment and the Quality of Life	ECTS:4.0
Polytechnic graduate professional study programme specialization in Electrical Engineering elective courses		
P:dr.sc. Joško Lozić P:mr.sc. Sanja Bračun dipl.oec. A:mag.oec Kristina Perec A:dr.sc. Joško Lozić A:mr.sc. Sanja Bračun dipl.oec.	Digital economy	ECTS:4.0
P: Ivor Marković , mag. ing. A: Ivor Marković , mag. ing.	Electric energy conversions	ECTS:5.0
P:dr.sc. Davor Petranović dipl.ing.el. A:dr.sc. Davor Petranović dipl.ing.el. S:dr.sc. Davor Petranović dipl.ing.el.	Quality Management	ECTS:5.0
P: Vesna Alić-Kostešić dipl.ing.stroj. A:mr.sc. Branimir Preprotić dipl. inž. stroj. A: Vesna Alić-Kostešić dipl.ing.stroj. S: Vesna Alić-Kostešić dipl.ing.stroj.	Project Management	ECTS:5.0

Semester 2		
Polytechnic graduate professional study programme specialization in Electrical Engineering elective courses		
P: Ivor Marković , mag. ing. K: Ivor Marković , mag. ing. L: Ivor Marković , mag. ing.	3D modeling and 3D printing	ECTS:5.0
P: Marko Miletić L: Marko Miletić	Electrical Materials	ECTS:5.0
P: Mate Lasić L: Mate Lasić	EM field and EM compatibility	ECTS:5.0
P: Ivica Vlašić P:dr.sc. Predrag Valožić prof. vis. šk. P:mr.sc. Goran Malčić v.pred. P: Goran Belamarić viši predavač A: Ivica Vlašić K: Ivica Vlašić L: Ivica Vlašić L: Mario Lučan	Industrial Computer Networks	ECTS:5.0
P:dr.sc. Zdenko Balaž dipl.ing.el. L:dr.sc. Zdenko Balaž dipl.ing.el.	Inteligent systems	ECTS:5.0
P:Prof.dr.sc. Krešimir Meštrović P: Zvonimir Meštrović mag. ing. A: Zvonimir Meštrović mag. ing. L: Zvonimir Meštrović mag. ing.	Renewable Energy Sources in Power Systems	ECTS:5.0
P: Željko Stojanović	Electrical Equipment Design Basics	ECTS:5.0
P: Tomislav Špoljarić d. i. e., v. pred. A: Tomislav Špoljarić d. i. e., v. pred.	Rational Use of Energy	ECTS:5.0
P: Lukša Padovan	Regulation of electrical engineering in the design and construction process	ECTS:5.0
P:mr.sc. Goran Malčić v.pred. L: Ivica Vlašić L: Mario Lučan	Plant Control and Monitoring Systems	ECTS:5.0
P: Stjepan Tvorić P: Ante Elez L: Ante Elez L: Stjepan Tvorić	Techniques of maintenance and testing of electrical equipment	ECTS:5.0
P: Nikola Majstorović dipl.ing.	Algorithm Theory	ECTS:5.0

Semester 3		
Polytechnic graduate professional study programme specialization in Electrical Engineering elective courses		
P: Marko Miletić L: Marko Miletić S: Marko Miletić	Microcontrollers	ECTS:6.0
P:v.pred. Mato Fruk dipl.ing. K:v.pred. Mato Fruk dipl.ing. L:v.pred. Mato Fruk dipl.ing.	Process Modelling and Simulation	ECTS:6.0
P:mr.sc. Davor Gadže P:mr. sc. Ivan Mišković dipl. ing. pred. L:mr.sc. Davor Gadže L:mr. sc. Ivan Mišković dipl. ing. pred.	Advanced Control Systems	ECTS:6.0
P:mr.sc. Davor Gadže P: Tomislav Špoljarić d. i. e., v. pred. K:mr.sc. Davor Gadže K: Mario Ličanin K: Tomislav Špoljarić d. i. e., v. pred.	Design and construction of power plants	ECTS:6.0
P: Marko Miletić L: Marko Miletić	Sensors and actuators for industrial processes	ECTS:6.0
P:dr.sc. Davor Petranović dipl.ing.el. A:dr.sc. Davor Petranović dipl.ing.el.	Automation Systems in Building Construction	ECTS:6.0
P: Branko Tomičić A: Branko Tomičić K: Branko Tomičić L: Branko Tomičić	Electrical Motor Drive Control	ECTS:6.0
Polytechnic graduate professional study programme specialization in Electrical Engineering elective courses		
P:mr.sc. Zoran Kovačević predavač P:Prof.dr.sc. Krešimir Meštrović A:mr.sc. Zoran Kovačević predavač	Power Plants	ECTS:6.0
P:mr.sc. Veselko Tomljenović viši predavač	Electrical Machines	ECTS:6.0
P: Tomislav Plavšić L: Tomislav Plavšić	Smart grids	ECTS:6.0
P:dr.sc. Davor Petranović dipl.ing.el. L:dr.sc. Davor Petranović dipl.ing.el.	Lighting and Installations	ECTS:6.0
P:Prof.dr.sc. Krešimir Meštrović	Switching Equipment	ECTS:6.0
P:dr.sc. Dalibor Filipović - Grčić dipl.ing. A:dr.sc. Dalibor Filipović - Grčić dipl.ing.	Transformers	ECTS:6.0
Polytechnic graduate professional study programme specialization in Electrical Engineering elective courses		
P:Prof.dr.sc. Slavica Ćosović Bajić P: Milan Bajić P: Sanja Kraljević , dipl.ing., v. pred. A:Prof.dr.sc. Slavica Ćosović Bajić A: Milan Bajić A: Sanja Kraljević , dipl.ing., v. pred. A: Tamara Ivelja mag. ing. geod. et. geoinf.	Digital Image Processing	ECTS:6.0
P:dr.sc. Predrag Valožić prof. vis. šk. A:dr.sc. Predrag Valožić prof. vis. šk.	Digital Signal Processors	ECTS:6.0
P:Prof. dr. sc. Renato Filjar dipl. ing. elektrotehnike, FRIN, prof. v. š.	Geographic Information Systems	ECTS:6.0

A:Prof. dr. sc. Renato Filjar dipl. ing. elektrotehnike, FRIN, prof. v. š.		
P: Marko Miletić L: Marko Miletić S: Marko Miletić	Microcontrollers	ECTS:6.0
P:dr.sc Sonja Zentner Pilinsky prof.v.š. A:dr.sc Sonja Zentner Pilinsky prof.v.š.	Mobile Communication Networks	ECTS:6.0
P:Prof.dr.sc. Slavica Ćosović Bajić P: Milan Bajić P: Sanja Kraljević , dipl.ing., v. pred. A:Prof.dr.sc. Slavica Ćosović Bajić L:Prof.dr.sc. Slavica Ćosović Bajić A: Milan Bajić L: Milan Bajić A: Sanja Kraljević , dipl.ing., v. pred. L: Sanja Kraljević , dipl.ing., v. pred.	Multimedia Systems	ECTS:6.0
P:dr.sc Sonja Zentner Pilinsky prof.v.š. A:dr.sc Sonja Zentner Pilinsky prof.v.š. L:dr.sc Sonja Zentner Pilinsky prof.v.š. S:dr.sc Sonja Zentner Pilinsky prof.v.š.	Optical Communication Networks	ECTS:6.0
P:pred. Ivan Lujo , dipl.ing. L:pred. Ivan Lujo , dipl.ing.	Optical Sensors	ECTS:6.0
P: Goran Belamarić viši predavač A: Goran Belamarić viši predavač	Automation Systems in Building Construction	ECTS:6.0
P: Mirko Jukl A: Mirko Jukl	Radar Systems	ECTS:6.0
P:dr.sc. Davor Petranović dipl.ing.el. A:dr.sc. Davor Petranović dipl.ing.el.	Automation Systems in Building Construction	ECTS:6.0

Semester 4		
Polytechnic graduate professional study programme specialization in Electrical Engineering elective courses		
P: Tomislav Novak mag. ing. inf. et comm. techn. A: Tomislav Novak mag. ing. inf. et comm. techn.	Graduation Thesis	ECTS:24.0
P:dr. sc. Roman Domović , prof. P: Doc. dr. sc. Lidija Tepeš Golubić v. pred. S:dr. sc. Roman Domović , prof.	Methodology of professional and scientific research	ECTS:6.0

Semester 5

Semester 6

Code WEB/ISVU	23800/170923	**ECTS**	5.0	**Academic year**	2018/2019
Name	3D modeling and 3D printing				
Status	2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+15+0+15) 90
Teachers	Lectures:1. Ivor Marković , mag. ing. Laboratory exercises: Ivor Marković , mag. ing. Construction exercises: Ivor Marković , mag. ing.				
Course objectives	Acquisition of knowledge in field of 3D modeling and 3D printing				
Learning outcomes:	1.Analyse the need for 3D modeling and 3D printing. Level:6 2.Constuct 3D models. Level:6,7 3.Combine multiple 3D models into one assembly. Level:6,7 4.Choose material used for 3D printing. Level:7 5.Create 3D models from 2D sketches. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Demonstration Simulations Modelling Discussion				
Methods of carrying out laboratory exercises	Laboratory exercises, computer simulations Group problem solving Workshop				
How construction exercises are held	Essay writing Computer simulations				
Course content lectures	1.Introduction to Solidworks, 2h, Learning outcomes:1 2.Creation of 2D sketches, 2h, Learning outcomes:2 3.Annotations, 2h, Learning outcomes:1 4.Conversion of 2D sketches into 3D models, 2h, Learning outcomes:3 5.Conversion of 2D sketches into 3D models, 2h, Learning outcomes:2 6.Conversion of 2D sketches into 3D models, 2h, Learning outcomes:2,3 7.Conversion of 2D sketches into 3D models, 2h, Learning outcomes:1,3 8.Assemblies, 2h, Learning outcomes:1,4 9.Assemblies, 2h, Learning outcomes:4,5 10.Mechanical simulations, 2h, Learning outcomes:3,5 11.Thermal simulations, 2h, Learning outcomes:3,4 12.Introduction to 3D printing, 2h, Learning outcomes:3,4 13.Types of 3D printers, 2h, Learning outcomes:1,2 14.Materials used in 3D printing, 2h, Learning outcomes:2,3 15.Specific problems in 3D modeling for 3D printing, 2h, Learning outcomes:1,2				
Course content laboratory	1.Introduction to Solidworks, 1h 2.Creation of 2D sketches, 1h 3.Annotations, 1h 4.Conversion of 2D sketches into 3D models, 1h 5.Conversion of 2D sketches into 3D models, 1h 6.Conversion of 2D sketches into 3D models, 1h 7.Conversion of 2D sketches into 3D models, 1h 8.Assemblies, 1h 9.Assemblies, 1h 10.Mechanical simulations, 1h 11.Thermal simulations, 1h 12.Introduction to 3D printing, 1h 13.Types of 3D printers, 1h 14.Materials used in 3D printing, 1h 15.Specific problems in 3D modeling for 3D printing, 1h				
Course content constructures	1.Creation of parts, assemblies and analysis and preparation for 3D printing, 15h 2.- 3.- 4.- 5.- 6.- 7.- 8.- 9.- 10.- 11.- 12.- 13.- 14.-				

	15.-	
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory Overhead projector	
Exam literature	-EDU_CAD_Student_Guide -SOLIDWORKS 2016 Basic Tools, Paul Tran, 2016. -SOLIDWORKS 2016: A Power Guide for Beginners and Intermediate Users, CADArtifex, 2016. -SOLIDWORKS 2016 Reference Guide, David Planchard, 2015.	
Students obligations	Completed laboratory exercises and tasks	
Knowledge evaluation during semester	2. midterm exams	
Knowledge evaluation after semester	Written exam	
Student activities:	Aktivnost (Constantly tested knowledge) (Oral exam)	ECTS 3 2
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
Proposal made by	Ivor Marković , mag. ing.	

Code WEB/ISVU	23315/146766	**ECTS**	6.0	**Academic year**	2018/2019
Name	Advanced Control Systems				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. mr.sc. Davor Gadže Lectures:2. mr. sc. Ivan Mišković dipl. ing. pred. Laboratory exercises:mr.sc. Davor Gadže Laboratory exercises:mr. sc. Ivan Mišković dipl. ing. pred.				
Course objectives	students will acquire knowledge of advanced algorithms in control and regulation systems and their implementation in the industrial plant automation				
Learning outcomes:	1.lead projects where involving advance control systems. Level:6,7 2.ability to classify linear and non-linear regulation systems of plants and processes. Level:6,7 3.ability to develop a controller for certain non-linear processes. Level:7 4.ability to estimate a suitable adaptive control system for a particular process. Level:6,7 5.ability to integrate a control system based on adaptive, fuzzy control and neuro algorithms. Level:7				
Methods of carrying out lectures	Ex cathedra teaching Simulations Modelling Discussion				
Methods of carrying out laboratory exercises	Laboratory exercises, computer simulations Computer simulations				
Course content lectures	1.Introduction, 2h, Learning outcomes:1,2,3,4 2.State space mathematical models, 2h, Learning outcomes:1,2 3.Controllability and observability. LQ regulator. , 2h, Learning outcomes:1,2 4.State estimation., 2h, Learning outcomes:1,2,4 5.Adaptive controllers, 2h, Learning outcomes:1,2,3,4 6.Gain scheduling regulators, 2h, Learning outcomes:2,3,4 7.Controllers with feed forward signals. , 2h, Learning outcomes:2,3,4 8.Adaptive Controllers with reference model . , 2h, Learning outcomes:2,3,4 9.Choice of the regulator structure - process description, 2h, Learning outcomes:2,3 10.SCADA in Control Engineering, 2h, Learning outcomes:2,3 11.Fuzzy control - Introduction, 2h, Learning outcomes:1,2 12.Fuzzy control design, 2h, Learning outcomes:3,4 13.Fuzzy control - examples, 2h, Learning outcomes:3,4 14.Artificial Neural Networks, 2h, Learning outcomes:3,4 15.Artifical Neural Control Design, 2h, Learning outcomes:3,4				
Course content laboratory	1.Matlab Introduction, 2h, Learning outcomes:1 2.Matlab - basic function, 2h, Learning outcomes:1 3.Matlab - programming, 2h, Learning outcomes:1 4.Simuink, 2h, Learning outcomes:1 5.Simulink - examples, 2h, Learning outcomes:1 6.Mathematical models development, 2h, Learning outcomes:1,2 7.Controllability and observability. LQ regulator. , 2h, Learning outcomes:1,2 8.State estimation - examples, 2h, Learning outcomes:1,2,3 9.Gain scheduling regulators - examples, 2h, Learning outcomes:2,3 10.Adaptive Controllers with reference model - examples, 2h, Learning outcomes:2,3 11.MATLAB Fuzzy Tool - Introduction, 2h, Learning outcomes:2,3 12.MATLAB Fuzzy Tool - examples 1, 2h, Learning outcomes:1,2 13.MATLAB Fuzzy Tool - examples 2, 2h, Learning outcomes:1,2,4 14.MATLAB Neuro Tool - Introduction, 2h, Learning outcomes:1,2 15.MATLAB Neuro Tool - examples, 2h, Learning outcomes:1,2,4				
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory Overhead projector				
Exam literature	1. Z. Vukić, Lj. Kuljača; Automatsko upravljanje - analiza linearnih sustava; Kigen d.o.o.; 2004. 2. K.J. Astrom; B. Wittenmark; Adaptive Control; Dover Publication; 2008. 3. D. Đonlagić: Neizraziti regulatori; FER-ZaiPR. 2001. 4. I. Petrović, M. Baotić, N. Perić; Inteligentni sustavi upravljanja: Neuronske mreže, evolucijski i genetički algoritmi, FER, 2011.				
Students obligations	regular class attendance				
Knowledge evaluation during semester	Kolokvij, numeri zadaci#1#50#50$Kolokvij, teorijska pitanja#1#20#50$Seminarski rad#1#30#50$				
Knowledge evaluation after semester	Written and oral part of the exam				

Student activities:	Aktivnost (Constantly tested knowledge)	ECTS 6
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	

Code WEB/ISVU	23313/146764	**ECTS**	5.0	**Academic year**	2018/2019
Name	Algorithm Theory				
Status	2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 90
Teachers	Lectures:1. Nikola Majstorović dipl.ing.				
Course objectives	students will understand the concept of algorithm, its recording and analyzing and will be familiar with complexities of algorithms and general techniques for their construction				
Learning outcomes:	1.ability to suggest a suitable data type and /or data structure to describe a problem . Level:6,7 2.ability to choose the most suitable of the available algorithms for a particular purpose. Level:7 3.ability to write in C algorithms precisely worded pseudo. Level:6,7 4.ability to compare complexity of different algorithms for the same problem. Level:6,7 5.ability to rearrange offered algorithms to meet specific requirements or simplifications. Level:6,7 6.ability to integrate familiar, available algorithms into a complex software solution. Level:6,7 7.ability to find out if suitable, already embedded types and algorithms exist in the language, libraries and development environment . Level:6,7				
Methods of carrying out lectures	Case studies Demonstration Discussion Questions and answers Seminar, students presentation and discussion				
Methods of carrying out auditory exercises	Laboratory exercises, computer simulations				
Course content lectures	1.Introducing to VS 2010 IDE., 2h, Learning outcomes:1 2.Visual Basic, C++, C#, J# and other supported programming languages, 2h, Learning outcomes:1,3 3.Templates for standard project, 2h, Learning outcomes:1,3 4.Basic controls used to build rich user interface, 2h, Learning outcomes:1,2 5.Basic data structures : stack, queue and list, 2h, Learning outcomes:1,2 6.Data bstructures heap and tree, 2h, Learning outcomes:1,2 7.Binary tree., 2h, Learning outcomes:3,4 8.Algorithm complexity. Big O notation., 2h, Learning outcomes:1,4 9.Sorts with quadratic complexity., 2h, Learning outcomes:1,4 10.Devide and conquer strategy., 2h, Learning outcomes:1,4 11.Sorts having logarithmic complexity O(n*ln(n))., 2h, Learning outcomes:1,4 12.Presentation of students seminar., 2h, Learning outcomes:1,4,7 13.Presentation of students seminar., 2h, Learning outcomes:1,4,7 14.Presentation of students seminar., 2h, Learning outcomes:1,4,7 15.Presentation of students seminar., 2h, Learning outcomes:1,4,7				
Course content auditory	1.Triangle. Heronova formula., 2h, Learning outcomes:1 2.Stack and list., 2h, Learning outcomes:1,2 3.Queue., 2h, Learning outcomes:1,2 4.Quadratic sort methods., 2h, Learning outcomes:1,2,4 5.Qick and merge sort., 2h, Learning outcomes:1,2,4 6.Binary tree., 2h, Learning outcomes:1,4 7.The system of linear equations - Gaussian elimination., 2h, Learning outcomes:1,4,6 8.no 9.no 10.no 11.no 12.no 13.Seminar papers presentation., 2h, Learning outcomes:1,3,5,6 14.Seminar papers presentation., 2h, Learning outcomes:1,3,5,6 15.Seminar papers presentation., 2h, Learning outcomes:1,3,5,6				
Required materials	Special purpose computer laboratory Whiteboard with markers Overhead projector Tools				
Exam literature	1. R. Manger, M. Marušić: Strukture podataka i algoritmi, skripta, 2. izdanje, PMF-MO, Zagreb, 2003. (URL: http://www.math.hr/nastava/spa/files/skripta.pdf) 2. T. Cormen, C.E. Leiserson, Introduction to algorithms, 2nd edition, MIT Press, 2001. 3. E. Petroutsos, Mastering Visual Basic .NET, Sybex, 2010 4. M. T. Goodrich, R. Tamassia, Algorithm design - Foundations, analysis, and Internet examples, John Wiley Sons, New York, 2002. 5. M. A. Weiss, Data structures and algorithm analysis in C, Addison Wesley, 1997. 6. E. Horowitz, S. Sahni, S. Rajasekaran: Computer algorithms / C++, Computer Science Press, New York, 1997.				
Students obligations	submitted and positively graded design assignment				

Knowledge evaluation during semester	Redovitost pohaa#10#10#50$Programski zadatak#4#90#90$
Knowledge evaluation after semester	Pismeni ispit#1#50#50$Usmeni ispit#1#50#50$
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22610;

Code WEB/ISVU	23303/146751	**ECTS**	5.0	**Academic year**	2018/2019
Name	Applied Statistics				
Status	1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 90
Teachers	Lectures:1. Maja Pauković Auditory exercises: Maja Pauković				
Course objectives					
Remark	This course can not be used for final thesis theme				
Prerequisites:	No prerequisites.				

Code WEB/ISVU	23300/146748	**ECTS**	4.0	**Academic year**	2018/2019
Name	Asset Management				
Status	1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+15 (15+0+0+0) 75
Teachers	Lectures:1. mr.sc. Sanja Bračun dipl.oec. Auditory exercises:mr.sc. Sanja Bračun dipl.oec.				
Course objectives	To empower a student to understand that Asset management is not a separate process, but an integrated part of every business system. As Asset management team members they will be responsible to solve potential challenges and in position to give constant improvements proposals. Through the lessons the student will be familiar with the process of procurement, use and maintenance of the property, as well as planning and investment processes and human resources importance. As Asset management team member the student will be in position to solve various problem situations under realistic market conditions.				
Learning outcomes:	1.Identify the role and place of asset management within the business system. Level:6 2.Link importance of planning process and market analysis in order to ensure successful asset management. Level:6,7 3.Key performance indicators comment of asset management over the lifetime. Level:6 4.Identify the sequence and understand the importance of investment project monitoring. Level:6 5.Critically evaluate results of analysis of use fixed assets and maintenance based on method of reliability of asset management. Level:7 6.Be prepared for active participation in processes of asset management within the business system. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Discussion The lessons are exhibited in a way that the theoretical framework combines with examples of practice and students are encouraged to give an overview of the examples they have come up with				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Interactive problem solving Workshop				
Course content lectures	1.Introduction, 5h, Learning outcomes:1 2.One stage amplifiers. Common emitter amplifier, 5h, Learning outcomes:2 3.One stage amplifiers. Common emitter amplifier 4.One stage amplifiers. Common emitter amplifier, 5h, Learning outcomes:3 5.One stage amplifiers. Common collector amplifier 6.Transistor series voltage regulator, 5h, Learning outcomes:4 7.Common source amplifier, 5h, Learning outcomes:5 8.Common drain amplifier, 5h 9.Multistage amplifiers 10.Amplitude and phase frequency response 11.Amplitude and phase frequency response 12.Differential amplifier 13.Power amplifiers 14.Feedback 15.Oscillators				
Course content auditory	1.Type and purpose of Assets and the Process of Asset Management Planning, 2h, Learning outcomes:1,2 2.Market Analysis Methods Applying, 2h, Learning outcomes:3 3.Cost and revenue analysis in process of performance indicators calculation , 2h, Learning outcomes:3 4.I colloquium , 1h, Learning outcomes:1,2,3 5.Practical application of process norms in Asset management , 2h, Learning outcomes:4 6.Investment project analysis, 2h, Learning outcomes:4,5 7.Faults and damage monitoring of Fixed assets during their life cycle, 3h, Learning outcomes:5,6 8.II colloquium , 1h, Learning outcomes:4,5,6 9.No lessons 10.No lessons 11.No lessons 12.No lessons 13.No lessons 14.No lessons 15.No lessons				
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory Overhead projector				
Exam literature	Obavezna literatura: 1.prof. dr.sc. Ivo Čala i ostali: Održavanje i gospodarenje imovinom, Hrvatsko društvo održavatelja, Zagreb, 2016. 2.dr.sc. Mladen Mauher i mr.sc. Sanja Bračun: Aktualne elektroničke mape nastavnika pripremljene za predavanja dostupne na LMS sustavu Preporučena literatura: 1.S. Duffuaa; A Raouf, Cham: e-book Planning and control of maintenance systems: modelling and analysis", Springer,				

	2015. 2.John Woodhouse: ISO 55000: Asset management What to do and why? 2014. 3.David G Cotts; Kathy O Roper; Richard P Payant, Chichester: e-book International facility management, West Sussex, United Kingdom, 2014. 4.Constantin May; Peter Schimek, Ansbach: Total productive management: fundamentals and introduction to TPM - or how to achieve operational excellence", CETPM Publ. 2014. 5.David G Cotts; Kathy O Roper; Richard P Payant: e-book The facility management handbook, New York: American Management Association, 2010. 6.D. J. VANIER, Asset management: "A to Z", Institute for Research in Construction, National Research Council Canada, 1200 Montreal Road, Ottawa, 2001.
Students obligations	70% of attendance on lessons and exercises
Knowledge evaluation during semester	1. st colloquium 2. nd colloquiumest
Knowledge evaluation after semester	Oral Exam (in case of non-fulfilment of 1st and 2nd colloquium conditions)
Student activities:	Aktivnost ECTS (Written exam) 2 (Oral exam) 2
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.

