

Semester 1			
Undergraduate prof	Undergraduate professional study in electrical engineering obligatory courses		
P:prof.vis.šk. lvica Levanat P: Alemka Knapp A: Alemka Knapp A: Diana Šaponja-Milutinović dipl.ing.fizike, pred. A: Borna Radatović A: Valentino Jadriško	Physics	ECTS:6.0	
A: Boris Metikoš ,prof