Code WEB/ISVU	23658/164212	**ECTS**	6.0	**Academic year**	2018/2019
Name	Automation Systems in Building Construction				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+15 (15+0+0+0) 135
Teachers	Lectures: Goran Belamarić viši predavač Auditory exercises: Goran Belamarić viši predavač				
Course objectives	students will acquire and apply basic knowledge of the standards of generic cabling in offices, industrial and residential premises and database centres				
Learning outcomes:	1.ability to plan a generic cabling system. Level:6,7 2.ability to construct a generic cabling system. Level:6,7 3.ability to write the terms of reference (TOR). Level:6,7 4.ability to evaluate a generic cabling system. Level:7 5.ability to verfy a generic cabling system. Level:7 6.ability to create/design a generic cabling system. Level:6,7 7.ability to select a generic cabling system. Level:6,7 8.Connect GCS with External Networks. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Demonstration Modelling Discussion Questions and answers Seminar, students presentation and discussion Homework presentation				
Methods of carrying out auditory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Group problem solving Traditional literature analysis Data mining and knowledge discovery on the Web Discussion, brainstorming Mind mapping Computer simulations Interactive problem solving Workshop Reference visit to customer site				
Course content lectures	1.Generic cabling systems introduction, 2h, Learning outcomes:1 2.Service oriented generic cabling systems , 2h, Learning outcomes:1 3.Standards and regulations of generic cabling systems EIA/TIA 568, ISO 11801, EN 50173, 2h, Learning outcomes:1 4.General standard EN 50173-1, 2h, Learning outcomes:1,2 5.Office premises cabling EN 50173-2, 2h, Learning outcomes:1,2 6.Industrial premises cabling EN 50173-3, 2h, Learning outcomes:1,2 7.Home and residential cabling EN 50173-4, 2h, Learning outcomes:1,2 8.Data cente cabling EN 50173-5, 2h, Learning outcomes:1,2 Distributed building services EN 50173-6, 2h, Learning outcomes:1,2 9.Development of specifications for cabling system and quality assurance EN 50174-1 , 2h, Learning outcomes:1,3,4 10.Installation planning and construction inside the buildings EN 50174-2 , 1h, Learning outcomes:1,3,4 11.Installation planning and construction on the building site EN 50174-3, 1h, Learning outcomes:1,3,4,7,8 12.Application of equipotential bonding and earthing in buildings with ICT equipment EN 50310, 1h, Learning outcomes:2,3,4,6,7 Requirements for resistance to interference with the equipment telecommunication connections (ports) CLC / TR 50450 , 1h, Learning outcomes:2,3,4,6 13.Measuring the installed structured cabling HRN EN 50346 , 2h, Learning outcomes:4 14.Cabling guidelines in support of 10 GBASE-T CLC / TR 50173-99-1 , 1h, Learning outcomes:5,6,7 Customer premises cabling for wireless access points HRI ISO / IEC / TR 24704, 1h, Learning outcomes:5,6,7,8 15.Other relevant HR standards, rules and recommendations for generic cabling, 2h, Learning outcomes:6,7,8				
Course content auditory	1.Getting familiar with CAD tool Microsoft Visio , 1h, Learning outcomes:1 2.House drawing in MS Visio, 1h, Learning outcomes:1 3.Getting know Panduit Visio Stencil, 1h, Learning outcomes:1 4.Getting know Panduit Visio Stencil generic cabling components, 1h, Learning outcomes:1 5.Home generic cabling design according to EN 50173-3 1st part, 1h, Learning outcomes:1,2,5 6.Home generic cabling design according to EN 50173-3 2nd part, 1h, Learning outcomes:1,2,5 7.Campus backbone cabling design, 1h, Learning outcomes:5,6,7 8.Building backbone design Example, 1h, Learning outcomes:1,2,5,6,7 9.Office premises cabling design, 1h, Learning outcomes:5 10.Zone cabling design, 1h, Learning outcomes:1,2,5 11.Projektiranje PoE, WAP, 1h, Learning outcomes:1,2,5,6,7 12.Telecommunication spaces and room design, 1h, Learning outcomes:1,2,5,7,8 13.Entrance facilities design, 1h, Learning outcomes:1,2,5,7,8 14.Copper cable installation, connection and testing , 1h, Learning outcomes:3,4 15.Fibre optic cable installation, connection and testing , 1h, Learning outcomes:3,4				

Required materials	Special purpose laboratory Special purpose computer laboratory Whiteboard with markers Overhead projector Tools Operating supplies Special equipment Reference visit to customer site
Exam literature	1. Goran Belamarić: Projektiranje elektroničke komunikacijske mrežne infrastrukture u poslovnim i stambenim zgradama, HKIE 2011; 2. Generičko kabliranje: grupa autora, Zagreb, Kigen 2010 3. Norme HRN EN 50173-1..6, HRN EN 50174-1..3, HRN EN 50098-1..2, HRN EN 50346, HRN EN 50310 4. Pravilnik o tehničkim uvjetima za elektroničku komunikacijsku mrežu poslovnih i stambenih zgrada, NN 155/2009. Proizvođačke brošure, upute i tehnički dokumenti
Students obligations	80% of class attendance, seminar work
Knowledge evaluation during semester	Regular attendance#10#0#80$, Preliminary Exam #1#60#60$, Seminar work#1#40#60$
Knowledge evaluation after semester	Teoretical exam#1#60#60$, Oral exam #1#30#60$, Seminar work#1#40#60$
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	60286;172324;
Proposal made by	Goran Belamarić, dipl. ing. el.

Code WEB/ISVU	23318/146769	**ECTS**	6.0	**Academic year**	2018/2019
Name	Automation Systems in Building Construction				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 120
Teachers	Lectures:1. dr.sc. Davor Petranović dipl.ing.el. Auditory exercises:dr.sc. Davor Petranović dipl.ing.el.				
Course objectives	students will acquire basic knowledge in the field of building automation system (BAS)				
Learning outcomes:	1.ability to formulate/create functional characteristics of the building automation system (smart homes, buildings and similar). Level:6,7 2.ability to classify the option of technological solutions to BAS. Level:6,7 3.ability to give critical estimation of final designs of the BAS projects. Level:7 4.ability to create final designs of the BAS projects. Level:6,7 5.ability to integrate different components and systems into a functional integral unit. Level:6,7 6.ability to choose suitable BAS solutions. Level:7 7.ability to present final designs of the BAS projects. Level:6,7 8.ability to evaluate final designs of the BAS projects. Level:7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion Seminar, students presentation and discussion Homework presentation				
Methods of carrying out auditory exercises	Laboratory exercises, computer simulations Group problem solving Computer simulations BAS system analyses				
Course content lectures	1.Basic concepts of building automation systems (BAS). Historical development of the BAS system, 2h, Learning outcomes:1 2.Classification of the BAS system by complexity and technical features (1). Organization and architecture (1), 2h, Learning outcomes:1 3.Components (1). Analog and digital inputs (1), 2h, Learning outcomes:2 4.Transducers (converters temperature, humidity, light, motion detectors, mechanical sensors), 2h, Learning outcomes:2 5.Actuators (electrical and mechanical), 2h, Learning outcomes:2 6.Smart sensors, 2h, Learning outcomes:2 7.Interfaces and connection component, 2h, Learning outcomes:3 8.Topology and network organization system, The central control unit Vs. distributed system, 2h, Learning outcomes:3 9.Communication protocols (BACnet, LON, KNX / EIB), 2h, Learning outcomes:3 10.Software support and user interface, 2h, Learning outcomes:3 11.Principles of BAS system design and optimization, 2h, Learning outcomes:6 12.Examples of different fields of application and function, 2h, Learning outcomes:8 13.BAS system maintenance , 2h, Learning outcomes:8 14.Introduction to , 2h, Learning outcomes:8 15.Integration of FM / BM and BAS system (1). Market analysis of supply and demand BAS system (1)., 2h, Learning outcomes:8				
Course content auditory	1.Examples and analysis of BAS systems of different functionality, scope and complexity, 2h, Learning outcomes:3 2.Examples and analysis of BAS systems of different functionality, scope and complexity, 2h, Learning outcomes:3 3.Designing BAS of different complexity degrees, 2h, Learning outcomes:4 4.Designing BAS of different complexity degrees, 2h, Learning outcomes:4 5. Optimizing the system with regard to functionality, specifications and price, 2h, Learning outcomes:8 6. Optimizing the system with regard to functionality, specifications and price, 2h, Learning outcomes:8 7.Project design and specifications of the system, 2h 8.Project design and specifications of the system, 2h 9.Demonstration on the demo system, 2h, Learning outcomes:4 10.Demonstration on the demo system, 2h, Learning outcomes:4 11.Demonstration on the demo system, 2h, Learning outcomes:4 12.Demonstration on the demo system, 2h, Learning outcomes:4 13.Demonstration on the demo system, 2h, Learning outcomes:4 14.Demonstration on the demo system, 2h, Learning outcomes:4 15.Demonstration on the demo system, 2h, Learning outcomes:4				
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory Overhead projector				
Exam literature	H. Michael Newman : Direct Digital Control of Building Systems: Theory and Practice, John Wiley Sons Inc, 1994 Reinhold A. Carlson, Robert A. Di Giandomenico: Understanding Building Automation Systems, RS Meand Company inc., 1992 Jim Sinopoli: Smart Buildings,Spicewood Publishing, 2006				

	ayControl, On-line manual	
Students obligations	80% of class attendance	
Knowledge evaluation during semester	Seminar paper	
Knowledge evaluation after semester	paper test #1#80#50$verbal exam#1#20#50	
Student activities:	Aktivnost (Written exam) (Oral exam)	ECTS 5 1
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
ISVU equivalents:	63186;146788;	
Proposal made by	MSEE Davor Petranović, senior lecturer	

Code WEB/ISVU	23302/146750	**ECTS**	4.0	**Academic year**	2018/2019
Name	Bussiness Ethics and Law				
Status	1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+15 (15+0+0+0) 75
Teachers	Lectures:1. Ljiljana Matuško Antonić Lectures:mr.sc. Sergej Lugović MBA Auditory exercises: Ljiljana Matuško Antonić				
Course objectives	Introduce students to the interest group management theory and teach them about basic notions of civil law.				
Methods of carrying out lectures	Case studies Discussion Questions and answers Seminar, students presentation and discussion Interactive lessons.				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Practice courses in real life situations.				
Course content lectures	1.Introduction to Civil Law, 2h 2.Principles of Civil Law, 2h 3.The subjects and objects of civil right, 2h 4.Introduction to the law of obligations, 2h 5.Subjects civil obligations relations, 2h 6.Objects civil obligations relations, 2h 7.Reinforcement of civil obligations relations, 2h 8.The sales contract, Services contract, 2h 9.Construction contract, 2h 10.Loan Agreement, 2h 11.The agency agreement, 2h 12.Termination of an obligation relations, 2h 13.Introduction to business ethics, principles, 2h 14.Convention on Human Rights, 2h 15.The right to freedom of speech, work, family life, 2h				
Course content auditory	1.Protection of private life, 2h 2.The responsibilities of the contractor, 2h 3.The banking secret, 2h 4.The right buyer, 2h 5.Relatively be invalid contracts, 2h 6.Legal actions for determining ownership, 2h 7.Odgovornost za nedostatke stvari, 2h 8.The sales contract, 2h 9.Construction contract, 2h 10.Loan Agreement, 2h 11.The agency agreement, 2h 12.Liability for Damage, 2h 13.Breach of contract, 2h 14.Ineffectiveness of contract, 2h 15.Services contract, 2h				
Required materials	Whiteboard with markers Overhead projector Practice courses in real life situations.				
Exam literature	1. Hans Jonas, The Imperative of Responsibility, The University of Chicago Press 2. Funky Business Kapital pleše samo s darovitima, Kjell A. Nordstrm Jonas Ridderstr#229;le (Differo) 3. Etika u gospodarstvu : (religije, moral, poslovanje) / Tibor Karpati (Ekonomski fakultet u Osijeku) 4. Business Ethics: Readings and Cases in Corporate Morality, / W. Michael Hoffman, Robert E Frederick, Mark Schwartz (McGraw-Hill Humanities) 5. http://www.kurzweilai.net/ 6. Građansko pravo: Martin Vedriš, Petar Klarić, Narodne novine 2003 7. Stvarno pravo: Nikola Gavella, Tatjana Josipović, Igor Gliha, Vlado Belaj, Zlatan Stipković				
Students obligations	maximum of 3 absences from exercises				
Knowledge evaluation during semester	Seminarski rad#1#20#0$Usmena provjera znanja#1#80#0$				
Knowledge evaluation after semester	Writing a paper on subject and exam.				
Student activities:	Aktivnost (Classes attendance) (Written exam)		ECTS 1 3		
Remark	This course can be used for final thesis theme				
Prerequisites:	No prerequisites.				

ISVU equivalents:	22663;63931;63932;63933;132265;200529;

Code WEB/ISVU	23316/146767	**ECTS**	6.0	**Academic year**	2018/2019
Name	Design and construction of power plants				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+0+0+30) 120
Teachers	Lectures:1. mr.sc. Davor Gadže Lectures:2. Tomislav Špoljarić d. i. e., v. pred. Construction exercises:mr.sc. Davor Gadže Construction exercises: Mario Ličanin Construction exercises: Tomislav Špoljarić d. i. e., v. pred.				
Course objectives	students will acquire knowledge of establishing, designing and constructing electric power plant				
Learning outcomes:	1.ability to determine the energy requirements of electric power plant. Level:7 2.ability to select the elements of protection against overload inelectric power plant. Level:7 3.ability to select the elements of protection against indirect contact in electric power plant. Level:7 4.ability to design a scheme of the electric power plant control. Level:6,7 5.ability to write project documentation of electric power plant. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Discussion Questions and answers Seminar, students presentation and discussion				
Course content lectures	1.Industrial plant - material, energy and information flow., 2h, Learning outcomes:1 2.Engineering approach to analysis and synthesis of the plant., 2h, Learning outcomes:1 3.Laws, regulations and standards in design (IEC, ISO, HRN)., 2h, Learning outcomes:1 4.Stages of plant construction: project, installation, commissioning and operating., 2h, Learning outcomes:1,4,5 5.Tehni dokumentacija za pojedine faze., 2h, Learning outcomes:1,4,5 6.Energy requirements, power supply and quality., 2h, Learning outcomes:1 7.Reactive power control. High harmonic sources and filtering., 2h, Learning outcomes:1,4,5 8.Protection of staff and equipment in the plant., 2h, Learning outcomes:1,3,4,5 9.Protection against voltage shock., 2h, Learning outcomes:1,3,4,5 10.Earthing and potential equalizing., 2h, Learning outcomes:1,3,4,5 11.Protection against short circuits., 2h, Learning outcomes:1,2,3,4,5 12.Protection against overload., 2h, Learning outcomes:1,2,3,4,5 13.Safety working conditions: mechanical protection., 2h, Learning outcomes:1,4,5 14.Safety working conditions: cooling., 2h, Learning outcomes:1,4,5 15.Plant testing and commissioning , 2h, Learning outcomes:1,4,5				
Course content constructures	1.no classes, 2h 2.no classes, 2h 3.no classes, 2h 4.no classes, 2h 5.no classes, 2h, Learning outcomes:1,2,4,5 6.Organization of project documentation, 3h, Learning outcomes:1,2,4,5 7.Organization of project documentation, 3h, Learning outcomes:1,2,4,5 8.forms, 3h, Learning outcomes:4,5 9.the installation site, 3h, Learning outcomes:4,5 10.marking, 3h, Learning outcomes:4,5 11.symbols, 3h, Learning outcomes:2,3,4,5 12.wires, 3h, Learning outcomes:4,5 13.cables, 3h, Learning outcomes:2,3,4,5 14.layout of equipment, 3h, Learning outcomes:4,5 15.reporting, 3h, Learning outcomes:4,5				
Required materials	General purpose computer laboratory Special equipment				
Exam literature	1. A. D. Wilkoks: Engineering design for Electrical Engineers, Prentice Hall. 1990. 2 Electrical installation guide According to IEC Standards 2010; Schneider Electric SAS, Rueil-Malmaison Cedex, France. 2. Westermannov elektrotehnički priručnik; Školska knjiga, Zagreb 1991. 3 Tehnički priručnik; Končar elektroindustrija dd Zagreb, 1991. 4. EPLAN, CADdy, WsCAD upute za korištenje				
Students obligations	classes pressence				
Knowledge evaluation during semester	pressence 10 seminar 40 oral exam 50				
Knowledge evaluation after semester	seminar 40 oral exam 60				
Student activities:	Aktivnost (Constantly tested knowledge)		ECTS 6		
Remark	This course can be used for final thesis theme				
Prerequisites:	No prerequisites.				

Proposal made by	Mr. sc. Davor Gadže, viši predavač

Code WEB/ISVU	23296/146744	**ECTS**	4.0	**Academic year**	2018/2019
Name	Digital economy				
Status	1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+15 (15+0+0+0) 75
Teachers	Lectures:1. dr.sc. Joško Lozić Lectures:2. mr.sc. Sanja Bračun dipl.oec. Auditory exercises:mr.sc. Sanja Bračun dipl.oec. Auditory exercises:dr.sc. Joško Lozić Auditory exercises:mag.oec Kristina Perec				
Course objectives	The aim of the course is to introduce students with the development of digital economy in the platform economy model				
Learning outcomes:	1.Compare old and new factors that determine economic development in the platform economy. Level:6,7 2.Formulate the underlying concepts associated with the development of the platform economy. Level:6,7 3.Formulate the underlying factors that determine the difference between the classic linear and circular model of production. Level:6,7 4.Assess the underlying factors that affect the economic trends in the post-industrial society. Level:6,7 5.Compare old and new factors that determine economic development in the platform economy. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion Questions and answers				
Methods of carrying out auditory exercises	Traditional literature analysis Essay writing Discussion, brainstorming				
Course content lectures	1.Defining the business model of the platform economy, 2h, Learning outcomes:1 2.Defining changes within the industry under the influence of the platform economy, 2h, Learning outcomes:1 3.The process of transforming a classic linear business into a platform model. Platform model, 2h, Learning outcomes:2 4.Capitalization of a company from a platform model. The value of brands from the platform economy model, 2h, Learning outcomes:2 5.Colloquium, 2h, Learning outcomes:2 6.The platform strategy is not a software strategy. Historical Review of Strategies, 2h, Learning outcomes:3 7.Linear business model. A platform-based business model, 2h, Learning outcomes:3 8.Platforms change industrial environments, 2h, Learning outcomes:4 9.Architecture platform. Network effect, 2h, Learning outcomes:4 10.Colloquium, 2h, Learning outcomes:4 11.Platform launch models, 2h, Learning outcomes:4 12.Metrics on platforms, 2h, Learning outcomes:5 13.Management Platform Strategies, 2h, Learning outcomes:5 14.Monetization on platforms, 2h, Learning outcomes:5 15.Colloquium, 2h, Learning outcomes:5				
Course content auditory	1.Explain and put into context the development of economic systems through history, 2h, Learning outcomes:1 2.Explain the basics of the development of different models of the economy of the platform, 2h, Learning outcomes:1 3.Determining key management strategies in the process of transforming classical linear business into a platform economy model, 2h, Learning outcomes:2 4.Determining the key factors that have affected the change of business paradigm, 2h, Learning outcomes:2 5.Determining Key Factors Affecting the Value of Brands in Platform Economics, 2h, Learning outcomes:2 6.Determining Key Factors Affecting Managerial Processes Managing the , 2h, Learning outcomes:3 7.Evaluate and analyze the underlying factors that affect the architecture of the platform, 2h, Learning outcomes:3 8.Evaluate and analyze the underlying factors that affect building network effect, 2h, Learning outcomes:4 9.Evaluate and identify the underlying factors that affect platform launch strategies, 2h, Learning outcomes:4 10.Evaluate and Identify Fundamental Factors Determining the Power of Network Effect After Launching Platforms, 2h, Learning outcomes:4 11.Evaluate the underlying metric factors in the different phase metrics on platforms, 2h, Learning outcomes:4 12.Evaluate the underlying factors in the growth and maturity of the platform, 2h, Learning outcomes:5 13.Evaluate the underlying factors in the growth and maturity of the platformi , 2h, Learning outcomes:5 14.Evaluate the underlying factors of ecosystem development as a management strategy, 2h, Learning outcomes:5 15.Determining the underlying factors that affect the monetization method on the platform, 2h, Learning outcomes:5				
Required materials	Whiteboard with markers				
Exam literature	Obvezatna literatura: 1. Parker, G.G.; Van Alstyne, M.W.; Choudary, S.P. (2016) Platform Revolution: How Networked Markets are Transforming the Economy and How to Make Them Work for You, W.W. Norton Company Ltd. 2.Tapscott, D.,The Digital Economy Anniversary Edition: rethinking promise and peril in the age of networked intelligence,McGrow-Hill Education,978-0-07-183555-8,2015 Neobvezatna literatura: 1. Moazed, A.; Johnson, N.L. (2016) Modern Monopolies What it takes to Dominate the 21st Century Economy, Applico, LLC				
Students obligations	Attendance at lectures; seminar work				

Knowledge evaluation during semester	Colloquium	
Knowledge evaluation after semester	Written exam	
Student activities:	Aktivnost	ECTS
	(Classes attendance)	1
	(Written exam)	1
	(Essay)	1
	(Seminar Work)	1
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
Proposal made by	PhD Joško Lozić	

Code WEB/ISVU	23326/146777	**ECTS**	6.0	**Academic year**	2018/2019
Name	Digital Image Processing				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 120
Teachers	Lectures: Milan Bajić Lectures:Prof.dr.sc. Slavica Ćosović Bajić Lectures: Sanja Kraljević , dipl.ing., v. pred. Auditory exercises: Milan Bajić Auditory exercises:Prof.dr.sc. Slavica Ćosović Bajić Auditory exercises: Tamara Ivelja mag. ing. geod. et. geoinf. Auditory exercises: Sanja Kraljević , dipl.ing., v. pred.				
Course objectives	To transfer to students the technical knowledge related to digital processing and analysis of image				
Learning outcomes:	1.ability to formulate the possibilities of digital image processing implementation . Level:6,7 2.ability to choose the area of implementation, depending on a course module chosen. Level:7 3.ability to generate new information as a result of a processing . Level:6,7 4.ability to choose open source programs and present images related to the area chosen. Level:7 5.ability to provide a critical review of the possibilities of implementation of various programs (ImageJ, IrAnalyser, FLIR Researcher, TNTmipsFree,Multispec). Level:7 6.ability to propose procedures of a quantity based digital image processing. Level:6,7 7.ability to interpret images for various engineering needs. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Simulations				
Methods of carrying out auditory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Group problem solving Data mining and knowledge discovery on the Web Computer simulations				
Course content lectures	1.Digital images, definitions, formats, analysis of the characteristics., 4h, Learning outcomes:1,2 2.Digital images, definitions, formats, analysis of the characteristics., 2h, Learning outcomes:1,2 3.Electro optical digital cameras and principles imaginary acquisitions. Multispectral, hyperspectral and thermal IR sensors., 4h, Learning outcomes:4 4.Principles and methods of global and local processing and image analysis. Enrichment, filtering, extraction and reduction., 4h, Learning outcomes:3,4 5.Principal component analysis. Image Compression. Basic methods of classification. The spatial transformation., 4h, Learning outcomes:3,4 6.The application of image processing in the industry, radars, surveillance systems in buildings, and in space., 4h, Learning outcomes:1,2,7 7.The application of software for processing and analyzing images., 4h, Learning outcomes:1,2,4,5 8.HTML5 image processing., 2h, Learning outcomes:6,7 9.Keras and Tensorflow in digital image processing, 2h, Learning outcomes:2,3 10.No classes. 11.No classes. 12.No classes. 13.No classes. 14.No classes. 15. No classes.				
Course content auditory	1.No classes. 2.No classes. 3.No classes. 4.No classes. 5.No classes. 6.No classes. 7.No classes. 8.Digital images, definitions, formats, analysis of the characteristics., 1h, Learning outcomes:1,2 9.Digital images, definitions, formats, analysis of the characteristics., 2h, Learning outcomes:1,2 10.Electro optical digital cameras and principles imaginary acquisitions. Multispectral, hyperspectral and thermal IR sensors., 2h, Learning outcomes:4 11. Principles and methods of global and local processing and image analysis. Enrichment, filtering, extraction and reduction., 2h, Learning outcomes:3,4 12. Principal component analysis. Image Compression. Basic methods of classification. The spatial transformation., 2h, Learning outcomes:3,4 13.The application of image processing in the industry, radars, surveillance systems in buildings, and in space., 2h, Learning outcomes:1,2,7 14.The application of software for processing and analyzing images., 2h, Learning outcomes:1,2,4,5 15.The application of software for processing and analyzing images., 2h, Learning outcomes:1,2,4,5				
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory Whiteboard with markers Overhead projector				

	Video equipment
Exam literature	1. Jain A. K. 1989. Fundamentals of Digital Image Processing, Prentence /Hall 2. T.M. Lillesand, R.W. Kiefer, Remote sensing and image interpretation, III-rd edition, John Wiley and Sons, New York, 1994. 3. J. A. Richards, J. Xiuping, Remote Sensing Digital Image Analysis, An Introduction, Berlin, 1999. 4. G. C. Holst, CCD arrays, cameras and displays, SPIE Optical Engineering Press, Bellingham, USA, 1996 5. R. Steinmetz, K. Nahrstedt - Multimedia Applications (University of Illinois, Department of computer science)
Students obligations	Done exercises, defined project / seminar task
Knowledge evaluation during semester	Redovitost pohaa#10#10#30$Seminarski rad#1#90#70$
Knowledge evaluation after semester	Seminarski rad#1#100#70$
Student activities:	Aktivnost ECTS (Constantly tested knowledge) 2 (Project) 2 (Oral exam) 2
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
Proposal made by	01.06.2017.

Code WEB/ISVU	23327/146778	**ECTS**	6.0	**Academic year**	2018/2019
Name	Digital Signal Processors				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 120
Teachers	Lectures:dr.sc. Predrag Valožić prof. vis. šk. Auditory exercises:dr.sc. Predrag Valožić prof. vis. šk.				
Course objectives	students will understand the DSP architecture; practise certain applications				
Learning outcomes:	1.ability to generate harmonic, periodic and random signal with defined properties generated in real time. Level:6,7 2.ability to develop a complex algorithm of linear and non-linear signal processing in real time. Level:6,7 3.ability to measure the properties of the modelled digital system. Level:7 4.ability to design digital filters. Level:6,7 5.ability to integrate several signal processing procedure into a complex one. Level:6,7 6.ability to design a digital signal processing system. Level:6,7 7.ability to choose optimal parameters of a complex system of digital and hybrid signal processing. Level:6,7 8.ability to identify the output signal characteristics of a part and of the complex DSP system. Level:7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Simulations Modelling Workshop-like teaching is performed by oral lecturing and laboratory exercises integration. Individual student work is completed with a peer-to-peer collaboration or an ad-hoc interest group.				
Methods of carrying out auditory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Group problem solving Computer simulations Workshop				
Course content lectures	1.Introduction to the course; Presentation of the students, 2h 2.Defining the project with discussion, 2h, Learning outcomes:5,6 3.Project building and analysis of components, 2h, Learning outcomes:2,5,6,7 4.Discussion on generating auxiliary signal; case study, 2h, Learning outcomes:1,7,8 5.Discussion on conditioning the input signal; case study, 2h, Learning outcomes:4,7,8 6.Discussion on processing in the transmitter; case study, 2h, Learning outcomes:2,3,5,6,7 7.Discussion on the model and algorithm of the transmission system; case study, 2h, Learning outcomes:5,6,7 8.Discussion on processing in the receiver; case study, 2h, Learning outcomes:2,3,7 9.Predict the characteristics of the modeled digital systems; specify testing methods, 2h, Learning outcomes:3,8 10.Analysis of diversity in DSPs family , 2h, Learning outcomes:8 11.Special algorithms FFT and DCT, 2h, Learning outcomes:7 12.Analysis of DSP applications, 2h, Learning outcomes:7,8 13.Project presentation with discussion, 2h, Learning outcomes:6,7,8 14.Project presentation with discussion, 2h, Learning outcomes:6,7,8 15.Project presentation with discussion, 2h, Learning outcomes:6,7,8				
Course content auditory	1.Presentation of the students and check their knowledge and skills essential for DSP, 2h 2.Defining the project with discussion, 2h, Learning outcomes:5,6 3.Project building and analysis of components, 2h, Learning outcomes:2,5,6,7 4.Discussion on generating auxiliary signal; case study, 2h, Learning outcomes:1,7,8 5.Discussion on conditioning the input signal; case study, 2h, Learning outcomes:4,7,8 6.Discussion on processing in the transmitter; case study, 2h, Learning outcomes:2,3,5,6,7 7.Discussion on the model and algorithm of the transmission system; case study, 2h, Learning outcomes:5,6,7 8.Discussion on processing in the receiver; case study, 2h, Learning outcomes:2,3,7 9.Predict the characteristics of the modeled digital systems; specify testing methods, 2h, Learning outcomes:3,8 10.Analysis of diversity in DSPs family , 2h, Learning outcomes:8 11.Special algorithms FFT and DCT, 2h, Learning outcomes:7 12.Analysis of DSP applications, 2h, Learning outcomes:7,8 13.Project presentation with discussion, 2h, Learning outcomes:6,7,8 14.Project presentation with discussion, 2h, Learning outcomes:6,7,8 15.Project presentation with discussion, 2h, Learning outcomes:6,7,8				
Required materials	Basic: classroom, blackboard, chalk... Special purpose computer laboratory Overhead projector				
Exam literature	Basic literature: 1. Steven W. Smith, The Scientist and Engineer's Guide to Digital Signal Processing, na http://www.dspguide.com/ Additional literature: 1. Sanjit K. Mitra, Digital Signal Processing, A Computer Based Approach, The McGraw-Hill Companies, Inc. 1998 2. C6000 Teaching Materials, Texas Instruments, 2002. 3. Samuel D. Stearns, Ruth A. David, Signal Processing Algorithms in Matlab, Prentice-Hall, Inc. 1996 4. A.V.Oppenheim R.W.Schafer, Discrete Time Signal Processing, Prentice-Hall, 1992. 5. D.F.Elliott: Handbook of Digital Signal Processing, Academic, 1987.				
Students obligations	Regularity and activity				

Knowledge evaluation during semester	Regular attendance 10 percent Activity in class 40 percent Programming example 50 percent	
Knowledge evaluation after semester	Students work evaluation. Exercises presentation. Exam project presentation.	
Student activities:	Aktivnost (Classes attendance) (Activity in class) (Constantly tested knowledge) (Seminar Work) (Report)	ECTS 1 1 2 1 1
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
Proposal made by	PhD Predrag Valožić prof. May, 31. 2013	

Code WEB/ISVU	23297/146745	**ECTS**	5.0	**Academic year**	2018/2019
Name	Electric energy conversions				
Status	1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				45+15 (15+0+0+0) 90
Teachers	Lectures:1. Ivor Marković , mag. ing. Auditory exercises: Ivor Marković , mag. ing.				
Course objectives	students will acquire knowledge in the field of energy conversion and power converters				
Learning outcomes:	1.To classificate dc converters and rectifiers depending on source and load types. Level:6,7 2.To chose appropriate dc converter for specific purpose. Level:7 3.To chose appropriate rectifier for specific purpose. Level:7 4.To compare transformer models depending on transformer's function in electrical circuit. Level:6,7 5.To classificate electrical machines depending on their structure and purpose. Level:6,7 6.To confirm energy conservation law in transformers, power converters and electrical machines. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Discussion Questions and answers				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Other Analysis of typical examples				
Course content lectures	1.Electrical component and network properties. Energy, power, effective and average value, time-invariant and time-varying components and networks., 3h, Learning outcomes:1,2,3,4,6 2.Electrical component and network properties. Linearity and nonlinearity, activity and passivity, electrical energy storage., 3h, Learning outcomes:1,2,3,4,6 3.Electrical component and network properties. Controllable and uncontrollable semiconductor switches. Commutation., 3h, Learning outcomes:1,2,3,4,6 4.First and second order electrical circuits. Zero-input and zero-state responses. Energy considerations., 3h, Learning outcomes:1,2,3,6 5.Periodical steady-state. Sinusoidal and nonsinusoidal steady-state. Three-phase system., 3h, Learning outcomes:1,3,6 6.Transformer. Ideal and real transformer., 3h, Learning outcomes:3,4,6 7.Transformer. Use of transformers in transmission and distribution of electrical energy. Power converters., 3h, Learning outcomes:3,4,6 8.Buck, boost and flyback DC converters., 3h, Learning outcomes:1,2,6 9.Four-quadrant DC converter. Rectifiers. Rectifiers with inductive and capacitive load., 3h, Learning outcomes:1,2,3,6 10.Rectifiers with inductive and capacitive load. ACDC converter inverter mode of operation. Voltage inverter., 3h, Learning outcomes:3,6 11.Electrical machines. DC machines., 3h, Learning outcomes:2,5,6 12.Synchronous machines., 3h, Learning outcomes:2,5,6 13.Asynchronous machines., 3h, Learning outcomes:2,5,6 14.Synchronous machines., 3h, Learning outcomes:5,6 15.Synchronous machines., 3h, Learning outcomes:5,6				
Course content auditory	1.Electrical component and network properties., 1h, Learning outcomes:1,2,3,4,6 2.Commutation., 1h, Learning outcomes:2,3,6 3.First and second order electrical circuits., 1h, Learning outcomes:1,2,3,6 4.Phasor calculus., 1h, Learning outcomes:6 5.Transformer. Ideal and real transformer., 1h, Learning outcomes:4,6 6.Buck, boost, flyback and four-quadrant DC converters., 1h, Learning outcomes:1,2,6 7.Buck, boost, flyback and four-quadrant DC converters., 1h, Learning outcomes:1,2,6 8.Rectifiers with inductive and capacitive load., 1h, Learning outcomes:3,6 9.Rectifiers with inductive and capacitive load., 1h, Learning outcomes:3,6 10.Voltage inverter., 1h, Learning outcomes:6 11.DC machines., 1h, Learning outcomes:2,5,6 12.Synchronous machines., 1h, Learning outcomes:2,5,6 13.Synchronous machines., 1h, Learning outcomes:5,6 14.Synchronous machines., 1h, Learning outcomes:5,6 15.Synchronous machines., 1h, Learning outcomes:5,6				
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector				
Exam literature	I.Flegar, Elektronički energetski pretvarači, Kigen, Zagreb, 2010 V.Mikuličić, Z.Šimić, Energijske tehnologije FER, Zagreb 2011. L.M. Piotrovskij, Električki strojevi, Tehnička knjiga, Zagreb, 1974. T. Kelemen, Transformatori, Tehnička enciklopedija, knjiga 13, Leksikografski zavod "Miroslav Krleža", Zagreb, str. 148-168, 1997.				
Students obligations	80% of class attendance.				
Knowledge	Kolokvij, numeri zadaci#3#75#0$Kolokvij, teorijska pitanja#3#25#0$				

evaluation during semester		
Knowledge evaluation after semester	Written exam - 50%. Oral exam - 50%.	
Student activities:	Aktivnost (Written exam)	ECTS 5
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
ISVU equivalents:	95597;	
Proposal made by	Željko Stojanović	

Code WEB/ISVU	23337/146852	**ECTS**	5.0	**Academic year**	2018/2019
Name	Electrical Equipment Design Basics				
Status	2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+0 (0+0+0+0) 120
Teachers	Lectures:1. Željko Stojanović				
Course objectives	students will acquire knowledge of specific features of electrical equipment design				
Learning outcomes:	1.ability to rank criteria for evaluating the solutions . Level:7 2.ability to formulate/write technical specification of the equipment. Level:6,7 3.ability to chose parameters important for the equipment design. Level:7 4.ability to evaluate different calculation methods. Level:7 5.ability to give critical evaluation of the personal role and the role of other members in the engineering team . Level:7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Modelling Discussion Questions and answers Seminar, students presentation and discussion Other All topics are explained and illustrated by means of characteristic examples.				
Course content lectures	1.Engineering. Engineering methods., 2h, Learning outcomes:1,2,3,4,5 2.Engineering methods. Electrical equipment design principles., 2h, Learning outcomes:1,3,4,5 3.Electrical equipment design principles., 2h, Learning outcomes:1,2,3,5 4.Phases of electrical equipment design., 2h, Learning outcomes:1,5 5.Phases of electrical equipment design., 2h, Learning outcomes:1,2,3,5 6.Phases of electrical equipment design., 2h, Learning outcomes:1,2,3,5 7.Design directives. Internal technical specifications., 2h, Learning outcomes:2,3 8.Design directives. Components, circuits and devices. , 2h, Learning outcomes:1 9.Design directives. Components, circuits and devices. Documentation., 2h, Learning outcomes:1,2,3 10.Design directives. Documentation. Analysis procedure. Types of analysis., 2h, Learning outcomes:2,3,4 11.Analysis procedure. Types of analysis. Mathematical models., 2h, Learning outcomes:1,3,4 12.Analysis procedure. Directives for analysis procedure. , 2h, Learning outcomes:3,4 13.General designers misconceptions. Cognitional types of misconceptions., 2h, Learning outcomes:1,2,3,5 14.General designers misconceptions. Cognitional types of misconceptions. Motivational and societal types of misconceptions., 2h, Learning outcomes:1,2,3,5 15.General designers misconceptions. Motivational and societal types of misconceptions., 2h, Learning outcomes:1,2,3,5				
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory General purpose computer laboratory Maquette Operating supplies Special equipment Electronic devices and measurement equipement				
Exam literature	Osnovna: 1. I. Flegar: Osnove projektiranja električkih uređaja, Element, Zagreb, 2016. Pomoćna: 1. M. T. Holtzapple, W.D. Reece: Foundations of engineering, McGraw Hill, Boston, 2003.				
Students obligations	80% of class attendance				
Knowledge evaluation during semester	Attendance. Seminary - optional.				
Knowledge evaluation after semester	Written exam and oral examination. More than 40% - pass Grades: - 0 - 39% #8594; 1 , not passed - 40 - 54% #8594; 2 , passed - 55 - 69% #8594; 3 , passed - 70 - 84% #8594; 4 , passed - 85 - 100% #8594; 5 , passed Seminar work in consultation with the teacher is optional.				
Student activities:	Aktivnost (Written exam) (Oral exam) (Classes attendance)		ECTS 2 2 1		
Remark	This course can be used for final thesis theme				
Prerequisites:	No prerequisites.				
Proposal made by	Željko Stojanović				

Code WEB/ISVU	23321/146772	**ECTS**	6.0	**Academic year**	2018/2019
Name	Electrical Machines				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				60+0 (0+0+0+0) 120
Teachers	Lectures:1. mr.sc. Veselko Tomljenović viši predavač				
Course objectives	students will acquire specialist knowledge in the field of electric rotating machines				
Learning outcomes:	1.ability to make a device for testing the special types of rotating machines . Level:6,7 2.ability to measure specific properties of different types of machines. Level:7 3.ability to give critical evaluation dynamic behaviour of different machines. Level:7 4.ability to choose optional solution to various requirements for the use of electrical machines . Level:7 5.ability to establish the quality of solution for the use of different machines. Level:7				
Methods of carrying out lectures	Ex cathedra teaching Discussion Questions and answers Seminar, students presentation and discussion All exposed materials are analized and discussed with students. Considerable part of the material will be taught through individual seminars.				
Course content lectures	1.Windings of synchronous machines., 4h, Learning outcomes:4 2.Windings of synchronous machines., 4h, Learning outcomes:4 3.Sudden short-circuit and reactances of synchronous machines , 4h, Learning outcomes:1 4.Sudden short-circuit and reactances of synchronous machines , 4h, Learning outcomes:1 5.Monitoring of synchronous machines., 4h, Learning outcomes:2,3 6.Monitoring of synchronous machines., 4h, Learning outcomes:2,3 7.Maintenance and life cycle management of synchronous machines., 4h, Learning outcomes:4 8.Regulations, design construction and types of mechanical protection of induction motors. , 4h, Learning outcomes:5 9.Regulations, design construction and types of mechanical protection of induction motors. , 4h, Learning outcomes:5 10.Heating and cooling of induction motors., 4h, Learning outcomes:5 11.Insulation tests of induction motor windings., 4h, Learning outcomes:2 12.Maintenance of induction motors. , 4h, Learning outcomes:4 13.Linear electric motors., 4h, Learning outcomes:5 14.Electrical step-motors., 4h, Learning outcomes:5 15.Electrical step-motors., 4h, Learning outcomes:5				
Required materials	Basic: classroom, blackboard, chalk... Overhead projector				
Exam literature	1. Z. Sirotić, Z. Maljković: Sinhroni strojevi, Fakultet elektrotehnike i računarstva, Element, Zagreb, 1996. 2. R. Wolf: Osnove električnih strojeva, Školska knjiga, Zagreb, 1995. 3. Tehnička enciklopedija Jugoslavenskog leksikografskog zavoda, članak ''Električni strojevi'', knjiga 4.,str. 153-225, Zagreb, 1973. 4. N. Srb: Magnetski monitoring električnih rotacijskih strojeva, Graphis, Zagreb, 2004. 5. Stephen D. Umans: FitzgeraldKingsley's Electric Machinery, Seventh Edition, McGraw-Hill International Edition, 2014				
Students obligations	Regular class attendance.				
Knowledge evaluation during semester	Mid-term, numerical tasks#2#50#40$Mid-term, theoretical questions#2#50#50$				
Knowledge evaluation after semester	- Seminar work in consultations with the teacher and using specialist literature - Oral examination on the seminar work				
Student activities:	Aktivnost (Classes attendance) (Seminar Work)		ECTS 1 5		
Remark	This course can be used for final thesis theme				
Prerequisites:	No prerequisites.				

Code WEB/ISVU	23306/146754	**ECTS**	5.0	**Academic year**	2018/2019
Name	Electrical Materials				
Status	2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+15 (0+15+0+0) 105
Teachers	Lectures:1. Marko Miletić Laboratory exercises: Marko Miletić				
Course objectives	students will acquire professional technical knowledge in the field of electrical engineering technologies and apply it in production engineering				
Learning outcomes:	1.compare the advantages and disadvantages of some newer technologies. Level:6,7 2.select appropriate materials for use in electrical technology. Level:7 3.ability to plan preparations for production of the electrical engineering products. Level:6,7 4.arrange the order of use of basic electrical technological processes. Level:6,7 5.suggest appropriate type of technology appropriate to the product being produced. Level:6,7 6.prepare the workplace appropriate to manufacturing process that is planned. Level:6,7 7.critically assess economics of the relevant electro-technology. Level:7 8.connect a range of technological activities in the production process. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Seminar, students presentation and discussion Lectures using multimedia presentations, and to illustrate current examples of practical application of electrical technology.				
Methods of carrying out laboratory exercises	Laboratory exercises, computer simulations Discussion, brainstorming Workshop Other Presentations of construction works				
Course content lectures	1.Introduction to electrical engineering technology, Electronic Components, Basic processes, Printed ties, preparing production el. modules, Movies, 8h, Learning outcomes:1,2,3,4,5,6,7,8 2.Automatic installation, Energy storage, 4h, Learning outcomes:1,2,3,4,5,6,7,8 3.Designing the signal and power conductors, Forming, installation and connection, 4h, Learning outcomes:1,2,3,4,5,6,7 4.Designing magnetic parts, capacitors and capacitive elements, 4h, Learning outcomes:1,2,3,4,5,6,7,8 5.Optoelectronic technology, Photovoltaics, Fuel Cells, 4h, Learning outcomes:1,2,3,4,5,6,7,8 6.Wireless sensor networks, optimization jobs, preparation of production, 4h, Learning outcomes:1,2,3,4,5,6,7,8 7.Nanotechnology, Production Systems supported computer, 4h 8.Presentations of construction works, 2h 9.no lectures 10.no lectures 11.no lectures 12.no lectures 13.no lectures 14.no lectures 15.no lectures				
Course content laboratory	1.no classes 2.Guided Tour through the Eagle, SCHEMATIC editor, 2h, Learning outcomes:1,2,3,4,5,6,7,8 3.Guided Tour through the Eagle, SCHEMATIC editor, 2h, Learning outcomes:1,2,3,4,5,6,7,8 4.Guided Tour through the Eagle, LAYOUT editor, 2h, Learning outcomes:1,2,3,4,5,6,7,8 5.Guided Tour through the Eagle, LAYOUT editor, 2h, Learning outcomes:1,2,3,4,5,6,7,8 6.Guided Tour through the Eagle, Defining library parts, Producing CAM data, 2h, Learning outcomes:1,2,3,4,5,6,7,8 7.Guided Tour through the Eagle, Defining library parts, Producing CAM data, 2h, Learning outcomes:1,2,3,4,5,6,7,8 8.Presentations of construction works, 3h, Learning outcomes:1,2,3,4,5,6,7,8 9.no classes 10.no classes 11.no classes 12.no classes 13.no classes 14.no classes 15.no classes				
Required materials	General purpose computer laboratory Whiteboard with markers Overhead projector				
Exam literature	1. Skripta na bazi predavanja 2. Uputstva za rad u programskom alatu za projektiranje tiskanih pločica Autodesk EAGLE 3. V. Bek: Tehnologija elektrotehničkog materijala, FER, Zagreb, 1999., skripta 4. B. Miletić Elektrotehnička tehnologija, lekcije 3. V. Bek P. Čatoš: Impregnacija namota električnih proizvoda 5. N. P. Bogoroditssky, V. V. Pasinkov, B. M. Tareev, Electrical Engineering Materials, Mir Publishers Moscow				
Students obligations	Committed and positively evaluated structural work Participate in making at least 1/3 of laboratory exercises Attendance at least one lecture				

Knowledge evaluation during semester	Regular attendance	
Knowledge evaluation after semester	written and oral exam	
Student activities:	Aktivnost	ECTS
	(Classes attendance)	1
	(Written exam)	1
	(Oral exam)	1
	(Project)	1
	(Activity in class)	1
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
Proposal made by	Marko Miletić, struč.spec.ing.el., 1.6.2018.	

Code WEB/ISVU	23319/146770	**ECTS**	6.0	**Academic year**	2018/2019
Name	Electrical Motor Drive Control				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (10+10+0+10) 120
Teachers	Lectures:1. Branko Tomičić Auditory exercises: Branko Tomičić Laboratory exercises: Branko Tomičić Construction exercises: Branko Tomičić				
Course objectives	students will acquire knowledge of controlled electric motor drives, their properties, possibilities and modern design applications				
Learning outcomes:	1.ability to specify requirements for controlled electric motor drive in industrial plants. Level:7 2.ability to assess the properties of the controlled speed electric motor drive and their impact on motor and power supply network. Level:7 3.ability to propose a control system of the torque (current) and the speed. Level:7 4.ability to select rated data of motor and frequency converter in the given static and dynamic operating conditions. Level:6,7 5.ability to compare properties of scalar and vector control systems of induction motor fed by variable voltage and frequency converter. Level:6,7 6.ability to justify the use of increased efficiency motor and the use of regulations by the standards of economy and energy savings. Level:7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Modelling Seminar, students presentation and discussion				
Methods of carrying out auditory exercises	Traditional literature analysis Computer simulations				
Methods of carrying out laboratory exercises	Laboratory exercises, computer simulations				
How construction exercises are held	Group problem solving Discussion, brainstorming				
Course content lectures	1.Definition of controlled electric drive. Energy and information flow , 3h, Learning outcomes:1 2.Types and properties of the controlled drives and applications , 3h, Learning outcomes:2 3.Drive system of DC motor with current, torque, speed and position control by armature voltage and field current setting. Adaptive control of current and speed , 3h, Learning outcomes:2 4.Control of asynchronous motor drive with current, voltage, and speed regulation, 3h, Learning outcomes:3 5.Control of synchronous motor drive with current, voltage, and speed regulation, 3h, Learning outcomes:3 6.Principles of energy conversion for AC motor drives., 3h, Learning outcomes:3,4 7.Dynamic model od DC motor. Simulations of transient phenomena. , 3h, Learning outcomes:2,3 8.Dynamic model od asynchronous motor. Simulations of transient phenomena. , 3h, Learning outcomes:2,3,4 9.Dynamic model od synchronous motor. Simulations of transient phenomena. , 3h, Learning outcomes:3,4 10.Theory of heating of motor, determination of equivalent parameters (current, torque, power), 3h, Learning outcomes:2,3,4 11.Electric drives in special operating conditions. 12.- 13.- 14.- 15.-				
Course content auditory	1.Examples of controlled DC motor. Settings of parameters, 2h, Learning outcomes:3,4 2.Examples of controlled asynchronous motor. Settings of parameters 3.Examples of controlled synchronous motor. Settings of parameters, 2h, Learning outcomes:4,5 4.Model of synchronous motor with constant field, 2h, Learning outcomes:4,5 5.Analiza svojstava vektorski reguliranog elektromotornog pogona s asinkronim motorom, 2h, Learning outcomes:4,5 6.Examples of choice of motor parameters in dynamic operation mode 7.krug struje uzbude (d komponente struje statora) i momenta (q komponenta struje statora), 2h, Learning outcomes:3,4,5 8.- 9.- 10.- 11.- 12.- 13.- 14.- 15.-				
Course content laboratory	1.- 2.Settings the controlled drive system of DC motor., 2h, Learning outcomes:1,2 3.Recording dynamic properties of the motor drive when changing the load.				

	4.- 5.- 6.- 7.- 8.-, 2h, Learning outcomes:4,5 9.Setting of the scalar and vector based asynchronous motor drive, 2h, Learning outcomes:4,5 10.Servo drive properties, 2h, Learning outcomes:4,5 11.NV 12.- 13.Comparison of the data and responses obtained by measurements by simulation on a model., 2h, Learning outcomes:3,4,5 14.- 15.-
Course content constructures	1.- 2.- 3.- 4.-, 2h 5.- 6.Motor drive elements selection acording to techncal process needs - , 2h, Learning outcomes:6 7.- 8.- 9.- 10.- 11.Calculate electrical values and parameters of drive elements., 2h, Learning outcomes:6 12.Mechanical and electrical values of motor drive in static and dynamic states, 2h, Learning outcomes:5 13.Selection of motor control system scalar, vector, sensorles. Draw up plans of complete drive system., 2h, Learning outcomes:5 14.- 15.Project presentation, 2h, Learning outcomes:6
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory Whiteboard with markers Overhead projector Maquette
Exam literature	W. Leonhard: Control of electrical Drives, Springer Verlag, 1996. B. Jurković: Elektromotorni pogoni, Školska knjiga Zagreb 1990. M. Jadrić, B. Frančić: Dinamika elektromotornih pogona, Graphis, Zagreb 1996.
Students obligations	Selection of electric motor in accordance with requirements of technical process. Calculations for purchasing required equipment. Calculation of mechanical, current and voltage values in dynamic and static operating conditions. Selection of the torque and speed control system. Project documentation of the drive.
Knowledge evaluation during semester	Redovitost pohaa#5#10#5$Kolokvij, numeri zadaci#2#30#15$Kolokvij, teorijska pitanja#2#30#15$Programski zadatak#1#30#20$
Knowledge evaluation after semester	the written part and oral part of the exam
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Written exam) — 3 (Oral exam) — 2
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22613;
Proposal made by	Dr.sc. Branko Tomičić v pred, 30.5.2018

Code WEB/ISVU	23307/146755	**ECTS**	5.0	**Academic year**	2018/2019
Name	EM field and EM compatibility				
Status	2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+90 (0+90+0+0) 30
Teachers	Lectures:1. Mate Lasić Laboratory exercises: Mate Lasić				
Course objectives					
Remark	This course can not be used for final thesis theme				
Prerequisites:	No prerequisites.				

Code WEB/ISVU	23328/146781	**ECTS**	6.0	**Academic year**	2018/2019
Name	Geographic Information Systems				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 120
Teachers	Lectures:1. Prof. dr. sc. Renato Filjar dipl. ing. elektrotehnike, FRIN, prof. v. š. Auditory exercises:Prof. dr. sc. Renato Filjar dipl. ing. elektrotehnike, FRIN, prof. v. š.				
Course objectives					
Remark	This course can not be used for final thesis theme				
Prerequisites:	No prerequisites.				

Code WEB/ISVU	23336/146818	**ECTS**	24.0	**Academic year**	2018/2019
Name	Graduation Thesis				
Status	4th semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course4th semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				60+360 (360+0+0+0) 300
Teachers	Lectures:1. Tomislav Novak mag. ing. inf. et comm. techn. Auditory exercises: Tomislav Novak mag. ing. inf. et comm. techn.				
Course objectives	students will learn to have individual approach to project design in electrical engineering				
Learning outcomes:	1.ability to identify the problem studied. Level:7 2.ability to analyze the problem. Level:6,7 3.ability to analyse the problem components. Level:6,7 4.ability to suggest possible solution to the problem. Level:6,7 5.ability to integrate the existing scientific achievements into solution to the identified problem . Level:6,7 6.ability to work out a practical solution to the problem. Level:6,7 7.ability to make conclusion on the scope and possibility of generalization of the ideas presented. Level:6,7 8.ability to present the results of the thesis. Level:6,7				
Methods of carrying out lectures	Case studies Simulations Modelling Discussion Seminar, students presentation and discussion Other A continuous communication between the student and the graduation thesis mentor.				
Methods of carrying out auditory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Traditional literature analysis Data mining and knowledge discovery on the Web Discussion, brainstorming				
Course content lectures	1.Work coordinated with Graduation thesis menthor, 2h 2.Work coordinated with Graduation thesis menthor, 2h 3.Work coordinated with Graduation thesis menthor, 2h 4.Work coordinated with Graduation thesis menthor, 2h 5.Work coordinated with Graduation thesis menthor, 2h 6.Work coordinated with Graduation thesis menthor, 2h 7.Work coordinated with Graduation thesis menthor, 2h 8.Work coordinated with Graduation thesis menthor, 2h 9.Work coordinated with Graduation thesis menthor, 2h 10.Work coordinated with Graduation thesis menthor, 2h 11.Work coordinated with Graduation thesis menthor, 2h 12.Work coordinated with Graduation thesis menthor, 2h 13.Work coordinated with Graduation thesis menthor, 2h 14.Work coordinated with Graduation thesis menthor, 2h 15.Work coordinated with Graduation thesis menthor, 2h				
Course content auditory	1.Work coordinated with Graduation thesis menthor, 2h 2.Work coordinated with Graduation thesis menthor, 2h 3.Work coordinated with Graduation thesis menthor, 2h 4.Work coordinated with Graduation thesis menthor, 2h 5.Work coordinated with Graduation thesis menthor, 2h 6.Work coordinated with Graduation thesis menthor, 2h 7.Work coordinated with Graduation thesis menthor, 2h 8.Work coordinated with Graduation thesis menthor, 2h 9.Work coordinated with Graduation thesis menthor, 2h 10.Work coordinated with Graduation thesis menthor, 2h 11.Work coordinated with Graduation thesis menthor, 2h 12.Work coordinated with Graduation thesis menthor, 2h 13.Work coordinated with Graduation thesis menthor, 2h 14.Work coordinated with Graduation thesis menthor, 2h 15.Work coordinated with Graduation thesis menthor, 2h				
Required materials	Special purpose laboratory General purpose computer laboratory Special purpose computer laboratory				
Exam literature	Hrvatski pravopis. Upute za izradu diplomskog rada.				
Students obligations	Finished Graduation thesis				
Knowledge evaluation during semester	Finished Graduation thesis				
Knowledge evaluation after	Finished Graduation thesis				

semester		
Student activities:	Aktivnost (Practical work)	ECTS 24
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
Proposal made by	Ivan Lujo, MSc, Lecturer	

Code WEB/ISVU	23308/146756	**ECTS**	5.0	**Academic year**	2018/2019
Name	Industrial Computer Networks				
Status	2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+78 (24+27+0+27) 42
Teachers	Lectures:1. dr.sc. Predrag Valožić prof. vis. šk. Lectures:2. mr.sc. Goran Malčić v.pred. Lectures:3. Goran Belamarić viši predavač Lectures: Ivica Vlašić Auditory exercises: Ivica Vlašić Laboratory exercises: Mario Lučan Laboratory exercises: Ivica Vlašić Construction exercises: Ivica Vlašić				
Course objectives	students will understand scientific foundations, technologies, standards and technical solutions to communications in industrial control systems and will be trained to work on important network components.				
Learning outcomes:	1.ability to develop a critical approach in estimating communication requirements of small and medium-sized production systems. Level:7 2.ability to formulate/design a proposal for optimal configuration of information-communication subsystem. Level:6,7 3.ability to evaluate functionality and cost-effectiveness of the existing communication solutions. Level:7 4.ability to suggest alternative solutions to enhance communication between production systems. Level:6,7 5.ability to create requirements for communication sub-system of a business information system . Level:6,7 6.ability to manage the setting up, implementation, maintenance and servicing of the production system communication. Level:6,7 7.ability to manage the maintenance of aacommunication subsystem . Level:6,7 8.ability to combine elements and processes into an integral production IC system. Level:6,7 9.ability to create, design, build, choose, justify, plan and evaluate an industrial computer network based on generic cabling, Ethernet and wireless network. Level:6,7 10.ability to classify the type of computer network. Level:7 11.ability to estimate which types of network are suitable for particular requirements. Level:6,7 12.ability to develop network application within software. Level:6,7 13.ability to plan hardware organization of a network infrastructure. Level:6,7 14.ability to compare advantages and disadvantages of various types of computer networks. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Demonstration Simulations Modelling Oral lecturing illustrated with case studies, numerical examples and supported with a modern presentation technology.				
Methods of carrying out auditory exercises	Computer simulations Other Numerical problem solving on the blackboard. Using of product manuals. Network design.				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Group problem solving Laboratory network building: introduction with components, network cabling, measurement, control and communication elements installation. Network activating, signals and traffic measurement. Data analysis.				
How construction exercises are held	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Group problem solving Workshop				
Course content lectures	1.Sources of information in industrial control systems. The source of information sufficienc, 2h, Learning outcomes:1 2.Information encoding, error control, packet structure, 2h, Learning outcomes:2 3.Communication signals, presentation and analysis, 2h, Learning outcomes:3 4.OSI model in industrial standards, Ethernet, TCP/IP, IP address, network masking, subnetworks, 2h, Learning outcomes:4 5.Network components, LAN basics, network topologie, 2h, Learning outcomes:5 6.Transmission systems: wired, wireless, optica, 2h, Learning outcomes:6 7.Modulation, access and protocols, 2h, Learning outcomes:7 8.Basic architectures of a distributed control systems, 2h, Learning outcomes:8 9.Communication networks and interfaces: hardware, software, referent communication models, 2h, Learning outcomes:9 10.Real-time distributed system, 2h, Learning outcomes:10 11.Functional demands and systems classification, 2h, Learning outcomes:11 12.Global time in a real time distributed system, 2h, Learning outcomes:12 13.Sensors and effectors in an industrial network, 2h, Learning outcomes:13 14.Automatic control systems based on industrial network , 2h, Learning outcomes:14 15.SCADA systems in industrial networks, 2h, Learning outcomes:14				
Course content auditory	1.Information content calculation, 2h 2.Encoding: equal-length and statistical, error-control codes, 2h 3.Encoding: error-control codes (CRC, Hamming) and decoding, 2h 4.IP address, network classes and masks, 2h				

	5.Ethernet, TCP/IP, IP address, network masking, subnetworks, 2h 6.Introduction to Ethernet network - System configuration, 2h 7.Introduction to EthernetIP industrial network - System configuration, 2h 8.Communication through the EthernetIP network service utilities, 2h 9.Introduction to ProfiNet industrial network - System configuration, 2h 10.Communication through the ProfiNet network service utilities, 2h 11.Introduction to DeviceNet industrial network - System configuration, 2h 12.Communication through the DeviceNet network service utilities, 2h 13.Introduction to ProfiBus industrial network - System configuration, 2h 14.Communication through the ProfiBust network service utilities, 2h 15.Introduction to SCADA software support. Simple examples, 2h
Course content laboratory	1.Introduction to Ethernet network - System configuration, 2h 2.Introduction to Ethernet network - System configuration, 2h 3.Introduction to EthernetIP industrial network - System configuration, 2h 4.Communication over an EthernetIP network, 2h 5.Communication through the EthernetIP network service utilities, 2h 6.Introduction to ProfiNet industrial network - System configuration, 2h 7.Communication over an ProfiNet network, 2h 8.Communication through the ProfiNet network service utilities, 2h 9.Introduction to DeviceNet industrial network - System configuration, 2h 10.Communication over an DeviceNet network, 2h 11.Communication through the DeviceNet network service utilities, 2h 12.Introduction to ProfiBus industrial network - System configuration, 2h 13.Communication over an ProfiBus network, 2h 14.Communication through the ProfiBus network service utilities, 2h 15.Introduction to SCADA software support. Simple examples, 2h
Course content constructures	1.Independent technical process automation project with subordinate control system and system status display and control., 2h 2.Independent technical process automation project with subordinate control system and system status display and control., 2h 3.Independent technical process automation project with subordinate control system and system status display and control., 2h 4.Independent technical process automation project with subordinate control system and system status display and control., 2h 5.Independent technical process automation project with subordinate control system and system status display and control., 2h 6.Independent technical process automation project with subordinate control system and system status display and control., 2h 7.Independent technical process automation project with subordinate control system and system status display and control., 2h 8.Independent technical process automation project with subordinate control system and system status display and control., 2h 9.Independent technical process automation project with subordinate control system and system status display and control., 2h 10.Independent technical process automation project with subordinate control system and system status display and control., 2h 11.Independent technical process automation project with subordinate control system and system status display and control., 2h 12.Independent technical process automation project with subordinate control system and system status display and control., 2h 13.Independent technical process automation project with subordinate control system and system status display and control., 2h 14.Verification of the project on a laboratory model of the process., 2h 15.Verification of the project on a laboratory model of the process., 2h
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory Overhead projector
Exam literature	1.L.M. Thompson Industrial Data Communications 3rd Edition, ISA, 2002 2.CCNA INTRO, Exam Certification Guide, Wendell Odom, Indianapolis 2004. 3.P. Valožić: Osnove telekomunikacija, skripta TVZ, 2003. 4.P. S. Marshall, J. S. Rinaldi Industrial Ethernet, ISA, 2005 5.CCNA ICND, Exam Certification Guide, Wendell Odom, Indianapolis 2004. 6.SLC 500 DeviceNet scanner module 1747-SDN user manual 7.DeviceNet interface 1761-NET-DNI user manual 8.MicroLogix ethernet interface 1761-NET-ENIW user manual 9. Hans Berger, Decentralization with PROFIBUS DP/DPV1: Architecture and Fundamentals, Configuration and Use with SIMATIC S7
Students obligations	Mandatory attendance level of 80% of classes taught.
Knowledge evaluation during semester	Regular attendance Colloquium, numerical tasks Colloquium, theoretical issues 90 100 = 5 (A) 80 89 = 4 (B)

	65 79 = 3 (C) 60 64 = 2 (D) 50 59 = 2 (E) 49 and less, insufficient	
Knowledge evaluation after semester	Written exam. Oral exam. 90 100 = 5 (A) 80 89 = 4 (B) 65 79 = 3 (C) 60 64 = 2 (D) 50 59 = 2 (E) 49 and less, insufficient	
Student activities:	Aktivnost (Written exam)	ECTS 5
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
ISVU equivalents:	22607;	

Code WEB/ISVU	23309/146757	**ECTS**	5.0	**Academic year**	2018/2019
Name	Inteligent systems				
Status	2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+15 (0+15+0+0) 105
Teachers	Lectures:1. dr.sc. Zdenko Balaž dipl.ing.el. Laboratory exercises:dr.sc. Zdenko Balaž dipl.ing.el.				
Course objectives	Acquisition of knowledge on the application of intelligent and expert systems as well as components of artificial intelligence and the application of knowledge and understanding in a broad and interdisciplinary context associated with cognitive cybernetics in the field of electrical engineering.				
Learning outcomes:	1.Developing learning skills of artificial intelligence. . Level:6,7 2.Communicating attitudes, ideas, problems and solutions on the model of expert systems. Level:6 3.The conclusion of the reasoning on the basis of learning data base collection and interpretation of relevant data from the intelligent and expert systems. . Level:6,7 4.Knowledge integration and with the complexity of the cognitive level of cybernetics, formulating vessels based on incomplete or limited information.. Level:6,7 5.Identifying and linking cognitive cybernetics and intelligent systems for evaluating the effectiveness of their. . Level:6,7 6.Getting to know captology impact of intelligent technology and formulation problems in the selection and application of information, communication and computer components.. Level:6				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Discussion Seminar, students presentation and discussion Lectures, exercises and participation in development projects through interactive creation of the seminar as a conceptual study program based on scientific - research work.				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Other Laboratory practical exercises associated with intelligent transport systems: - airports expert system light signaling and tunnel safety systems - practical introduction (creation and testing)				
Course content lectures	1.1. Introduction to Artificial Intelligence, (AI) - 3 hours - Ontologi-hermeneutics-heuristics as propaedeutics biological and technical intelligence - Products and areas of application AI - Expert System as a representative of AI, 3h 2.2. Neural network Main Software Characteristics - 3 hours - Neural self-research techniques and neural networks - The self-regulating entities nerve network - Stimulation of electromagnetic waves and analogy biological and artificial neurons, 3h 3.3. Metamodel Management Expert System, (ES) and Intelligent Systems, (IS)- 3 hours - Experts, expertise and rules of inference in expert systems - A tutorial, and intelligent agent systems - Applied power expert systems, 3h 4.4. Database and Knowledge Base - 3 hours - Lost in search of the , 3h 5.5. Intelligent Systems in Power Supply - 3 hours - Practical examples of intelligent management of the power system needs of large tunnels - Practical examples of expert solving faults in power systems - Practical examples of secure and uninterruptible power supplies vital consumers, 3h 6. 6. Introduction in Cognitive Cybernetics, (CC) - , 3h 7.7. Persuasive Technology - Cognitive Cybernetics - 3 hours - 3P Model cybernetic intelligent interactive technology - Captology and propaedeutics polytechnics - Simulacrum, modeling, simulation and simultaneity in cognitive cybernetics, 3h 8.8. Behavioral and Cognitive Engineering - 3 hours - Human factors in cognitive cybernetics and mechanical theory of physiological memory - Quality Systems and , 3h 9.9. Development and Research in the Field of Cognitive Cybernetics - 3 hours - Scientific research works - Institute for Cognitive Cybernetics - Cognitive and cybernetic motivational implications, 3h 10.10. Applied Cognitive Cybernetics - 3 hours - Practical introduction to complex systems and the application of cognitive cybernetics in ITC - Practical examples and applications - Cognitive Cities, 3h 11.-, 2h 12.-, 2h 13.-, 2h 14.-, 2h 15.-, 2h				
Course content laboratory	1.1. Expert Traffic Systems and Electromobility - 3 hours - Airport and tunnel systems in the function of traffic safety - Systems and categories of secure electricity supply and intelligent transport systems - The supervisory-control specialist systems and secure power supply, 3h 2.2. Serial Circuit Concept - 3 hours - Components of a serial circuit of the airport system of light signaling - Regulator constant current to power - power electronics unit - Modules supervisory control system serial circuit, 3h 3.3. Parameters of Serial Circuits to Data bases - 3 hours - Resistance insulation - measurement and the measuring device as the agent system - Balance the number of correct lighting unit in the serial circuit of light signaling system - Management and control aircraft movements per operating areas - sensors and actuators, 3h 4.4. Maintenance and Intervention on Specialized Systems - 3 hours - Determining the fault serial circuit - Types of failures within - Damage to the components of a serial circuit, 3h 5.5. Exercises to Acquire Skills in the Use of Specialized Systems - 3 hours - Conceptual control of specialist system parameters - Tuning, configuration and handling of scenarios and algorithms, control systems - Operators of specialized systems, interventions and checklists as training pads, 3h 6.-, 2h 7.-, 2h 8.-, 2h				

	9.-, 2h 10.-, 2h 11.-, 2h 12.-, 2h 13.-, 2h 14.-, 2h 15.-, 2h
Required materials	Basic: classroom, blackboard, chalk... Special purpose computer laboratory Whiteboard with markers Special equipment specialized equipment with adequate technical support, (specialist systems of airports and tunnel)
Exam literature	OBVEZNA: [1] Z. Balaž, K. Meštrović, "Inteligentni sustavi u elektroenergetici" TVZ, Zagreb 2015. [2] M. Haun, "Cognitive Computing - Steigerung des systemischen Intelligenzprofils", Springer, Berlin, 2014 [3] Z. Balaž, M. Haun," Manual Intelligent Systems-Cognitive Cybernetics, Organization, Robotic and Computing", 2017. PREPORUĆENA: [4] J. Stuart, P. Russell, Norvig, "Artificial Intelligence: A Modern Approach", 2nd Ed. Prentice Hall, 2003. [5] M. Negnevitsky, "Artificial Intelligence: A Guide to Intelligent Systems", Addison Wesley, 2002. [6] P. Jackson, "Introduction to Expert Systems", 3rd Edition, Addison-Wesley, Wokingham, 1999. [7] A. M. Meystel, J. S.Albus, "Intelligent Systems: Arhitecture, Design and Control", Wiley-Interscience, 2002. [8] E. Turban, "Decision Support Expert Systems - Management Support Systems", Macmillan Pbl. Co. N.Y. 1993. [9] Intelligent Transport Systems (ITS) for Sustainable Mobility, United Nations, Economic Commission for Europe ISBN 9788897212034, Geneva 2012.
Students obligations	Interactive participation in lectures and do laboratory exercises, independent seminar work
Knowledge evaluation during semester	interaction
Knowledge evaluation after semester	Examination deadlines
Student activities:	Aktivnost ECTS (Seminar Work) 5
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.

Code WEB/ISVU	23304/146752	**ECTS**	4.0	**Academic year**	2018/2019
Name	Introduction to object-oriented programming				
Status	1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 60
Teachers	Lectures:1. v.pred. Aleksander Radovan , dipl. ing. Laboratory exercises:v.pred. Aleksander Radovan , dipl. ing.				
Course objectives	Acquiring knowledge and skills for development of Java applications that use the database.				
Learning outcomes:	1.write a code for a JavaFX application which will use a GUI and a database. Level:6,7 2.develop a Java development option if it is suitable for solving a specific task. Level:6,7 3.elements of an application into classes, interfaces and packages according to the principles of OOP. Level:6,7 4.develop a JavaFX applications to solve various types of practical problems. Level:6,7 5.individually evaluate the appropriateness of using Java in solving a specific practical problem. Level:7 6.organize development environment (Eclipse) for an efficient development of JavaFX applications. Level:6,7 7.design the structure of classes in Java applications to make it upgradable. Level:6,7 8.the possibilities of upgrading an application by means of open source libraries. Level:6,7 9.redesign the existing applications by using Java. Level:6,7 10.relate the knowledge of Java to the knowledge of other programming languages. Level:6,7 11.provide a critical review of the advantages and disadvantages of Java when compared to other programming languages. Level:7 12.choose the option to use advanced language features such as lambda expressions for solving programming tasks. Level:7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Demonstration Discussion Questions and answers				
Methods of carrying out laboratory exercises	Other Practical work using computer with Java development environment installed.				
Course content lectures	1.Java programming language basics and simple Java programs, 2h, Learning outcomes:3,5,10,11 2.Classes and objects in Java, 2h, Learning outcomes:8 3.Object oriented programming in Java, 2h, Learning outcomes:3 4.Exceptions in Java, 2h, Learning outcomes:7,8,9,11 5.Collections, generics and Javadoc, 2h, Learning outcomes:1,3,4 6.Files in Java, 2h, Learning outcomes:7,9,11 7.JavaFX, 2h, Learning outcomes:1,3,4,6 8.JDBC, 2h, Learning outcomes:1,2,3,6 9.Using new features of programming languages., 2h, Learning outcomes:12 10.No classes, 2h 11.No classes, 2h 12.No classes, 2h 13.No classes, 2h 14.No classes, 2h 15.No classes, 2h				
Course content laboratory	1.No classes, 2h 2.Classes and objects in Java, 2h, Learning outcomes:3,7,11 3.Exceptions in Java, 2h, Learning outcomes:7 4.Collections and generics in Java, 2h, Learning outcomes:3,5,7,9,10,11 5.Files in Java, 2h, Learning outcomes:7,8,9,10,11 6.JavaFX, 2h, Learning outcomes:1,2,4,5,6,8,9,10,11 7.JDBC, 2h, Learning outcomes:1,2,8,9,10,11 8.No classes, 2h 9.No classes, 2h 10.No classes, 2h 11.No classes, 2h 12.No classes, 2h 13.No classes, 2h 14.No classes, 2h 15.No classes, 2h				
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory Whiteboard with markers Overhead projector Students work individually in the lab, one person per workplace. Work requires use of computers with development tools for programming.				
Exam literature	Effective Java, 3rd edition, 2018. Java 8 in Action, Manning, 2015. Beginning Java Programming (The Object-Oriented Approach), Wrox, 2015. OCA/OCP Java SE 7 Programmer I II Study Guide, Exams 1Z0-803 1Z0-804, Certification Press, 2014. Java SE 8 for Programmers, Deitel, 2014.				

	Oracle Press: OCA Java SE 7 Programmer I Study Guide (Exam 1Z0-803), Oracle Press, 2012. Grundkurs Programieren iz Java, Hanser, 6. Auflage, 2011. Java The Good Parts, O'Reilly, svibanj, 2010. Effective Java, 2nd edition, Prentice Hall, svibanj, 2008. Bruce Eckel: Thinking in Java, 4th edition, veljača, 2006.
Students obligations	Completing all seven laboratory excercises
Knowledge evaluation during semester	Seven laboratory exams - 60 points in total Two partial exams - 20 points each Optional points for additional effort Every partial exam has a correctional exam Maximum 100 points 0-49 - not good enough 50-61 - sufficient 62-74 - good 75-86 - very good 87-100 - excellent
Knowledge evaluation after semester	Written exam is evalued with 40 points, and remaining 60 points are transferred from the achievement on laboratory exams during the semester time.
Student activities:	Aktivnost ECTS (Practical work) 3 (Written exam) 1
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	85745;201727;
Proposal made by	senior lecturer Aleksander Radovan, dipl.ing., 02.06.2018.

Code WEB/ISVU	23323/146774	**ECTS**	6.0	**Academic year**	2018/2019
Name	Lighting and Installations				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. dr.sc. Davor Petranović dipl.ing.el. Laboratory exercises:dr.sc. Davor Petranović dipl.ing.el.				
Course objectives	students will be introduced to new technologies in electrical installations and modern design software				
Learning outcomes:	1.ability to design electric installations in different objects. Level:6,7 2.ability to design indoor and outdoor lighting in different objects. Level:6,7 3.ability to write technical description and specification (bill of materials - BOM) for electrical installations of different objects. Level:6,7 4.ability to write technical description and specification (BOM) for indoor and outdoor lighting of different objects. Level:6,7 5.ability to assess the existing electrical installation of different objects. Level:6,7 6.ability to assess the existing indooe and outdoor lighting of different objects. Level:6,7 7.ability to evaluate a computer-designed model of electrical installation . Level:6,7 8.ability to evaluate a computer-designed model of indoor and outdoor lighting . Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Demonstration Modelling Discussion				
Methods of carrying out laboratory exercises	Laboratory exercises, computer simulations Group problem solving				
Course content lectures	1.Lighting introduction, 2h, Learning outcomes:2 2.Regulations, 2h, Learning outcomes:2 3.Lighting sources, 2h, Learning outcomes:5 4.Lamps, 2h, Learning outcomes:5 5.Indoor illumination, 2h, Learning outcomes:2 6.Outdoor illumination, 2h, Learning outcomes:2 7.Sport illumination, 2h, Learning outcomes:2 8.Kolokvij 1, 2h, Learning outcomes:2 9.Introduction to electric installations, 2h, Learning outcomes:7 10.Regulations, 2h, Learning outcomes:7 11.Power cables, 2h, Learning outcomes:3,7 12.Protection devices, 2h, Learning outcomes:7 13.Calculations, 2h, Learning outcomes:7 14.Metering, 2h, Learning outcomes:7 15.Kolokvij2, 2h, Learning outcomes:7				
Course content laboratory	1.Indoor lighting calculation, 2h, Learning outcomes:2,4,6,8 2.Outdoor lighting calculation, 2h, Learning outcomes:2,4,6,8 3.Road lighting calculation, 2h, Learning outcomes:2,4,6,8 4.Indor sport lighting calculation, 2h, Learning outcomes:2,4,6,8 5.Outdoor sport lighting calculation, 2h, Learning outcomes:2,4,6,8 6.Indoor LED lighting calculation, 2h, Learning outcomes:2,4,6,8 7.Outdoor LED lighting calculation, 2h, Learning outcomes:2,4,6,8 8.Introduction to Ecodial, 2h, Learning outcomes:1,3,5,7 9.House electric installation calculation - 1, 2h, Learning outcomes:1,3,5,7 10.House electric installation calculation - 2, 2h, Learning outcomes:1,3,5,7 11.House electric installation calculation, 2h, Learning outcomes:1,3,5,7 12.Shopping mall electric installation calculation, 2h, Learning outcomes:1,3,5,7 13.School electric installation calculation, 2h, Learning outcomes:1,3,5,7 14.Stadium electric installation calculation, 2h, Learning outcomes:1,3,5,7 15.Sport dome electric installation calculation, 2h, Learning outcomes:1,3,5,7				
Required materials	Special purpose computer laboratory Overhead projector				
Exam literature	Electric installation guide, Schneider electric Tehnički propis za niskonaponske električne instalacije (NN 005/2010) HRN EN 1838:2008 Primjena rasvjete -- Nužna rasvjeta HRN EN 12193:2008 Svjetlo i rasvjeta -- Rasvjeta sportskih objekata HRN EN 12464-1:2012 Svjetlo i rasvjeta -- Rasvjeta radnih mjesta -- 1. dio: Unutrašnji radni prostori HRN EN 12464-2:2008 Svjetlo i rasvjeta -- Rasvjeta radnih mjesta -- 2. dio: Vanjski radni prostori HRN EN 12665:2012 Svjetlo i rasvjeta -- Osnovni nazivi i kriteriji za specificiranje zahtjeva rasvjete HRI CEN/TR 13201-1:2009 Cestovna rasvjeta -- 1. dio: Odabir razreda rasvjete HRN EN 13201-2:2008 Cestovna rasvjeta -- 2. dio: Zahtijevana svojstva HRN EN 13201-3:2008 Cestovna rasvjeta -- 3. dio: Proračun svojstava HRN EN 13201-4:2008 Cestovna rasvjeta -- 4. dio: Metode mjerenja svojstava rasvjete RELUX On-line manual				

	Ecodial On-line manual	
Students obligations	80 % of class attendance	
Knowledge evaluation during semester	Paper tests #3#100#50$	
Knowledge evaluation after semester	Paper exam#1#80#50$Verbal exam#1#20#50$	
Student activities:	Aktivnost (Written exam) (Oral exam)	ECTS 5 1
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
ISVU equivalents:	22627;158352;	
Proposal made by	Davor Petranović,MSEE, 29.05.2013	

Code WEB/ISVU	23301/146749	**ECTS**	6.0	**Academic year**	2018/2019
Name	Mathematics				
Status	1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 120
Teachers	Lectures:1. Ivica Vuković Lectures:2. dr. sc. Anđa Valent viši predavač Auditory exercises:dr. sc. Anđa Valent viši predavač Auditory exercises: Ivica Vuković				
Course objectives	Students should be qualified to use differential and integral calculus of several variables.				
Learning outcomes:	1.ability to write analytic expression for partial derivatives and differential of real analytic function of several variables. Level:7 2.ability to write the equation of the tangent plane to the surface at the given point of the surface. Level:7 3.ability to expand a real function of two real variables into Taylor and MacLaurin series. Level:7 4.ability to calculate and classify local extrema of a real function of two real variables. Level:7 5.ability to integrate real functions of several variables. Level:7 6.ability to apply polar coordinates to integral calculus. Level:7 7.ability to understand the implementation of integrals on calculating centre of mass, static moments and centre of gravity. Level:7 8.ability to understand methods of solving differential equations. Level:7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Modelling Discussion Other The lectures are being presented in the classroom with detailed solving and analysis.				
Methods of carrying out auditory exercises	Laboratory exercises, computer simulations Group problem solving Computer simulations Other The problems are being solved on the blackboard with detailed explanations.				
Course content lectures	1.Functions of several variables. Continuity and limit., 2h, Learning outcomes:1 2.Partial derivatives. Schwartz theorem., 2h, Learning outcomes:1 3.Tangent plane. Differential., 2h, Learning outcomes:1,2 4..Taylor mean value theorem. Taylor and Maclaurin series., 2h, Learning outcomes:1,3 5.Local extrema of functions of several variables., 2h, Learning outcomes:1,4 6.Conditional extrema. Lagrange multipiler method., 2h, Learning outcomes:1,4 7.Double integrals. Notion and properties., 2h, Learning outcomes:5 8.Double integrals over curvilinear trapezoid., 2h, Learning outcomes:5 9.Double integrals in polar coordinates, 2h, Learning outcomes:5,6 10.Triple integrals., 2h, Learning outcomes:5,6 11.Applications of multiple integrals. Calculatiog areas and volumes., 2h, Learning outcomes:5,6,7 12.Applications of multiple integrals. Center of mass., 2h, Learning outcomes:5,6,7 13.Homogenous systems of differential linear equations second order with constant coefficients., 2h, Learning outcomes:8 14.Nonhomogenous systems of differential linear equations with constant coefficients., 2h, Learning outcomes:8 15.Systems of linear differential equations. Numerical methods., 2h, Learning outcomes:8				
Course content auditory	1.Functions of several variables. Domains and graphs., 2h, Learning outcomes:1 2.Partial derivatives. Schwarz theorem, 2h, Learning outcomes:1 3.Tangent plane. Differential., 2h, Learning outcomes:1,2 4.Taylor mean value theorem. Taylor and Maclaurin series, 2h, Learning outcomes:1,3 5.Local extrema of functions of several variables., 2h, Learning outcomes:1,4 6.Conditional extrema. Lagrange multiplier method., 2h, Learning outcomes:1,4 7.Double integrals. Notion and properties., 2h, Learning outcomes:5 8.Double integrals over curvilinear trapezoid., 2h, Learning outcomes:5 9.Double integrals in polar coordinates., 2h, Learning outcomes:5,6 10.Triple integrals., 2h, Learning outcomes:5,6 11.Applications of multiple integrals. Calculatiog areas and volumes., 2h, Learning outcomes:4,5,6 12.Applications of multiple integrals. Center of mass., 2h, Learning outcomes:5,6,7 13.Homogenous systems of differential linear equations second order with constant coefficients, 2h, Learning outcomes:8 14.Method variation constants., 2h, Learning outcomes:8 15.Euler method and Runge-Kutta method., 2h, Learning outcomes:8				
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory Whiteboard with markers Overhead projector				
Exam literature	1. I. Vuković, A. Valent: Zbirka riješenih primjera iz primijenjene matematike, Redak, 2015. 1. P. Javor, Matematička analiza 2, Element, Zagreb, 2000. 3. B. P. Demidovič: Zadaci i riješeni zadaci iz više matematike s primjenom na tehničke nauke, Tehnička knjiga, 1978.				

Students obligations	50% of class attendance of the total class number. In case of less attendance, submitted seminar paper.
Knowledge evaluation during semester	Total 2 preliminary exams (numerical tasks). Final mark: 50% - 62% of total points at both preliminary exams = sufficient(2) 63% - 74% of total points at both preliminary exams = good(3) 75% - 87% of total points at both preliminary exams = very good(4) 88% - 100% of total points at both preliminary exams = excellent (5);
Knowledge evaluation after semester	Written exam: 6 examining terms; pass: 50% od total points; Written exam mark: see final mark formed as the result of both preliminary exams; Oral exam: optional. Oral exam mark: maximum 1 mark better than mark of written exam.
Student activities:	Aktivnost — ECTS (Constantly tested knowledge) — 4 (Written exam) — 2
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
Proposal made by	Ivica Vuković, Anđa Valent

Code WEB/ISVU	23659/164241	**ECTS**	6.0	**Academic year**	2018/2019
Name	Methodology of professional and scientific research				
Status	4th semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course4th semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				15+45 (0+0+45+0) 120
Teachers	Lectures:1. dr. sc. Roman Domović , prof. Lectures:2. Doc. dr. sc. Lidija Tepeš Golubić v. pred. Lectures:3. dr.sc. Žarko Nožica Seminar exercises:dr. sc. Roman Domović , prof. Seminar exercises:dr.sc. Žarko Nožica				
Course objectives	Enable students to produce high-quality professional work and research				
Learning outcomes:	1.Design hypotheisis for research problem solution. Level:6,7 2.present the results in appropriate way to target audience. Level:6,7 3.formulate / shape research results. Level:6,7 4.choosing methods for creating a professional work. Level:7 5.Select procedures for transforming good ideas into high-quality professional work. Level:7 6.evaluate policies and procedures of the methodology of professional and research work. Level:7 7.generate a solution of professional and scientific problems through research. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Discussion Questions and answers Seminar, students presentation and discussion Homework presentation				
Methods of carrying out seminars	Traditional literature analysis Data mining and knowledge discovery on the Web Discussion, brainstorming				
Course content lectures	1.Introduction to professional and research work. Professional, research and scientific activities. Concept and types of scientific work. Concept and types of professional work. , 3h, Learning outcomes:1,7 2.The methodology of professional research. Concept and classification of professional and scientific methods, 3h, Learning outcomes:2,4 3.Technology of professional and scientific research. The choice of research topics. Planning and organization of research work. , 3h, Learning outcomes:6 4.Research and development. Writing and technical processing of professional work. Using literature and citation, parts of the report and research documentation., 3h, Learning outcomes:3 5. Plagiarism. Professional and scientific journals and publications. Searching databases. Works for acquiring professional and scientific titles., 3h, Learning outcomes:1 6.The ways of controlling originallity of written papers, appling computer programs, 2h, Learning outcomes:1,2,3,4,5,6,7 7.no lessons, 2h 8.no lessons, 2h 9.no lessons, 2h 10.no lessons, 2h 11.no lessons, 2h 12.no lessons, 2h 13.no lessons, 2h 14.no lessons, 2h 15.no lessons, 2h				
Course content seminars	1.assigned by mentor, 3h, Learning outcomes:4,5,6 2.U dogovoru s mentorom, 3h, Learning outcomes:4,5,6 3.assigned by mentor, 3h, Learning outcomes:4,5,6 4.assigned by mentor, 3h, Learning outcomes:3,7 5.assigned by mentor, 3h, Learning outcomes:3,7 6.assigned by mentor, 3h, Learning outcomes:3,7 7.assigned by mentor, 3h, Learning outcomes:3,7 8.assigned by mentor, 3h, Learning outcomes:3,7 9.assigned by mentor, 3h, Learning outcomes:2,3,7 10.assigned by mentor, 3h, Learning outcomes:2,3,7 11.assigned by mentor, 3h, Learning outcomes:2,3,7 12.assigned by mentor, 3h, Learning outcomes:2,3,7 13.assigned by mentor, 3h, Learning outcomes:2,3,7 14.assigned by mentor, 3h, Learning outcomes:2,3,7 15.assigned by mentor, Learning outcomes:2,3,7				
Required materials	Basic: classroom, blackboard, chalk... Overhead projector				
Exam literature	1. M.Žugaj, K.Dumičić, V.Dušak: Temelji znanstvenoistraživačkog rada- Metodologija i metodika, FOI, Varaždin, 2006.g. 2. R. Zelenika: Metodologija i tehnologija izrade znanstvenog i stručnog djela. Ekonomski fakultet, Rijeka, 2000.g. 3. Lj. Baban, K. Ivić, S. Jelinić, M. Lamza-Maronić, A. Šundalić: Primjena metodologije stručnog i znanstvenog				

	istraživanja.Ekonomski fakultet, Osijek, 2000. 4. R. Zelenika: Tehnologija znanstvenog i razvojnog istraživanja. IQ plus d.o.o.Rijeka 2016. ISBN: 978-953-95705-9-8	
Students obligations	Attending classes and participation in the process	
Knowledge evaluation during semester	Preliminary exam and seminar paper	
Knowledge evaluation after semester	Oral exam and seminar paper	
Student activities:	Aktivnost	ECTS
	(Oral exam)	1
	(Written exam)	1
	(Written exam)	1
	(Seminar Work)	1
	(Seminar Work)	1
	(Activity in class)	1
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
Proposal made by	dr.sc. Žarko Nožica , 18.6.2013 ()	

Code WEB/ISVU	23329/146782	**ECTS**	6.0	**Academic year**	2018/2019
Name	Microcontrollers				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+20+10+0) 120
Teachers	Lectures:1. Marko Miletić Laboratory exercises: Marko Miletić Seminar exercises: Marko Miletić				
Course objectives	Explore the structure and application of microcontroller and the necessary development tools in the context of embedded systems				
Learning outcomes:	1.combine knowledge in the field of analog and digital electronics and C programming in the construction of the microcontroller system. Level:6,7 2.choose the price, features and dobavljivošću optimal microcontroller for a given purpose. Level:7 3.integrate software application in C programming language with previously-written device drivers. Level:6,7 4.write drivers for various peripherals microcontroller using the C programming language. Level:6,7 5.construct circuitry peripheral units, sensors and controllers for use with a microcontroller. Level:6,7 6.build a dedicated computer system (Eng. embedded system) with microcontroller. Level:6,7 7.classify microcontroller with regard to their structure and application. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Demonstration Simulations Discussion Seminar, students presentation and discussion				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Discussion, brainstorming Workshop				
Methods of carrying out seminars	Laboratory exercises on laboratory equipment Group problem solving Interactive problem solving Workshop				
Course content lectures	1.Introductory lecture - Microprocessor-microcomputer-microcontroller, 4h, Learning outcomes:1,5,6 2.Microcontroller example. Digital outputs and inputs, 3h, Learning outcomes:1,3,4,5 3.Analog outputs and inputs, 2h, Learning outcomes:1,3,4,5,6 4.Peripheral devices - examples, 2h, Learning outcomes:1,3,4,5,6 5.Microcontroller - I/O communication, 5h, Learning outcomes:1,3,4,5,6 6.no lectures 7.Timers and interrupts, 4h, Learning outcomes:1,3,4,5,6 8.Advanced programming techniques, 5h, Learning outcomes:1,3,4,5,6 9.no classes 10.Microcontoller selection - criteria, 5h, Learning outcomes:1,2,6,7 11.no classes 12.no classes 13.no classes 14.no classes 15.no classes				
Course content laboratory	1.Microcontroller mbed lpc 1768 - software development, 1h, Learning outcomes:3,4 2.Digital otputs and inputs, 2h, Learning outcomes:1,3,4,5,6 3.Analog outputs and inputs, 3h, Learning outcomes:1,3,4,5,6 4.Peripheral devices - examplesnema nastave, 3h, Learning outcomes:1,3,4,5,6 5.no classes 6.Microcontroller - I/O communication, 5h, Learning outcomes:1,3,4,5,6 7.Timers and interrupts, 1h, Learning outcomes:1,3,4,5,6 8.no classes 9.Timers and interrupts. Advanced programming techniques., 5h, Learning outcomes:1,3,4,5,6 10.no classes 11.no classes 12.no classes 13.no classes 14.no classes 15.no classes				
Course content seminars	1.no classes 2.no classes 3.no classes 4.no classes 5.no classes				

	6.no classes 7.no classes 8.no classes 9.no classes 10.no classes 11.Seminar work 1, 5h, Learning outcomes:1,2,3,4,5,6,7 12.Seminar work 2, 5h, Learning outcomes:1,2,3,4,5,6,7 13.no classes 14.no classes 15.no classes
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory General purpose computer laboratory Special purpose computer laboratory Whiteboard with markers Overhead projector Operating supplies Special equipment mbed development boards, electronic components and prototype boards
Exam literature	www.mbed.org GANSSLE, JACK: The Firmware Handbook. Elsevier, ISBN 0-7506-7606-X, 2004., 365 str LABROSSE, J. JEAN: Embedded Systems Building Blocks, CMP Books, ISBN 0-87930-604-1, 1999., 615 str
Students obligations	Students can get a rating by depositing a written and oral examination on the exam, or through liberation. Students can be rid of the whole or part of the examination good results in two tests and the development of software tasks. Each colloquium brings a maximum of 33 points, and well-designed programming task 34 points. Maximum number of points two tests and the programming task is 100.
Knowledge evaluation during semester	for the liberation of the written exam must be achieved by 54 points for the liberation of the written and oral examination should achieve 68 points
Knowledge evaluation after semester	written and oral exam
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Written exam) — 1 (Oral exam) — 3 (Seminar Work) — 1
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
Proposal made by	dr.sc. Ljubivoj Cvitaš dipl.ing., 7.4.2017; revised mr.sc Goran Trutanić dipl.inž., 31.5.2018.

Code WEB/ISVU	23330/146783	**ECTS**	6.0	**Academic year**	2018/2019
Name	Mobile Communication Networks				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 120
Teachers	Lectures:1. dr.sc Sonja Zentner Pilinsky prof.v.š. Auditory exercises:dr.sc Sonja Zentner Pilinsky prof.v.š.				
Course objectives	students will be qualified to solve problems in installation and changing of mobile network functions as well as interconnection of different networks.				
Learning outcomes:	1.ability to predict possible signal disorders in networks due to transmitter locations of users. Level:7 2.ability to evaluate and grade possible transmitter locations. Level:6,7 3.ability to propose new transmitter locations for transmitters with poor performance. Level:6,7 4.ability to plan a complete network on the basis of given data. Level:6,7 5.bility to select base and mobile stations with satisfactory characteristics as well as the other equipment. Level:7 6.ability to integrate various networks into the integral a whole to meet the users' requirements. Level:6,7 7.ability to find optimal solutions based on the required characteristics and price of the entire equipment. Level:6,7 8.ability to evaluate spectra efficiency of different systems, different system compatibility and possibility of future upgrade. Level:7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Discussion Questions and answers Other The subject matter is explained by using drawings, tables and diagrams to make the material easier to understand. The teacher tests the students continuously if they participate in the lectures. Beside the blackboard it is necessary to have a LCD projector.				
Methods of carrying out auditory exercises	Group problem solving Other The problems of each theme are solved on the blackboard with the assistance of				
Course content lectures	1.introduction, repetition of basic GSM principles, 2h, Learning outcomes:1,2,5 2.security in GSM systems, 2h, Learning outcomes:4,5,6 3.GPRS systems, 2h, Learning outcomes:4,5,6 4.EDGE systems, 2h, Learning outcomes:4,5,6 5.UMTS system architecture, network planning, 2h, Learning outcomes:5,6 6.UMTS network planning, 2h, Learning outcomes:4,5,6 7.HSDPA technology, 2h, Learning outcomes:6,7,8 8.HSUPA technologies, 2h, Learning outcomes:6,7,8 9.Mobile forensics, 2h, Learning outcomes:6,8 10.Introduction to LTE and LTE demands, 2h, Learning outcomes:1,4,5 11.WiMAX vs. LTE, 2h, Learning outcomes:6,7,8 12.LTE system in Croatia and LTE measurements - guest-lecturer from operator, 2h, Learning outcomes:6,7,8 13.OFDMA technologies, 2h, Learning outcomes:1,3,4,7 14.MIMO technologies, 2h, Learning outcomes:1,3,4,7 15.Smart antennas, 2h, Learning outcomes:1,3,4,7				
Course content auditory	1.Transmit quality estimation in the presence of cochannel interference , 2h, Learning outcomes:1,2,3,4 2.Transmit quality estimation in the presence of cochannel interference, Methods of code generation for different purposes in mobile network , 2h, Learning outcomes:1,2,3,4 3.Methods of code generation for different purposes in mobile network , 2h, Learning outcomes:1,2,3,4 4.First semiexam, 2h, Learning outcomes:1,2,3 5.possibilities of tracing user who uses more SIM cards and more MSs, 2h, Learning outcomes:5,6 6.guest-lecturer from HAKOM regulator, 2h, Learning outcomes:6,7,8 7.QoS in UMTS and LTE systems - guest-lecturer from operator, 2h, Learning outcomes:4,6,8 8.Second semiexam, 2h, Learning outcomes:1,2,3,4,5 9.students present their seminar work, 2h, Learning outcomes:1,2,3,4,5,6,7,8 10.students present their seminar work, 2h, Learning outcomes:1,2,3,4,5,6,7,8 11.Third semiexam, 2h, Learning outcomes:4,5,6,7,8 12.students present their seminar work, 2h, Learning outcomes:1,2,3,4,5,6,7,8 13.students present their seminar work, 2h, Learning outcomes:1,2,3,4,5,6,7,8 14.students present their seminar work, 2h, Learning outcomes:1,2,3,4,5,6,7,8 15.Fourth semiexam, 2h, Learning outcomes:1,2,3,4,5,6,7,8				
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector				
Exam literature	1.E. Zentner, Antene i radiosustavi,Graphis, Zagreb, 2001. 2. Lehpamer H.: Transmission Systems Design Handbook for Wireless Networks, Artech House, Boston-London,2002. 3. W.C.Y.Lee: Mobile Communications Design Fundamentals, McGraw-Hill, 1993.				
Students obligations	minimum of 20 class attendance (lecture and exercises), submitted and presented seminar paper and performed laboratory exercises				

Knowledge evaluation during semester	Redovitost pohaa#4#10#50$Mini-test#2#30#50$Kolokvij, numeri zadaci#3#45#50$Kolokvij, teorijska pitanja#3#15#50$
Knowledge evaluation after semester	The written part of the exam (in case that both preliminary are not passed) and the oral part of the exam (final mark is arithmetic middle of 2 components in case that they are all positive)
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22631;
Proposal made by	professor Sonja Zentner Pilinsky, Ph.D.

Code WEB/ISVU	23331/146784	**ECTS**	6.0	**Academic year**	2018/2019
Name	Multimedia Systems				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (15+15+0+0) 120
Teachers	Lectures: Milan Bajić Lectures:Prof.dr.sc. Slavica Ćosović Bajić Lectures: Sanja Kraljević , dipl.ing., v. pred. Auditory exercises: Milan Bajić Auditory exercises:Prof.dr.sc. Slavica Ćosović Bajić Auditory exercises: Sanja Kraljević , dipl.ing., v. pred. Laboratory exercises: Milan Bajić Laboratory exercises:Prof.dr.sc. Slavica Ćosović Bajić Laboratory exercises: Sanja Kraljević , dipl.ing., v. pred.				
Course objectives	Acquire basic knowledge in the area of multimedia systems.				
Learning outcomes:	1.ability to integrate the interface functionalities of various types of TV systems. Level:6,7 2.ability to formulate/design both analog and digital electro-acoustic systems . Level:6,7 3.ability to classify devices according to the quality of recording and reproduction. Level:6,7 4.ability to choose an option of ready video signal processing programs. Level:7 5.ability to provide one's own critical view of the Internet TV possibilities. Level:7 6.ability to choose a computer program for TV image processing. Level:7 7.ability to evaluate the advantages of digital TV. Level:7 8.Ability to critically assess the quality of picture and sound.).. Level:7 9.Ability to review possibilities for integrating multimedia systems.. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Discussion Questions and answers Seminar, students presentation and discussion To achieve fundamental knowledge and competences in the area of Analog and digital electroacustical technique and systems. Distortions of the audio and video signals. Analog and digital processing of the audio and video signals. Computer programmes for editing of the audio and video materials. Communication channels for exchange of the programmes.Satelite systems.				
Methods of carrying out auditory exercises	Group problem solving Data mining and knowledge discovery on the Web Computer simulations				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Discussion, brainstorming Workshop				
Course content lectures	1.Analog and digital acoustic devices and systems., 2h, Learning outcomes:2,3,4 2.Analog and digital acoustic devices and systems., 2h, Learning outcomes:2,3,4 3.Analog and digital acoustic devices and systems., 2h, Learning outcomes:2,3,4 4.Distortion of audio and video signals. Analog and digital processing of audio and video signals., 2h, Learning outcomes:1,2,3,4,5 5.Distortion of audio and video signals. Analog and digital processing of audio and video signals., 2h, Learning outcomes:1,2,3,4,5 6.Computer programs for editing audio and video materials., 2h, Learning outcomes:1,2,3,4,5 7.Computer programs for editing audio and video materials., 2h, Learning outcomes:1,2,3,4,5 8.Computer programs for editing audio and video materials., 2h, Learning outcomes:1,2,3,4,5 9.Professional studio equipment for recording and playback of audio and video signals., 2h, Learning outcomes:3 10.The broadcasting transmitter system., 2h, Learning outcomes:3 11.TV system: studio and transmitters., 2h, Learning outcomes:1,2,3,4,5,7 12.TV system: studio and transmitters., 2h, Learning outcomes:1,2,3,4,5,7 13.Communication channels of the channel exchange., 2h, Learning outcomes:3,4,7 14.Satellite systems., 2h, Learning outcomes:3,7 15.Satellite systems., 2h, Learning outcomes:3,7				
Course content auditory	1.Seminar paper., 2h, Learning outcomes:9 2.Seminar paper., 2h, Learning outcomes:9 3.Seminar paper., 2h, Learning outcomes:9 4.Seminar paper., 2h, Learning outcomes:9 5.Seminar paper., 2h, Learning outcomes:9 6.Seminar paper., 2h, Learning outcomes:9 7.Seminar paper., 2h, Learning outcomes:9 8.Seminar paper., 2h, Learning outcomes:9 9. , 2h 10. , 2h 11. , 2h 12. , 2h 13. , 2h				

	14. , 2h 15. , 2h
Course content laboratory	1.Display different types of audio signals., 2h, Learning outcomes:8 2.Sound recording., 2h, Learning outcomes:8 3.Measuring the parameters of the video signal., 2h, Learning outcomes:8 4.Record video resume (CV)., 2h, Learning outcomes:8 5.Editing video content from archival material., 2h, Learning outcomes:1,5 6.Editing video resume., 2h, Learning outcomes:1,5 7.HTML 5 multimedia elements, presentation and use., 2h, Learning outcomes:9 8. , 2h 9. , 2h 10. , 2h 11. , 2h 12. , 2h 13. , 2h 14. , 2h 15. , 2h
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory General purpose computer laboratory Whiteboard with markers Overhead projector Video equipment
Exam literature	R. Steinmetz, K. Nahrstedt - Multimedia Systems (University of Illinois, Department of computer science) R. Steinmetz, K. Nahrstedt - Multimedia Applications (University of Illinois, Department of computer science) Bilješke nastavnika 1.Grgic, S., Grgic, M., Digitalna televizija - Upute za laboratorijske vjezbe, FER, Zagreb, 2002, 56 pages (in Croatian)(approved by the Senate of the University of Zagreb, 14 May 2002, 02-659/3-2002) 2.Grgic, S., Kos, T., Grgic, M., Televizija - Upute za laboratorijske vjezbe, FER, Zagreb, 2002, 82 pages (in Croatian)(approved by the Senate of the University of Zagreb, 14 May 2002, 02-660/3-2002) R. Steinmetz, K. Nahrstedt - Multimedia Applications (University of Illinois, Department of computer science)
Students obligations	Odra vjebe, preuzet projektni/seminarski zadatak
Knowledge evaluation during semester	Vjebe - 25% Projektni zadatak - 25% Usmeni ispit / obrana projekta - 50%
Knowledge evaluation after semester	Vjebe - 25% Projektni zadatak - 25% Usmeni ispit / obrana projekta - 50%
Student activities:	Aktivnost — ECTS (Constantly tested knowledge) — 2 (Project) — 2 (Oral exam) — 2
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
Proposal made by	Sanja Duk ,dipl.ing., 1.6.2018.

Code WEB/ISVU	23332/146785	**ECTS**	6.0	**Academic year**	2018/2019
Name	Optical Communication Networks				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (15+12+3+0) 120
Teachers	Lectures:1. dr.sc Sonja Zentner Pilinsky prof.v.š. Auditory exercises:dr.sc Sonja Zentner Pilinsky prof.v.š. Laboratory exercises:dr.sc Sonja Zentner Pilinsky prof.v.š. Seminar exercises:dr.sc Sonja Zentner Pilinsky prof.v.š.				
Course objectives	students will be introduced to transmission technologies of optical networks and basics of devices used for that purpose; understand specific features of the PON network and basic principles of construction and maintenance of the PON network				
Learning outcomes:	1.ability to compare different active and passive equipment required for optical network construction. Level:6,7 2.ability to evaluate characteristics of passive and active optical equipment required for building all-optical network. Level:7 3.ability to manage the maintenance of a small FTTH network. Level:6,7 4.ability to perform optical link measurements, interpret the measurement results and suggest the measurement-based solutions. Level:7 5.ability to manage a small PON network construction. Level:6,7 6.ability to choose network architecture. Level:7 7.ability to choose a network protocol. Level:7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Discussion Questions and answers Seminar, students presentation and discussion Lectures presented at the blackboard with an additional help of PowerPoint presentations with various graphs and examples built into them (LCD projector needed).				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Other				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Other Lab exercises will be partially on computers and partially on measurement equipment, students do all measurements and result analysis alone.				
Methods of carrying out seminars	Discussion, brainstorming Other Up to 3 students work on one theme. Result of their work is 8-10 A4 pages and 10 min. presentation in front of their colleagues and the teacher.				
Course content lectures	1.Optical networks infrastructure, 2h, Learning outcomes:1,2 2.Optical networks infrastructure, 2h, Learning outcomes:1,2 3.Fibers and their characteristics (fiber standards, fiber losses, dispersions and nonlinear effects), 2h, Learning outcomes:1,2 4.Fibers and their characteristics (fiber standards, fiber losses, dispersions and nonlinear effects), 2h, Learning outcomes:1,2 5.OTDR and OTDR measurements, 2h, Learning outcomes:3,4 6.optical transmitters, detectors, receivers and EDFA amplifiers, 2h, Learning outcomes:1,2,5,6 7.access network basics and PON standards, 2h, Learning outcomes:1,3,5,6,7 8.devices in access and FTTH networks, 2h, Learning outcomes:1,2,6,7 9.WDM standards and network equipment, 2h, Learning outcomes:1,2,6 10.legislation and business cases of optical distribution networks, 2h, Learning outcomes:1,5,6 11.documentation of optical networks, 2h, Learning outcomes:3,5 12.PON measurements (guest-lecturer from company), 2h, Learning outcomes:3,4 13.optical network measurements (guest-lecturer from company), 2h, Learning outcomes:3,4 14.optical networks - case studies, 2h, Learning outcomes:1,3,5,6 15.third semiexam, 2h, Learning outcomes:1,2,3,4,5,6,7				
Course content auditory	1.power budget and rise time calculations, 2h, Learning outcomes:4,5,6 2.power budget and rise time calculations, 2h, Learning outcomes:4,5 3.no numerical exercises this week 4.no numerical exercises this week 5.no numerical exercises this week 6.First semiexam, 2h, Learning outcomes:1,2,3,4,5,6 7.no numerical exercises this week 8.no numerical exercises this week 9.no numerical exercises this week 10.second semiexam, 2h, Learning outcomes:1,2,3,4,5,6,7 11.students present their seminars, 2h, Learning outcomes:1,2,3,4,5,6,7 12.students present their seminars, 2h, Learning outcomes:1,2,3,4,5,6,7 13.students present their seminars, 2h, Learning outcomes:1,2,3,4,5,6,7 14.students present their seminars, 1h, Learning outcomes:1,2,3,4,5,6,7 15.no numerical exercises this week				

Course content laboratory	1.no lab exercise in this week 2.no lab exercise in this week 3.exercises in company (connectoring, splicing, folding fibers into closures and clamps), 2h, Learning outcomes:1,2 4.exercises in company (connectoring, splicing, folding fibers into closures and clamps), 2h, Learning outcomes:1,2 5.exercises in company (connectoring, splicing, folding fibers into closures and clamps), 2h, Learning outcomes:1,2 6.no lab exercise in this week 7.OTDR measurements, 2h, Learning outcomes:3,4 8.OTDR measuremants analysis on computer, 2h, Learning outcomes:3,4 9.examples analysis with OptiSystem demo, 2h, Learning outcomes:2 10.no lab exercise in this week 11.no lab exercise in this week 12.no lab exercise in this week 13.no lab exercise in this week 14.no lab exercise in this week 15.no lab exercise in this week
Course content seminars	1.no student seminars this week 2.no student seminars this week 3.no student seminars this week 4.no student seminars this week 5.no student seminars this week 6.no student seminars this week 7.no student seminars this week 8.no student seminars this week 9.no student seminars this week 10.no student seminars this week 11.no student seminars this week 12.no student seminars this week 13.no student seminars this week 14.students present their seminars, 1h, Learning outcomes:1,2,3,4,5,6,7 15.students present their seminars, 2h, Learning outcomes:1,2,3,4,5,6,7
Required materials	Up to 3 students work on one theme. Result of their work is 8-10 A4 pages and 10 min. presentation in front of their colleagues and the teacher.
Exam literature	bilješke s predavanja R.Ramaswami, K.N.Sivarajan, Optical Networks A practical Perspective, 2nd ed, Morgan Kaufman Publishers, San Fransisco, 2002 A.Girard et all.: Guide to WDM Technology and Testing, EXFO 2008 A.Girard: FTTx PON Technology and Testing, EXFO 2005 ili novije izdanje G.P.Agrawal: Fiber Optic Communication Systems, 3rd ed, John WileySons Inc 2002 J.Walrand, P.Varaiya: High-Performance Communication Network, 2nd ed, Morgan Kaufman Publishers 2002 S.V.Kartalopoulus: Understanding SONET/SDH and ATM, IEEE Press, 1999
Students obligations	lab exercises and production and presentation of seminar
Knowledge evaluation during semester	Kolokvij, numeri zadaci#2#40#50$Kolokvij, teorijska pitanja#2#26#50$Seminarski rad#1#34#50$
Knowledge evaluation after semester	Two Compulsory preliminary written exams (arithmetic middle of both marks is taken as written exams mark) the written part of the exam (in case that both preliminary are not passed) and the oral part of the exam (final mark is arithmetic middle of 3 components in case that they are all positive)
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
Proposal made by	professor Sonja Zentner Pilinsky, Ph.D.

Code WEB/ISVU	23333/146786	**ECTS**	6.0	**Academic year**	2018/2019
Name	Optical Sensors				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. pred. Ivan Lujo , dipl.ing. Laboratory exercises:pred. Ivan Lujo , dipl.ing.				
Course objectives	students will understand the operating modes of optical sensors and recognize the possibilities of sensor applications				
Learning outcomes:	1.ability to analyze the operating principles of the optical sensor systems. Level:7 2.ability to test the operating of optical sensor system . Level:6,7 3.ability to establish advantages of optical/fiber optic sensor system over conventional sensor systems. Level:7 4.ability to design simple optical sensor systems. Level:6,7 5.ability to propose the implemention of available optical sensor solutions to particular applications. Level:6,7 6.ability to estimate and justify the requirements for optical sensor system. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Demonstration Simulations Discussion Seminar, students presentation and discussion Lectures presented at the blackboard with an additional help of PowerPoint presentations with various graphs and examples built into them (LCD projector needed).				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Group problem solving Computer simulations Lab exercises will be partially on computers and partially on measurement equipment, students do all measurements and result analysis alone.				
Course content lectures	1.Sensors - introduction, basic components of a sensing system, 2h, Learning outcomes:1 2.Division of sensor types, 2h, Learning outcomes:1,2 3.Light sources and their characteristics, 2h, Learning outcomes:1,2,3,4 4.Photodetectors and receivers, 2h, Learning outcomes:1,2,3,4 5.Optical fibers and plane dielectric waveguides, principles of wave travel adn modes, 2h, Learning outcomes:1,2,4 6.Attenuation, types of dispersion, non linear effects, 2h, Learning outcomes:1,2,4 7.Birefringence, 2h, Learning outcomes:1,4 8.Optical modulation types and detection, 2h, Learning outcomes:1,3,4 9.Optical modulation types and detection, 2h, Learning outcomes:1,3,4 10.Fiber microbending sensors and their application, 2h, Learning outcomes:1,3,4,5,6 11.Interferometer types, 2h, Learning outcomes:1,2,3,4 12.Interferometric sensors, 2h, Learning outcomes:1,3,5,6 13.OTDR and POTDR measurement devices, 2h, Learning outcomes:1,2,3,4 14.Distributed optical fiber sensors, 2h, Learning outcomes:1,2,3,4,5,6 15.Multiplexed sensors, 2h, Learning outcomes:1,2,3,4,5,6				
Course content laboratory	1.OTDR measurements, 4h, Learning outcomes:1,3,4 2.Detailed OTDR measurement analysis, 4h, Learning outcomes:3,4,5,6 3.Vibration and pressure sensor, 4h, Learning outcomes:1,3,4,5,6 4.Sensor simulations, 4h, Learning outcomes:1,2,3,4,5,6 5.Parameter calculation of various sensor systems, 4h, Learning outcomes:3,4,5,6 6.No class 7.No class 8.No class 9.No class 10.No class 11.No class 12.No class 13.No class 14.No class 15.No class				
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory Special purpose computer laboratory Whiteboard with markers Overhead projector				
Exam literature	Bilješke s predavanja E.Udd,ed.: Fiber Optic Sensors An Introduction for Engineers and Scientists, John WileySons 1991 J.M.Lpez-Higuera: Handbook of Optical Fibre Sensing Technology, WileySons 2002 D.Derickson, ed.: Fiber Optic Test and Measurement, Prentice Hall PTR 1998 Righini, Tajani, Cutolo, ed.: An Introduction to Optoelectronic Sensors, World scientific 2009 Yin, Ruffin, Yu, ed.: Fiber Optic Sensors, CRC Press 2008 Martellucci, Chester, Mignani, ed.: Optical Sensors and Microsystems, Kluwer Academic Publishers 2002				

	Jorg Haus: Optical Sensors, Wiley-VCH 2010	
Students obligations	class attendance, performed laboratory exercises, submitted and presented seminar paper	
Knowledge evaluation during semester	Two written examinations (50% needed to pass)	
Knowledge evaluation after semester	Seminar paper	
Student activities:	Aktivnost (Classes attendance) (Written exam) (Seminar Work)	ECTS 1 3 2
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
Proposal made by	Ivan Lujo, MSc, Lecturer	

Code WEB/ISVU	23642/159714	**ECTS**	5.0	**Academic year**	2018/2019
Name	Plant Control and Monitoring Systems				
Status	2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 90
Teachers	Lectures:1. mr.sc. Goran Malčić v.pred. Laboratory exercises: Mario Lučan Laboratory exercises: Ivica Vlašić				
Course objectives	students will acquire knowledge required to design and construct the control systems of industrial and electric power plants				
Learning outcomes:	1.ability to propose hardware solutions to a control systems. Level:6,7 2.ability to design a control software and the picture of the system visualization . Level:6,7 3.ability to redesign the developed system according to specific requirements. Level:6,7 4.ability to relate the elements of a real process to the program components. Level:6,7 5.ability to develop a simple plant control system. Level:6,7				
Methods of carrying out lectures	Presentation with Power point examples from industry.				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Group problem solving				
Course content lectures	1.Industrial and energy plants as an object of automation, 2h 2.Types of technical processes and management strategies, 2h 3.Control systems: switching, electronic, microprocessor and computer, 2h 4.Industrial programmable controllers - PLC, 2h 5.Requirements, architecture and functions, 2h 6.Interfaces process - control system, and control system - man, 2h 7.Logical elements of management, graphical programming, standard features PLC, 2h 8.Logical elements of management, graphical programming, standard features PLC, 2h 9.Industrial communication networks: topology, portable media media access methods, 2h 10.Network standards - ISO reference model, 2h 11.Communication protocols: Ethernet TCP / IP, Profbus ..., 2h 12.Interfaces and types of signals RS232, RS 485, 2h 13.Electrical and optical signal transmission., 2h 14.Process data acquisition SCADA, 2h 15.Logging process, visualization, 2h				
Course content laboratory	1.Elementary functional parts of a PLC,, 2h 2.Interaction with the environment and the PLC input and output control, 2h 3.Direct and indirect addressing, 2h 4.Programming language and the application development software, 2h 5.Application simulation on a PC, 2h 6.Specific application programming languages, 2h 7.Ladder diagrams (LAD), 2h 8.Statement list (STL), 2h 9.Sequencal function charts (SFC), 2h 10.Function block diagram (FBD), 2h 11.Instruction list (IL), 2h 12.Features and time response of control devices realized by a PLC, 2h 13.Connecting separate systems into a whole, 2h 14.Interrupt routines and operations program jumps, 2h 15.Human machine interface (SCADA), 2h				
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory Special purpose computer laboratory Overhead projector Maquette Tools Operating supplies Special equipment Self design of project example				
Exam literature	Friedman: Logical design of Automation Systems; Prentice Hall: 1990 Halsall: Data Commuincation, Computer Networks and Open Systems; AdisonWesley; 1992 Astrom, Wittenmark: Computer Controlled Systems:Prentice Hall 1984				
Students obligations	Individual project of process automation with subordinated control system and the system for visualization and monitoring. Project verification on the laboratory process model.				
Knowledge evaluation during semester	Colloquium numerical tasks Seminar Oral assessment				
Knowledge evaluation after semester	Written examination Oral examination Seminar				

Student activities:	Aktivnost	ECTS
	(Written exam)	3
	(Oral exam)	2
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
ISVU equivalents:	22609;146762;159139;	

Code WEB/ISVU	23320/146771	**ECTS**	6.0	**Academic year**	2018/2019
Name	Power Plants				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				45+15 (15+0+0+0) 120
Teachers	Lectures:1. mr.sc. Zoran Kovačević predavač Lectures:2. Prof.dr.sc. Krešimir Meštrović Auditory exercises:mr.sc. Zoran Kovačević predavač Auditory exercises:Izv.prof.dr.sc. Srđan Skok				
Course objectives	Power stations - classic and alternative. Electroenergetic system - basic facts and parameters				
Learning outcomes:	1.Power stations - history development. Level:6,7 2.Power stations - basic facts and parameters. Level:6,7 3.Analysis of the classic power stations types. Level:6 4.Analysis of the alternative sources for electric energy production. Level:6 5.Electrical energy production, transmission and consuming - analysis of technical and financial parametars. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Discussion Questions and answers Seminar, students presentation and discussion				
Methods of carrying out auditory exercises	No lecture				
Course content lectures	1.Power stations - history development, 3h, Learning outcomes:5 2.Power stations - basic facts and parameters, 3h, Learning outcomes:5 3.Classic power stations types, 3h, Learning outcomes:5 4.Alternative sources for electric energy production, 3h, Learning outcomes:5 5.Hydro power stations, 3h, Learning outcomes:5 6.Thermal power stations, 3h, Learning outcomes:5 7.Nuclear power stations, 3h, Learning outcomes:5 8.Wind power stations, 3h, Learning outcomes:5 9.Other power stations - solar, geothermal ..., 3h, Learning outcomes:5 10.Power station generators, 3h, Learning outcomes:5 11.Power station transformers, 3h, Learning outcomes:5 12.Power station internal consumption, 3h, Learning outcomes:5 13.Electroenergetic system - balance of the production and the consumption, 3h, Learning outcomes:5 14.Electric energy transmission (AC and DC), 3h, Learning outcomes:5 15.Electroenergetic systems - local, regional and global connecting, 3h, Learning outcomes:5				
Course content auditory	1.No lecture, Learning outcomes:5 2.No lecture, Learning outcomes:5 3.No lecture, Learning outcomes:5 4.No lecture, Learning outcomes:5 5.No lecture, Learning outcomes:5 6.No lecture, Learning outcomes:5 7.No lecture, Learning outcomes:5 8.No lecture, Learning outcomes:5 9.No lecture, Learning outcomes:5 10.No lecture, Learning outcomes:5 11.No lecture, Learning outcomes:5 12.No lecture, Learning outcomes:5 13.No lecture, Learning outcomes:5 14.No lecture, Learning outcomes:5 15.No lecture, Learning outcomes:5				
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector				
Exam literature	Basic literature: 1. K. Hot: Elektrane, Tehničko veleučilište, Zagreb, 2008. 2. H. Požar: Osnove elektroenergetike I/II, Tehnička knjiga, Zagreb, 1988. Dodatna: 1. R. Kehlhofer, F. Hannemann, F. Stirnimann, B. Rukes: Combined-Cycle Gas and Steam Turbine Power Plants, PennWell Corp., Tulsa (Ok), USA, 2009. 2. J. F. Manwell , J. G. McGowan , A. L. Rogers: Wind Energy Explained: Theory, Design and Application, John Wiley, N.Y. USA, 2009. 3. T.C. Elliott, K. Chen, R.C. Swanekamp, Standard Handbook of Powerplant Engineering, McGraw-Hill, New York, 2007.				
Students obligations	Lectures and exercises attendance				
Knowledge evaluation during semester	Seminars				

Knowledge evaluation after semester	Paper test1#20#50$Verbal exam1#80#50$
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.

Code WEB/ISVU	23314/146765	**ECTS**	6.0	**Academic year**	2018/2019
Name	Process Modelling and Simulation				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+15+0+15) 120
Teachers	Lectures:1. v.pred. Mato Fruk dipl.ing. Laboratory exercises:v.pred. Mato Fruk dipl.ing. Construction exercises:v.pred. Mato Fruk dipl.ing.				
Course objectives	Students will acquire knowledge of the control and regulation properties of the process elements by modeling and simulating				
Learning outcomes:	1.ability to formulate/create a task for analysis. Level:6,7 2.ability to write a mathematical model of the process. Level:6,7 3.ability to create a Simulink model. Level:6,7 4.ability to choose a controller type . Level:7 5.ability to estimate the transient response of open-loop and closed-loop system. Level:7 6.ability to generalize conduct of electrical, mechanical, electromechanical and thermal processes and the process the fluid storage. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Simulations Modelling Other The matter is presented by mathematical models, tables and diagrams using illustrative examples in practice.				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Group problem solving Computer simulations Other Exercises are performed in PC laboratory by using Matlab/Simulink programs.				
How construction exercises are held	Laboratory exercises, computer simulations Discussion, brainstorming Computer simulations				
Course content lectures	1.Introduction, 3h, Learning outcomes:1 2.One stage amplifiers. Common emitter amplifier, 3h, Learning outcomes:1 3.One stage amplifiers. Common emitter amplifier, 3h, Learning outcomes:1,2 4.One stage amplifiers. Common emitter amplifier, 3h, Learning outcomes:3 5.One stage amplifiers. Common collector amplifier, 3h, Learning outcomes:1,2,3 6.Transistor series voltage regulator, 3h, Learning outcomes:3,5 7.Common source amplifier, 3h, Learning outcomes:2,3,5 8.Common drain amplifier, 3h, Learning outcomes:2,3,4 9.Multistage amplifiers, 3h, Learning outcomes:1,2,3,6 10.Amplitude and phase frequency response, 3h, Learning outcomes:1,2,3,4,5,6 11.Amplitude and phase frequency response 12.Differential amplifier 13.Power amplifiers 14.Feedback 15.Oscillators				
Course content laboratory	1.No class. 2.No class. 3.No class. 4.Modelling of electrical system., 2h, Learning outcomes:1,2,3 5.Modelling of mechanical system., 2h, Learning outcomes:1,2,3 6.Modelling of electromechanical system., 2h, Learning outcomes:1,2,3,4 7.Modelling of thermal system., 2h, Learning outcomes:1,2,3,4 8.Modelling of fluid storage system. , 2h, Learning outcomes:1,2,3 9.Numerical integration procedure - properties and selection for specific use., 2h, Learning outcomes:2 10.Connection of PLC system and real-time process model in PC., 3h, Learning outcomes:1,2,3,4,5,6 11.No class. 12.No class. 13.No class. 14.No class. 15.No class.				
Course content constructures	1.No class. 2.No class. 3.No class. 4.No class. 5.No class. 6.No class. 7.No class. 8.No class. 9.No class.				

	10.No class. 11.Development of a mathematical model., 5h, Learning outcomes:1,2 12.Process and system parametar identification, 5h, Learning outcomes:2,3,4 13.Modeling and verification of mathematical Simulink model., 5h, Learning outcomes:1,2,3,4,5,6 14.No class. 15.No class.
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory Special purpose computer laboratory Overhead projector Special equipment Program package Matlab 2013a
Exam literature	1. Ž. Ban,J. Matuško, I. Petrović: Primjena programskog sustava MATLAB, Graphis, Zagreb, 2010. 2. Ž. Ban: Simulacijski paketi u analizi i sintezi sustava automatskog upravljanja: FER-ZAPR Zagreb, 1999. 3. N. Perić,I. Petrović: Automatizacija postrojenja i procesa, FER Zagreb, Zagreb, 2005. 4. D Hanselman, B. Littlefield: Mastering Matlab; Prentice Hall, New Jersey, 1996. 5. *** Simulik Users Guidethe Matlab Works Inc, 1993.
Students obligations	Attendance at all laboratory exercises and development of construction task
Knowledge evaluation during semester	Preliminary exams: 2 exams with simulation problems at least 50 percent to pass 1 exam with theoreticl problems at least 50 percent to pass
Knowledge evaluation after semester	Completed constuction task The written part and oral part of exam
Student activities:	Aktivnost — ECTS (Practical work) — 2 (Constantly tested knowledge) — 2 (Written exam) — 2
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22617;159771;
Proposal made by	Senior lecturer Mato Fruk, dipl. ing.

Code WEB/ISVU	23299/146747	**ECTS**	5.0	**Academic year**	2018/2019
Name	Project Management				
Status	1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+15 (11+0+4+0) 105
Teachers	Lectures:1. Vesna Alić-Kostešić dipl.ing.stroj. Auditory exercises: Vesna Alić-Kostešić dipl.ing.stroj. Auditory exercises:mr.sc. Branimir Preprotić dipl. inž. stroj. Seminar exercises: Vesna Alić-Kostešić dipl.ing.stroj.				
Course objectives	students will master basic elements of business management, production processes and services which can be viewed as projects				
Learning outcomes:	1.determine the importance of project management for a contemporary organization. Level:7 2.ability to manage the processes of the project integrity, its scope, time, costs, quality, personnel, communications, risks and project procurement . Level:6,7 3.ability to estimate the project risks in the project proposal. Level:6,7 4.ability to organize the project into steps and activities which will contribute to obtain the project goal. Level:6,7 5.ability to standardize required time and resources for carrying out activities using network planning techniques. Level:6,7 6.ability to plan costs for carrying out the project activities. Level:6,7 7.ability to analyze the project proposal through logical matrix. Level:6,7 8.ability to develop readiness for teamwork and cooperation. Level:6,7 9.ability to combine methods and procedures for decision making. Level:6,7 10.ability to estimate the impact of project on the environment. Level:6,7 11.ability to make a proposal for project and project plan in seminar paper. Level:6,7 12.present the project product , methods of keeping and monitoring plan, the expected change after project completion. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion Seminar, students presentation and discussion The whole material is presented in lectures illustrated by drawings, tables and graphs to facilitate understanding of the topic. It can be presented on OHP or in Power Point.				
Methods of carrying out auditory exercises	Group problem solving Computer simulations Workshop Problems of each particular topic analysed are solved on the blackboard. After explaining and solving a problem of a topic, students are given a related one to solve it on their own but with assistance of the teacher. Using the BK technique and with assistance of their teacher, students create a smaller project.				
Methods of carrying out seminars	Group problem solving				
Course content lectures	1.Nature and context of project management, processes and knowledge domains, 2h, Learning outcomes:1 2.Strategy and project management, 2h, Learning outcomes:2 3.Strategy and project management, 2h, Learning outcomes:2 4. Project management and interest and influence groups in project , 2h, Learning outcomes:3 5. Project structure, 2h, Learning outcomes:4 6. Initiating the project plans, 2h, Learning outcomes:5 7. Initiating the project plans, 2h, Learning outcomes:6 8.Preliminary project, 2h, Learning outcomes:6 9.Colloquium, 2h, Learning outcomes:1,2,3,4,5,6 10.Planning techniques, 2h, Learning outcomes:7,8 11.Planning techniques, 2h, Learning outcomes:7,8 12.Project implementation, 2h, Learning outcomes:9,10 13.Project implementation, 2h, Learning outcomes:9,10 14.Project closing, 2h, Learning outcomes:11 15.Colloquium, 2h, Learning outcomes:6,7,8,9,10,11,12				
Course content auditory	1.no class 2.no class 3.no class 4.no class 5.no class 6.Decision making methods, acceptance of differences, 2h, Learning outcomes:4 7.Problem analysis, problem /goal tree, 2h, Learning outcomes:5 8.Goal achievement strategy, logic matrix , 2h, Learning outcomes:6 9.Network planning techniques - tasks , 2h, Learning outcomes:7,8 10.Network planning techniques - tasks , 2h, Learning outcomes:7,8 11.Network planning techniques - tasks , 2h, Learning outcomes:7,8 12.no class 13.no class 14.no class 15.no class				
Course content seminars	1.no class 2.no class				

	3.no class 4.no class 5.no class 6.no class 7.no class 8.no class 9.no class 10.no class 11.no class 12.no class 13.no class 14.To logically relate the project elements, inspect logical matrix, present the project idea, 4h, Learning outcomes:11,12 15.no class
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory Overhead projector Operating supplies
Exam literature	PMI:Znanje o upravljanju projektima (vodič kroz PMBOK, 4.izdanje)mate d.o.o., Zagreb 2011.; Nikolić, čala, alić-kostešić: metode u planiranju odjeće,ZS 2010.;Čala,I; i ostali autori: Inženjerski priručnik, dio 4, poglavlja 6. Planiranje i praćenje proizvodnje, Školska knjiga, Zagreb, 2002. Vila, A; Štajdl, B; Čala, I; Karabajić, I: Metode planiranja proizvodnje, Informator, Zagreb, 1982. Vila, A; Leicher, Z: Planiranje proizvodnje i kontrola rokova, Informator, 3. izdanje, Zagreb 1983. Schroeder, Roger,G: Upravljanje proizvodnjom, Mate, Zagreb, 1999. Bilješke koje nastavnik priprema za nastavu Čala, I: Stupnjevito planiranje, izlaganje na savjetovanju Upravljanje proizvodnjom, CDI Zagreb, Briuni, 1989. Dilworth,J.B.: Operations Management, Mc Grow Hill, inc., New York, 1995. Schonberger,R.J., Knod, M.E.: Operations Management, Irwin, 1994. Majstorović, V.: Upravljanje Proizvodnjom i projektima (Production and Project Management), Nakladnici Sveučilište u Mostaru i DAAAM International Vienna, Mostar-Wien 2001.
Students obligations	submitted seminar paper, regular lecture attendance
Knowledge evaluation during semester	Redovitost pohaa#2#0#0$Kolokvij, numeri zadaci#1#33#60$Kolokvij, teorijska pitanja#1#33#60$Seminarski rad#1#34#60$ 1. colloquium min 30, max 50 2. colloquium min 30, max 50
Knowledge evaluation after semester	written and oral exam pointsevaluation 00 891 902 1063 1214 1365
Student activities:	Aktivnost — ECTS (Constantly tested knowledge) — 2 (Seminar Work) — 1 (Written exam) — 2
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22658;63916;63917;63918;161640;

Code WEB/ISVU	23298/146746	**ECTS**	5.0	**Academic year**	2018/2019
Name	Quality Management				
Status	1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+16 (13+0+3+0) 104
Teachers	Lectures:1. dr.sc. Davor Petranović dipl.ing.el. Auditory exercises:dr.sc. Davor Petranović dipl.ing.el. Seminar exercises:dr.sc. Davor Petranović dipl.ing.el.				
Course objectives	To transfer to students the basic knowledge related to quality management				
Learning outcomes:	1.ability to estimate to what point the regulations and norms concerning the quality of products or services are law-abiding. Level:7 2.ability to choose an appropriate quality tool for solving incompatibilities in processes, products or services. Level:7 3.ability to measure the level of stability and variability of a process. Level:7 4.ability to write a report on preventions or corrections that have been made towards the management or customers. Level:6,7 5.ability to buid a system of quality assurance on a model of a work organisation or institution. Level:6,7 6.ability to propose the activities which will introduce advancements in the existing processes in an organisation, to increase efficiency and reduce costs. Level:6,7 7.ability to manage the quality system in a chosen model of a work organisation or institution. Level:6,7 8.ability to devise a documented procedure to describe a process in the organisation model. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Discussion Seminar, students presentation and discussion Other Drawings, tables and diagrams are used to facilitate understanding, as well as photographs and prepared materials used in companies.				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Workshop Other problems are solved with students				
Methods of carrying out seminars	Data mining and knowledge discovery on the Web Discussion, brainstorming Workshop Other Student chooses an example to analyse, work on it and present for the group.				
Course content lectures	1.Introduction to the course, assessment of general concepts and definitions of quality, 4h, Learning outcomes:1,2,3,4,5,7,8 2.Systems standards, introduction to ISO 9001 Requirements for Management System, 4h, Learning outcomes:1,2,3,4,5,6,7,8 3.Collecting and displaying data, FMEA analysis, 3h, Learning outcomes:1,2,3,4,5,6,7,8 4.Process control and statistics, 3h, Learning outcomes:1,2,3,4,5,6,7,8 5.Repetition of topics S1-S4, 1h, Learning outcomes:1,2,3,4,5,6,7,8 6.Quality control of the process, SWOT analysis, 5S, 4h, Learning outcomes:1,2,3,4,5,6,7,8 7.Method six sigma, 3h, Learning outcomes:1,2,3,4,5,6,7,8 8.Product design, engineering, 3h, Learning outcomes:1,2,3,4,5,6,7,8 9.Method eight disciplines, 1h, Learning outcomes:1,2,3,4,5,6,7,8 10.Quality in procurement, 3h, Learning outcomes:1,2,3,4,5,6,7,8 11.Repetition of topics S5-S9, 1h, Learning outcomes:1,2,3,4,5,6,7,8 12.no lessons 13.no lessons 14.no lessons 15.no lessons				
Course content auditory	1.Process development and manufacturing, FMEA analysis, 2h, Learning outcomes:1,2,3,4,5,6,7,8 2.Xsr R-map, the analysis of the production process, 2h, Learning outcomes:1,2,3,4,5,6,7,8 3.Key Performance Indicators, 2h, Learning outcomes:1,2,3,4,5,6,7,8 4.quality plans, 2h, Learning outcomes:1,2,3,4,5,6,7,8 5.8D method, internal audits, 2h, Learning outcomes:1,2,3,4,5,6,7,8 6.Presentation of seminar papers, 2h, Learning outcomes:1,2,3,4,5,6,7 7.no lessons 8.no lessons 9.no lessons 10.no lessons 11.no lessons 12.no lessons 13.no lessons 14.no lessons 15.no lessons				
Course content seminars	1.Consultation and exercises, 1h, Learning outcomes:1,2,3,4,5,6,7,8 2.Consultation and exercises, 1h, Learning outcomes:1,2,3,4,5,6,7,8				

	3.Consultation and exercises, 1h, Learning outcomes:1,2,3,4,5,6,7,8 4.no lessons 5.no lessons 6.no lessons 7.no lessons 8.no lessons 9.no lessons 10.no lessons 11.no lessons 12.no lessons 13.no lessons 14.no lessons 15.no lessons
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector
Exam literature	Bilješke koje nastavnik priprema za nastavu J.M.Juran, Quality Control Handbook, McGraw-Hill, New York, 1989. Juran, Joseph Moses; Frank M. Gryna. 1993, 1999, Planiranje i analiza kvalitete. MATE d.o.o. Zagreb E.L.Grant, R.S.Leavenworth, Statistical Quality Control, McGraw-Hill, New York, 1988. Lazibat, Tonči, 2009, Upravljanje kvalitetom, Znanstv. knjiga, Zagreb. Oslić, Ivica, 2008, Kvaliteta i poslovna izvrsnost, MEP Consult, Zagreb Štajdohar-Pađen, Olga, 2009, Plivati s ISO-m i ostati živ, Kigen, Zagreb
Students obligations	delivered seminars and evaluated with at least 8 points
Knowledge evaluation during semester	Redovitost pohaa#3#0#0$Kolokvij, teorijska pitanja#2#35#0$Seminarski rad#1#15#8$Domazada5#3#0$
Knowledge evaluation after semester	written and oral exam
Student activities:	Aktivnost — ECTS (Written exam) — 4 (Oral exam) — 1
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
Proposal made by	dr.sc. Ljubivoj Cvitaš dipl.ing., 1.6.2015

Code WEB/ISVU	23334/146787	**ECTS**	6.0	**Academic year**	2018/2019
Name	Radar Systems				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 120
Teachers	Lectures:1. Mirko Jukl Auditory exercises: Mirko Jukl				
Course objectives	students will acquire basic knowledge of radar systems needed for further professional development and work with radars				
Learning outcomes:	1.ability to differentiate the basic features of the radar signal and the technical features of radar systems. Level:6 2.ability toconnect the basic features of the radar signal and the physical principles of radar techniques with prior knowledge acquired and performances radar subsystems. Level:6,7 3.ability to analyze complex radar signals using different models. Level:6 4.ability to calculate the main characteristics of radar systems using the acquired knowledge and additional resources. Level:6 5.ability to measure fundamental parameters of radar systems and analyze test results. Level:7 6.ability to make conclusion on optimal parameters of radar systems. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Demonstration Simulations Discussion Questions and answers Seminar, students presentation and discussion Multi medial lessons with verbal communication betwen teacher-students				
Methods of carrying out auditory exercises	Group problem solving Computer simulations Interactive problem solving Excercises on sloving numerical problems in radar technology				
Course content lectures	1.Introductory lesson; a plan of the course and content of the exam; summary of basic knowledge acquired in the course Radar circuits, 2h, Learning outcomes:1,2,3,4 Physical basis of radar techniques, 2h, Learning outcomes:1,2,3,4,6 2.Radar equations and a maximum range of active mono static and bi static radar, secondary and tracking radar, 2h, Learning outcomes:1,2,3,4 3.Impact of land, sea and clouds clutter on target detection and maximum range, 2h, Learning outcomes:1,2,3,4 4.Concepts performance of radar transmitter, first small test, ten minutes, 2h, Learning outcomes:1,2,3,4,5 5.Concepts performance of radar receiver, 2h, Learning outcomes:1,2,3,4,5 6.Methods for increasing radar range, phase and frequency signal compression , 2h, Learning outcomes:1,2,3,4 7.Special processing of radar signals in the radar receiver , 2h, Learning outcomes:1,2,3,4 8.Concepts performance of of classical parabolic radar antenna and the antenna is electronically controlled radiation pattern , 2h, Learning outcomes:1,2,3,4 9.Digitization of primary radar signals and digital processing, second colloquium outside the planed teaching, 2h, Learning outcomes:1,2,3,4,5 10.Extraction of radar targets and the automatic tracking , 2h, Learning outcomes:1,2,3,4 11.Concepts performance of surveillance radars, comparison and evaluation of operational technical features, 2h, Learning outcomes:1,2,3,4,5,6 12.Concepts tracking radars performance of, comparison and evaluation of operational technical features, first small test, ten minutes , 2h, Learning outcomes:1,2,3,4,5,6 13.Concepts performance of secondary radars, comparison and evaluation of operational technical features, 2h, Learning outcomes:1,2,3,4,5 14.Concept of performance of radar networks, comparison and evaluation of the operational and technical characteristics of the performance of electronic jamming to a specific performance, 2h, Learning outcomes:1,2,3,5,6 15.No classes, second colloquium outside the planed teaching				
Course content auditory	1.No classes 2.Basic principles of radiolocation , 2h, Learning outcomes:2,3,4 3.Basic principles of radiolocation , 2h, Learning outcomes:2,3,4 4.Calculation range primary radar in the free space , 2h, Learning outcomes:2,3,4 5.Calculation of the secondary radar range in the free space, 2h, Learning outcomes:2,3,4 6.Calculation radar range with the impact of interference from land, sea and clouds , 2h, Learning outcomes:2,3,4 7.Calculation radar range with the impact of interference from land, sea and clouds , 2h, Learning outcomes:2,3,4,5 8.Computer simulation calculations radar range in the free space and in terms of passive and active electronic interference, 2h, Learning outcomes:2,3,4 9.Computer simulation calculations radar range in the free space and in terms of passive and active electronic interference, 2h, Learning outcomes:2,3,4 10.Computer simulation calculations radar range in the free space and in terms of passive and active electronic interference, 2h, Learning outcomes:2,3,4,5 11.Passive and active radar jammers and radar network , 2h, Learning outcomes:2,3,4 12.Passive and active radar jammers and radar network , 2h, Learning outcomes:2,3,4 13.Passive and active radar jammers and radar network , 2h, Learning outcomes:2,3,4 14.Presentations of seminar papers, 2h, Learning outcomes:1,2,3,4,5,6 15.Presentations of seminar papers, 2h, Learning outcomes:1,2,3,4,5,6 Presentations of seminar papers, 2h, Learning outcomes:1,2,3,4,5,6				

Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory Whiteboard with markers Overhead projector Maquette Demonstration exercises are conducted during the lecture on a laboratory model of radar
Exam literature	Basic literature: 1. M.Jukl, Radaraski sustavi, lekcije,TVZ Zagreb 2011. 2. E. Zentner, Radiokomunikacije, Školska knjiga, Zagreb 1989. 3. D..K. Barton, Radar system analysis, 1976. 4. M. I. Skolnik, Radar Handbook, McGraw-Hill, New York, 1970. 5. Filmovi o radarskim sustavima Additional literature: Internet, prospekti, stručni članci
Students obligations	Class attendance, max. 10 points: Lectures by 5 points, 1 point for delay or failure to appear. Condition: min 0 points Exercises by 5 points, 1 point for delay or failure to appear. Condition: min 0 points
Knowledge evaluation during semester	There are two colloquiums. Each colloquium consists of a theoretical part, max 25 points and tasks, max 10 points The theoretical part of the learning outcomes, max. 50 points Two small test by 5 points, the passage of > 2.5 points Two preliminary tests by 20 points, the passage of > 10 points A positive evaluation of the theory: Both exams by > 10 points Tasks, max 20 points Two preliminary tests by 10 points, the passage of > 10 points Each of the colloquiums will have a fix. Seminar, max. 20 points Class attendance, max. 10 points: Total, max. 100 points. from 91 to 100 = 5 from 81 to 90 = 4 from 71 to 80 = 3 from 61 to 70 = 2 60 and under, 60 and under, not enough achievement
Knowledge evaluation after semester	The theoretical part of the learning outcomes, max. 40 points The classic exam 40 points, the passage of> 20 A positive evaluation of the theory: The classic exam> 20 Tasks max 30 points: The classic exam 30 points, passage > 15 Positive assessment of tasks: The classic exam > 10 Classical exam the poppy max 30 points: Seminary, max 20 points Class attendance, max. 10 points: Total, max. 100 points. from 91 to 100 = 5 from 81 to 90 = 4 from 71 to 80 = 3 from 61 to 70 = 2 60 and under, 60 and under, not enough achievement
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Constantly tested knowledge) — 2 (Practical work) — 2 (Seminar Work) — 1

Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22632;
Proposal made by	mr.sc. Mirko Jukl , lecturer, 1.6.2012

Code WEB/ISVU	23310/146760	**ECTS**	5.0	**Academic year**	2018/2019
Name	Rational Use of Energy				
Status	2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 90
Teachers	Lectures:1. Tomislav Špoljarić d. i. e., v. pred. Auditory exercises: Tomislav Špoljarić d. i. e., v. pred.				
Course objectives	students will acquire knowledge of rational use of energy and improvement of energy efficiency in industrial plants				
Learning outcomes:	1.ability to justify the application of procedure for possible reduction of energy consumption at the same process production. Level:7 2.ability to identify possible energy savings by using more efficient control system. Level:7 3.ability to propose applying the control system in pumping and ventilation plants with reduced electric energy consumption. Level:6,7 4.jability to ustify the reasons for investments in more expensive equipment from the point of savings within the plant lifecycle. Level:7 5.ability to chose technical solutions to energy distribution with reduced transmission line loss. Level:7 6.ability to present rationalization methods for energy consumption in civil engineering and industrial plants. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Discussion Seminar, students presentation and discussion				
Methods of carrying out auditory exercises	Traditional literature analysis Data mining and knowledge discovery on the Web Computer simulations Workshop				
Course content lectures	1.Energy supply systems and energy management in industry plants. , 3h, Learning outcomes:1,2 2.Loss minimization in production, conversion and transmission of energy, 3h, Learning outcomes:1,2 3.Process systems with possibilities of loss minimization , 3h, Learning outcomes:2,3 4.pump and fan drives. Replacement of mechanical variations of process control by speed variation, 3h, Learning outcomes:2,3,4 5.Application of the improved energy efficiency plant components, 3h, Learning outcomes:2,3,4 6.Basic economic analysis of the improved system., 3h, Learning outcomes:3,4 7.Plant life cycle costs., 3h, Learning outcomes:4,5 8.Loss minimization in transmission of electric energy by power factor improvement and filtering, 3h, Learning outcomes:4,5,6 9.Rationalizing in building automation system: lighting, air conditioning system, household appliances. , 3h, Learning outcomes:4,5,6 10.Cogeneration system in energy production. Use of non coventonal energy sources , 3h, Learning outcomes:5,6 11.- 12.- 13.- 14.- 15.-				
Course content auditory	1.Examples of energy saving in industry plants., 2h, Learning outcomes:1,2,3 2.Examples of energy saving in industry plants., 2h, Learning outcomes:2,3 3.Examples of energy saving in industry plants., 2h, Learning outcomes:2,3,4 4.ne 5.Basic cost-efficiency analysis of the improved efficiency drives use, 2h, Learning outcomes:3,4 6.Energy saving calculating using programs , 2h, Learning outcomes:3,4,5 7.Use of high efficiency motors, 2h, Learning outcomes:2,3,4 8.Loss reduction by veriable speed motor drive, 2h, Learning outcomes:3,4,5,6 9.Loss reduce by power factor kompensating, Loss reduction in lighting, 2h, Learning outcomes:4,5 10.Loss reduction in HVAC system, 2h, Learning outcomes:4,5,6 11.Loss reduction by houshold equpiement higher energy class, 2h, Learning outcomes:4,5,6 12.ne 13.ne 14.ne 15.ne				
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory Whiteboard with markers Overhead projector Maquette				
Exam literature	1.Feretić, Tomšić, Škanata, Subašić: Elektroenergetika i okoliš, Element, Zagreb, 2000. 2.Turner: Energy Management Handbook; Prentice Hall 2001.				
Students obligations	Individual project design of the rational use of energy in building automation system or industrial plant				

Knowledge evaluation during semester	Redovitost pohaa#5#10#5$Kolokvij, numeri zadaci#2#20#10$Kolokvij, teorijska pitanja#2#20#10$Programski zadatak#1#20#15$Usmena provjera znanja#1#30#20$	
Knowledge evaluation after semester	the written part and the oral part of the exam	
Student activities:	Aktivnost (Seminar Work)	ECTS 5
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
Proposal made by	dr. sc. Ljubivoj Cvitaš, predavač	

Code WEB/ISVU	23311/146761	**ECTS**	5.0	**Academic year**	2018/2019
Name	Regulation of electrical engineering in the design and construction process				
Status	2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				45+0 (0+0+0+0) 105
Teachers	Lectures:1. Lukša Padovan				
Course objectives	students will be introduced to organization, tehnical filds and procedures for lifelong learning in the fild of electrical engineering				
Learning outcomes:	1.ability to formulate/create the project documentation procedure. Level:6,7 2.ability to integrate requirements og all profession at the stagees of design and construction. Level:6,7 3.ability to give critical assesment of solutions an accordance with limitations. Level:7 4.ability to integrate all stages of design into a whole. Level:6,7 5.ability to estimate the quality of the offered solutions and methods. Level:7 6.ability to conduct the process of making design documentation. Level:6,7 7.ability to edit the content of project documentation. Level:6,7 8.ability to combine various design solutions. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion Questions and answers Presentation of experiences from industrial practice				
Course content lectures	1.laws, regulation, rules, standards, 3h, Learning outcomes:1,2,3 2.Preliminary and final design with examples, 3h, Learning outcomes:2,4,5,6 3.Detailed design examples and documentation as built, 3h, Learning outcomes:2,3,4,5,6 4.Electric drives design solution, types of documents, 4h, Learning outcomes:3,5,6 5.Calculations with examples, 4h, Learning outcomes:2,4,5,6,7 6.The process of creating a product with examples, 4h, Learning outcomes:3 7.Electrotehnical project elements, 4h, Learning outcomes:7 8.Regulation, Inspection and maintenance Checks, 4h, Learning outcomes:1,5,6,7,8 9.Colloquium 1, 2h, Learning outcomes:1,2,3,4,5,6,7,8 10.Basic of explosion protection, 3h, Learning outcomes:2,3,4,6,7 11.Requirements for electrical equipement , 3h, Learning outcomes:1,3,5,7 12.Requirements for electrical installation with examples, 3h, Learning outcomes:2,4,5,6 13.Other sources of ignition, 3h, Learning outcomes:1,3,4,5,7 14.Examples from practice, 3h, Learning outcomes:1,2,3,4,5,6,7,8 15.Colloquium 2, 2h, Learning outcomes:1,2,3,4,5,6,7,8				
Required materials	Basic: classroom, blackboard, chalk... Overhead projector Presentation of experiences from industrial practice				
Exam literature	Končarev priručnik, 1991, 1197 str. Električni uređaji i instalacije za eksplozivnu atmosferu, 1999, 540 str.				
Students obligations	80% of class attendance				
Knowledge evaluation during semester	The requirements for passage is min 50% points.				
Knowledge evaluation after semester	The requirements for passage is min 50% points.				
Student activities:	Aktivnost (Written exam)		ECTS 5		
Remark	This course can be used for final thesis theme				
Prerequisites:	No prerequisites.				

Code WEB/ISVU	23634/156992	**ECTS**	5.0	**Academic year**	2018/2019
Name	Renewable Energy Sources in Power Systems				
Status	2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (15+15+0+0) 90
Teachers	Lectures:1. Prof.dr.sc. Krešimir Meštrović Lectures:2. Zvonimir Meštrović mag. ing. Auditory exercises: Zvonimir Meštrović mag. ing. Laboratory exercises: Zvonimir Meštrović mag. ing.				
Course objectives	Acquisition of specialist knowledge in the field of renewable energy sources				
Learning outcomes:	1.analyze pros and cons of renewable energy technologies. Level:6 2.calculate power, production and other important parameters of renewable energy technologies. Level:6 3.identify key obstacles to greater integration of renewable energy sources in the electric power systems. Level:6 4.develop their own hybrid power system from renewable sources. Level:6,7 5.design hybrid renewable energy system . Level:6 6.choose appropriate RES technologies for specific applications. Level:7 7.compare various energy storage technologies in renewable energy context. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Simulations Modelling Discussion Questions and answers Seminar, students presentation and discussion				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Interactive problem solving				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations				
Course content lectures	1.Organization and introduction to renewable energy sources, 2h, Learning outcomes:1 2.Introduction to modeling in Homer energy, 2h, Learning outcomes:2,3,5,6 3.Solar radiation I, 2h, Learning outcomes:1 4.Solar radiation II, 2h, Learning outcomes:1 5.Photovoltaic (physics, technology, state of the art), 2h, Learning outcomes:1 6.PV systems (physics, state of the art, modeling), 2h, Learning outcomes:1 7.Designing off-grid photovoltaic system, 2h, Learning outcomes:1,2,4,5 8.First midterm exam, 2h, Learning outcomes:1,2,3,4,5 9.Wind energy (physics, technology, modeling), 2h, Learning outcomes:1 10.Basic wind turbine components , 2h, Learning outcomes:1 11.Physical principles of operation of modern wind turbines (physics, control system, modeling), 2h, Learning outcomes:1 12.Wind powerplants in Electric Power System, 2h, Learning outcomes:1 13.Wind energy production estimation and closing chapters, 2h, Learning outcomes:1 14.Second exam , 2h, Learning outcomes:1,2,3,4,5,6 15.Student presentation and discussion - Hybrid systems in Homer energy, 2h, Learning outcomes:1,2,3,4,5,6				
Course content auditory	1.AV 1, 1h, Learning outcomes:1 2.AV 2, 1h, Learning outcomes:1 3.AV 3, 1h, Learning outcomes:1 4.AV 4, 1h, Learning outcomes:1 5.AV 5, 1h, Learning outcomes:1 6.AV 6, 1h, Learning outcomes:1 7.AV 7, 1h, Learning outcomes:1 8.AV 8, 1h, Learning outcomes:1 9.AV 9, 1h, Learning outcomes:1 10.AV 10, 1h, Learning outcomes:1 11.AV 11, 1h, Learning outcomes:1 12.AV 12, 1h, Learning outcomes:1 13.AV 13, 1h, Learning outcomes:1 14.AV 14, 1h, Learning outcomes:1 15.AV 15, 1h, Learning outcomes:1				
Course content laboratory	1.PV measurement with various light intesity, 1h, Learning outcomes:4 2.PV measurement with various light incident angle, 1h, Learning outcomes:4 3.Lead battery charging directly from PV, 1h, Learning outcomes:4 4.U-I characteristic of PV panel, 1h, Learning outcomes:4 5.Shading of pv module, 1h, Learning outcomes:4 6.Temperature impact on PV module, 1h, Learning outcomes:4 7.PV series and parallel conection, 1h, Learning outcomes:4 8.Blocking diodes, 1h, Learning outcomes:4 9.Lead battery charging protection, 1h, Learning outcomes:4				

	10.Inverter efficiency in off-grid PV system, 1h, Learning outcomes:4 11.PV on-grid system, 1h, Learning outcomes:4 12.Power and efficiency of on-grid PV systems in various connections, 1h, Learning outcomes:4 13.Electrolysis and fuel cell, 3h, Learning outcomes:4 14.no class 15.no class
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory Special purpose computer laboratory Overhead projector
Exam literature	- G.M. Masters Renewable and Efficient Electric Power Systems, John Wiley Sons, Inc, 2004. - M. Jelavić Upravljanje vjetroagregatom s ciljem smanjenja dinamičkih opterećenja konstrukcije, doktorska disertacija, Zagreb 2009. - Novi izvori energije (II. dio) Sunčana energija i energija vjetra, Kulišić P., Školska knjiga, Zagreb, 1991. - Solarni sustavi Teorijske osnove, projektiranje, ugradnja i primjeri izvedenih projekata, Majdandžić Lj., Graphis d.o.o., Zagreb - Renewable Energy Resources; John Twindell, Tony Weir; The University Press, Cambridge; 2005 - Fundamentals of Renewable Energy Processes, Aldo V. Da Rosa, Elsevier, 2009. - Renewable Energy in Power Systems, L. Freris, D. Infield, Wiley, 2008 - Integration of Alternative Sources of Energy, F.A. Farret, M.G. Simones, IEEE Wiley 2006 - Wind Energy Explained; James F. Manwell, Jon G. McGowan, Anthony L. Rogers; John Wiley Sons, Chichester, England; 2002;
Students obligations	Final number of points >50%
Knowledge evaluation during semester	Project (Homer Energy): 20 points Laboratory: 10 points 1. Midterm exam: 35 points 2. exam: 35 points Total: 100 points Grades: 90 - 100 = 5 75 - 89 = 4 60 - 74 = 3 50 - 59 = 2 0 - 49 = 1
Knowledge evaluation after semester	Final exam 100 points, 50% necessary for positive grade
Student activities:	Aktivnost: (Written exam) — ECTS: 5
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	117045;132267;146758;156970;
Proposal made by	prof.dr.sc. Krešimir Meštrović

Code WEB/ISVU	23317/146768	**ECTS**	6.0	**Academic year**	2018/2019
Name	Sensors and actuators for industrial processes				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. Marko Miletić Laboratory exercises: Marko Miletić				
Course objectives	Adoption of the principles of the most used sensors and actuators in a typical technical systems in the industry, and knowledge application and connectivity of intelligent inverter in the communication subsystem managed, supervised or regulated process.				
Learning outcomes:	1.assess the cost-effectiveness and legitimacy of the use of sensors and actuators. Level:6,7 2.selecting operation of intelligent sensors physical size. Level:7 3.propose the use of the corresponding actuator in an appropriate place. Level:6,7 4.combine different types of sensors in industrial plants. Level:6,7 5.to form the working principle of the most used sensors and actuators. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Demonstration Seminar, students presentation and discussion Lectures using multimedia presentations, and to illustrate current examples of practical application of sebsoras and actuators in industrial processes.				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Workshop Other Performed using the model specifically geared to measure of certain physical quantities and models with sensors, transducers and actuators.				
Course content lectures	1.Introductory lecture, principles of sensors performance , Temperature measurement, Measuring linear position, 8h, Learning outcomes:1,2,3,4,5 2.Pressure measurement, Flow measurement, 4h, Learning outcomes:1,2,3,4,5 3.Actuators 1, Actuators 2, 4h, Learning outcomes:1,2,3,4,5 4.Colloquium 1, Servo drives, Level measurement, 4h, Learning outcomes:1,2,3,4,5 5.Communications in industrial factory, 4h, Learning outcomes:1,2,3,4,5 6.Examples of transducers, Examples of Actuators, 4h, Learning outcomes:1,2,3,4,5 7.Examples of technical systems 1, 4h, Learning outcomes:1,3,4,5 8.Colloquium 2, Examples of technical systems 2, 2h, Learning outcomes:1,2,3,4,5 9.no classes 10.no classes 11.no classes 12.no classes 13.no classes 14.no classes 15.no classes				
Course content laboratory	1.no classes 2.Measurement of current and voltage, Measurement of length, displacement and levels, 4h, Learning outcomes:1,2,3,4,5 3.Temperature measurement, Moisture measurement, 4h, Learning outcomes:1,2,3,4,5 4.Measuring interfaces, Light and heat radiation measurement, 4h, Learning outcomes:1,2,3,4,5 5.Flow measurement, Measuring the speed of rotation, Proximity sensors, 4h, Learning outcomes:1,2,3,4,5 6.Measurement of mechanical force and weight, 4h, Learning outcomes:1,2,3,4,5 7.Pressure measurement, Acceleration measurement, Humidity measurement, 4h, Learning outcomes:1,2,3,4,5 8.Actuators, 6h, Learning outcomes:1,2,3,4,5 9.no classes 10.no classes 11.no classes 12.no classes 13.no classes 14.no classes no classes 15.no classes				
Required materials	Special purpose laboratory Special purpose computer laboratory Whiteboard with markers Overhead projector Maquette				
Exam literature	Obavezna: 1.Skripta na bazi predavanja. 2. Measurement and Instrumentation Principles, A. Morris Butterworth-Heinemann, 2001 3. Fraden, J., Handbook of Modern Sensors - Physics, Designs, and Applications , AIP Press, NY 1997. Additional literature:				

	4. William C. Dunn, Fundamentals of Industrial Instrumentation and Proces Control, McGraw-Hill 5. Practical Design Techniques For Sensor Signal Conditioning, Analog Devices,
Students obligations	Attendance at least one lecture and: Participate in making at least 2/3 of laboratory exercises or Participate in making at least 1/3 of laboratory exercises + positively evaluated seminar paper
Knowledge evaluation during semester	Students can get a rating by depositing a written and oral examination on the exam, or through liberation. Students can be rid of the whole or part of the examination good results in two tests and active participation in laboratory exercises. Colloquium 1: max. 50 points Colloquium 2: max. 50 points Maximum number of points is 100. for the liberation of the written exam must be achieved by 54 points for the liberation of the written and oral examination should achieve 68 points
Knowledge evaluation after semester	written and oral exam
Student activities:	Aktivnost ECTS (Classes attendance) 1 (Written exam) 1 (Oral exam) 1 (Project) 1 (Activity in class) 1 (Constantly tested knowledge) 1
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
Proposal made by	Marko Miletić, struč.spec.ing.el., 1.6.2018.

Code WEB/ISVU	23322/146773	**ECTS**	6.0	**Academic year**	2018/2019
Name	Smart grids				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+15 (0+15+0+0) 135
Teachers	Lectures:1. Tomislav Plavšić Laboratory exercises: Tomislav Plavšić				
Course objectives	students will be introduced to the operating principles and application of advanced power engineering systems				
Learning outcomes:	1.Define importances and roles of advanced technologies and systems in power system development. Level:7 2.estimate role of smart grids as a function in electrical energy market stimulation. Level:6,7 3.estimate role of smart grids as a function in integration of renewable energy sources. Level:6,7 4.estimate role of energy policy in stimulation of smart grids development. Level:6,7 5.define general and operational micro grid characteristics. Level:7 6.analyse general and operational characteristics of energy storage. Level:6 7.analyse general and operational characteristics of distributed generation. Level:6				
Methods of carrying out lectures	Ex cathedra teaching Discussion Questions and answers Seminar, students presentation and discussion Field teaching				
Methods of carrying out laboratory exercises	Laboratory exercises, computer simulations Computer simulations				
Course content lectures	1.Introduction, 1h, Learning outcomes:1,2 , 2h, Learning outcomes:1,2 , 2h, Learning outcomes:1,2,3 2.One stage amplifiers. Common emitter amplifier, 1h, Learning outcomes:1,2 , 2h, Learning outcomes:1,2 , 2h, Learning outcomes:1,2 3.One stage amplifiers. Common emitter amplifier, 2h, Learning outcomes:1,2 , 3h, Learning outcomes:1,2,3 4.One stage amplifiers. Common emitter amplifier, 2h, Learning outcomes:1,2 , 2h, Learning outcomes:1,2,3 , 2h, Learning outcomes:1,2,3 5.One stage amplifiers. Common collector amplifier, 2h, Learning outcomes:1,2,3 , 2h, Learning outcomes:1,2,3 , 2h, Learning outcomes:1,2,3 6.Transistor series voltage regulator, 4h, Learning outcomes:1,2,3,4 7.Common source amplifier 8.Common drain amplifier 9.Multistage amplifiers 10.Amplitude and phase frequency response 11.Amplitude and phase frequency response 12.Differential amplifier 13.Power amplifiers 14.Feedback 15.Oscillators				
Course content laboratory	1.Work with computer tools for power network analysis, 5h, Learning outcomes:1,2 2.Power network analysis in PowerWorld, 5h, Learning outcomes:1,2 3.Work with computer tools for energy systems simulations, 5h, Learning outcomes:1,2 4.No lectures 5.No lectures 6.No lectures 7.No lectures 8.No lectures 9.No lectures 10.No lectures 11.No lectures 12.No lectures 13.No lectures 14.No lectures 15.No lectures				
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory				
Exam literature	1.M. Ožegović, K. Ožegović: Električne energetske mreže, I-IV, FESB, Split, 1997, 1999. 2.I. Pavić, Vođenje elektroenergetske mreže, FER, Zagreb, 2011. 3.http://www.smartgrids.hr/ 4.Prabha Kundur, Power system stability and control, McGraw-Hill, 1994. 5.A.J. Wood, B.F. Wollenberg, Power generation, operation and control, John Wiley Sons, 1996. 6.http://power.eecs.utk.edu/pubs/Fangxing_li_ieeepes2009_2.pdf, 7.http://www.netl.doe.gov/smartgrid/referenceshelf/whitepapers/The%20Transmission%20Smart%20Grid%20Imperativ				

	e_2009_09_29.pdf, 8.http://www.oe.energy.gov/DocumentsandMedia/DOE_SG_Book_Single_Pages(1).pdf
Students obligations	maximum of 1 absences from exercises
Knowledge evaluation during semester	Lectures10 points Laboratory excercises 10 points Quoloqium 40 points Seminar50 points
Knowledge evaluation after semester	Writing exam25 points Oral exam25 points Marks Sufficient (2)50 - 60 points Good (3)60 - 75 points Very good (4)75 - 90 points Excelent (5) 90 - 110 points
Student activities:	Aktivnost ECTS (Classes attendance) 1 (Written exam) 2 (Seminar Work) 2 (Oral exam) 1
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	95603;
Proposal made by	Tomislav Plavšić , 21.05.2014.

Code WEB/ISVU	23324/146775	**ECTS**	6.0	**Academic year**	2018/2019
Name	Switching Equipment				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				60+0 (0+0+0+0) 120
Teachers	Lectures:1. Prof.dr.sc. Krešimir Meštrović				
Course objectives	students will acquire specialist knowledge in the field of switching equipmwnt				
Learning outcomes:	1.ability to relate the application of the electric arc theory to specific problems at short circuit current break. Level:6,7 2.ability to present characteristics and different constructions of modern switching equipment. Level:6,7 3.ability to estimate interaction between switching equipment and electric power network. Level:6,7 4.ability to recommend measures for limiting the switching overvoltage which occurs at current break. Level:7 5.ability to plan the ways of switching equipment maintenance and management. Level:7 6.ability to compare the development testing, type-examination and individual-device testing as well as the field testing when commissioning switching equipment. Level:6,7 7.ability to evaluate the methods of diagnostic testing and the methods of switching equipment monitoring. Level:6,7 8.valorize. Level:7				
Methods of carrying out lectures	In the lectures drawings, tables and diagrams are used to ease understanding. The specific examples are also shown through photographs, design, project and test documentation. All exposed materials are analized and discussed with students to achieve their active participation. It is necessary to have blackboard and LCD projector.				
Course content lectures	1.Selected chapters from electrical contacts theory, 4h, Learning outcomes:1 2.Application of the electrical arc theory to the specific problems of low, medium and high voltage switching equipment, 4h, Learning outcomes:1 3. Characteristics and design of modern switching equipment, 4h, Learning outcomes:2 4. Characteristics and design of modern switching equipment, 4h, Learning outcomes:2 5.Switching equipment end electrical network interaction, 4h, Learning outcomes:3 6.Switching equipment end electrical network interaction, 4h, Learning outcomes:3 7.Transient phenomena due to circuit breaker operation in specific operation cases, 4h, Learning outcomes:4 8.Transient overvoltages limitation (opening and closing resistors, controlled switching etc.), 4h, Learning outcomes:5 9. Modern maintenance and asset management techniques for switching equipment, 4h, Learning outcomes:4 10.Switching equipment testing (development, type, routine and on-site tests) , 4h, Learning outcomes:5 11.Switching equipment testing (development, type, routine and on-site tests) , 2h, Learning outcomes:5 12.Switching equipment testing (development, type, routine and on-site tests) , 4h, Learning outcomes:5 13.Diagnostics and monitoring techniques, 4h, Learning outcomes:6 14.Diagnostics and monitoring techniques, 4h, Learning outcomes:6 15. Standardization in the field of switching equipment, 4h, Learning outcomes:7				
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector Special equipment In the lectures drawings, tables and diagrams are used to ease understanding. The specific examples are also shown through photographs, design, project and test documentation. All exposed materials are analized and discussed with students to achieve their active participation. It is necessary to have blackboard and LCD projector.				
Exam literature	1.Belin B.: Uvod u teoriju sklopnih aparata, Školska knjiga, Zagreb, 1978. 2.Meštrović K.: Sklopni aparati srednjeg i visokog napona, Udžbenik sveučilišta u Zagrebu, Graphis, Zagreb, 2007. 3.Jurjević V.: Električni sklopni aparati niskog napona, skripta, FER Zagreb, 1995. 4.M. Kapetanović: High voltage circuit breakers, KEMA, Sarajevo, 2011. 5. Brown T.E.Jr.: Circuit Interruption - Theory and Techniques, Marcel Dekker Inc., New York, 1984. 6.Flurscheim C.H.: Power Circuit Breakers - theory and design, Peter Peregrinus Ltd., London, 1982.				
Students obligations	regular class attendance				
Knowledge evaluation during semester	Seminar.				
Knowledge evaluation after semester	Written exam 10 examples, each example carries 2 points. For the passage should be > 50%. or Seminar. Presentation positively evaluated the seminar paper in front of students.				
Student activities:	Aktivnost (Constantly tested knowledge)				ECTS 6
Remark	This course can be used for final thesis theme				
Prerequisites:	No prerequisites.				
ISVU equivalents:	22624;				

Code WEB/ISVU	23312/146763	**ECTS**	5.0	**Academic year**	2018/2019
Name	Techniques of maintenance and testing of electrical equipment				
Status	2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course2nd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 90
Teachers	Lectures:1. Ante Elez Lectures: Stjepan Tvorić Laboratory exercises: Ante Elez Laboratory exercises: Stjepan Tvorić				
Course objectives	This course will deal with the topics related to maintenances, diagnostics and monitoring of the kay capital electrical equipment (transformers, switching equipment, rotating machines and cables). In order to satisfy todays requirements for reliable and available energy without interruptions, these topics are of significant importances their owners and users, equipment manufacturers, insurance companies ... These topics are of significant interest to the maintenance staff as well as for the experts that are providing testing of the capital electrical equipment. Such strong interest in this topics are present because there is direct link between maintenance and life expectancies of the equipment. In order to achieve maximum expected life time, maintain reliability, reduce maintenance expenses it is important to test equipment in order to detect and track equipment condition.				
Learning outcomes:	1.To analyse area of the maintenance and testing of the transformers). Level:6 2.To distinguish methods that are used today for transformer testing and monitoring. Level:6 3.To analyse area of the maintenance and testing of the switching equipment. Level:6 4.To classify methods that are used today for switching equipment testing and monitoring. Level:6,7 5.To analyse area of the maintenance and testing of the rotating machines. Level:6 6.To classify methods that are used today for rotating machines testing and monitoring. Level:6,7 7.To analyse area of the maintenance and testing of the cables. Level:6 8.To analyse methods that are used today for cables testing and monitoring. Level:6 9.To suggest methods of testing and monitoring of high voltage equipment. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies				
Methods of carrying out laboratory exercises	Presentanion of transformers, rotating machines and switching equipment at Koncar factory.				
Course content lectures	1.Rotating machines (2). Energy transformers (1)., 3h, Learning outcomes:1,2,5,6 2.Energy transformers (1). Measuring transformers (2)., 3h, Learning outcomes:1,2 3.Switching equipment (2). Common faults on capital equipment and main fault causes (1)., 3h, Learning outcomes:1,2,3,4,7,8,9 4.Common faults on capital equipment and main fault causes (1). Measuring values of significant importance for equipment evaluation (2), 3h, Learning outcomes:1,2,3,4,5,6,7,8,9 5.Measurement basics on rotating machines (2). Electrical field and dielectrics (1)., 3h, Learning outcomes:1,3,5,6,7,8,9 6.Electrical field and dielectrics (1). Producing and measuring of high voltages (1)., 3h, Learning outcomes:1,3,4,5,7,8,9 7.Producing and measuring of high voltages (1)., 3h, Learning outcomes:3,4 8.Partial discharges PD (2). Testing of energy transformers (1)., 3h, Learning outcomes:1,2,3,5,9 9.Testing of energy transformers (1). Testing of measuring transformers (2)., 3h, Learning outcomes:1,2 10.Testing of switching equipment (1). Off line methods of testing (2)., 3h, Learning outcomes:3,4 11.On line methods of monitoring (2). Measuring sensors used in testing and monitoring (1)., 3h, Learning outcomes:3,4,9 12.Measuring sensors used in testing and monitoring (3)., 3h, Learning outcomes:1,3,4,5,6,7,8,9 13.About diagnostics (2). About monitoring (1)., 3h, Learning outcomes:1,2,3,4,5,6,9 14.About monitoring (2). Basic concepts of monitoring systems (1)., 3h, Learning outcomes:1,2,3,4,5,6,7,8,9 15.Basic concepts of monitoring systems (1). Basic analysis of measuring results (2)., 3h, Learning outcomes:1,2,3,4,5,6,7,8,9				
Course content laboratory	1.No lesson 2.No lesson 3.No lesson 4.No lesson 5.Visit to factory for production of energy and measuring transformers, 3h, Learning outcomes:1,2,9 6.No lesson 7.No lesson 8.High voltage sources and high voltage measuring systems - high voltage laboratory of KONCAR - Electrical Engineering Institute, 2h, Learning outcomes:3,4,9 9.Test with test voltage - high voltage laboratory of KONCAR - Electrical Engineering Institute, 2h, Learning outcomes:3,4,9 10.Test with AC voltage - high voltage laboratory of KONCAR - Electrical Engineering Institute, 2h, Learning outcomes:3,4,9 11.PD measurement - high voltage laboratory of KONCAR - Electrical Engineering Institute, 2h, Learning outcomes:3,4,9 12.Accuracy of measuring transformers - high voltage laboratory of KONCAR - Electrical Engineering Institute, 2h, Learning outcomes:1,2,9 13.No lesson 14.Diagnostic testing of measuring and high voltage transformers - high voltage laboratory of KONCAR - Electrical Engineering Institute, 2h, Learning outcomes:1,2,9 15.No lesson				

Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector
Exam literature	Obavezna: [1] P. Gill, Electrical Power Equipment Maintenance and Testing, Second Edition, CRC Press 2008. Additional literature: [2] A.Dolenc: Transformatori I i II, Školska knjiga, 1991. [3] F. H. Kreuger, Partial discharge detection in high-voltage equipment, Butterworths, 1989. [4] V. Bego, Mjerni transformatori , Školska knjiga, Zagreb 1977. [5] E. Kuffel, W. S. Zaengl, J. Kuffel, High Voltage Engineering Fundamentals, Newnes, 2000. [6] High voltage circuit breakers, M. Kapetanović, ETF- Faculty of Electrical Engineering, Sarajevo, 2011. [7] Sklopni aparati srednjeg i visokog napona, K. Meštrović, Graphis, 2007
Students obligations	Classroom attendance 70% at least.
Knowledge evaluation during semester	Studenti piu 2 kolokvija. Grading: - 50 do 60 % #8594; 2, passed - 60 do 75 % #8594; 3, passed - 75 do 90 % #8594; 4, passed - 90 do 100 % #8594; 5, passed
Knowledge evaluation after semester	Grading: - 50 do 60 % #8594; 2, passed - 60 do 75 % #8594; 3, passed - 75 do 90 % #8594; 4, passed - 90 do 100 % #8594; 5, passed There is oral exam after written exam.
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
Proposal made by	Ante Elez , 30.6.2014

Code WEB/ISVU	23305/146753	**ECTS**	4.0	**Academic year**	2018/2019
Name	The Protection of the Environment and the Quality of Life				
Status	1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course1st semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+15 (15+0+0+0) 75
Teachers	Lectures:1. doc. dr. sc. Sanja Morić predavačica Auditory exercises:doc. dr. sc. Sanja Morić predavačica				
Course objectives	Understanding the interdependence of quality of life and environmental protection by applying a project approach in teaching				
Learning outcomes:	1.to determine the terms and trends in environmental protection. Level:6,7 2.to compare the ways of protection of the environment in the protected areas and the other areas of the republic of Croatia. Level:6,7 3.to analyze the impact of the environment on the quality of life of the individual (society). Level:6 4.to distinguish a traditional and contemporary (sustainable) environmental development. Level:6 5.to relate the importance of protecting the environment and its components in achieving (higher) quality of life. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Discussion Questions and answers Seminar, students presentation and discussion				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Workshop				
Course content lectures	1.Introduction, 1h, Learning outcomes:1 Protection of the environment and the quality of life, 1h, Learning outcomes:3 2.Sustainable development, 4h, Learning outcomes:4 3.Sustainable agriculture and rural development, 4h, Learning outcomes:4 4.Urban horticulture, 3h, Learning outcomes:4,5 5.Elements of green system and GIS, 3h, Learning outcomes:5 6.Green infrastructure; vertical and roof gardens, 4h, Learning outcomes:4 7.Permaculture, 2h, Learning outcomes:3 8.Horticultural therapy and innovations, 2h, Learning outcomes:3 9.Guest lecturer(s), 2h, Learning outcomes:5 10.EU programes, 2h, Learning outcomes:1 11.EU fonds, 2h, Learning outcomes:1 12.No classes 13.No classes 14.No classes 15.No classes				
Course content auditory	1.Instructions for writting seminar paper, 2h, Learning outcomes:1 2.No classes 3.No classes 4.No classes 5.No classes 6.No classes 7.No classes 8.No classes 9.No classes 10.No classes 11.Open space technology, 1h, Learning outcomes:5 12.Swot analysis, 1h, Learning outcomes:5 13.Logframe matrix, 6h, Learning outcomes:5 14.No classes 15.Presentation of seminar paper, 5h, Learning outcomes:5				
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector Operating supplies papers (A0, A4, post it), marker pens etc.				
Exam literature	Obvezna literatura: Materijali sa predavanja Dopunska literatura: 1. K. KIŠ, M. KIŠ: PERMAKULTURA, Zagreb, 2014. 2. I. KISIĆ: UVOD U EKOLOŠKU POLJOPRIVREDU, 2014. 3. F. CAPRA, P. L. LUISI: The Systems View of Life: A Unifying Vision, 2014.				

Students obligations	Class attendance - as measured through minimal presence checks at 70%	
Knowledge evaluation during semester	Check points of seminar paper execution at excercise	
Knowledge evaluation after semester	Seminar paper	
Student activities:	Aktivnost	ECTS
	(Classes attendance)	2
	(Activity in class)	1
	(Seminar Work)	1
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
Proposal made by	dr. sc. Sanja Morić, lecturer	

Code WEB/ISVU	23325/146776	**ECTS**	6.0	**Academic year**	2018/2019
Name	Transformers				
Status	3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Redovni specijalisti elektrotehnike) - elective course3rd semester - Polytechnic graduate professional study programme specialization in Electrical Engineering (NOVI Izvanredni specijalisti elektrotehnike) - elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 120
Teachers	Lectures:1. dr.sc. Dalibor Filipović - Grčić dipl.ing. Auditory exercises:dr.sc. Dalibor Filipović - Grčić dipl.ing.				
Course objectives					
Remark	This course can not be used for final thesis theme				
Prerequisites:	No prerequisites.				
ISVU equivalents:	22625;				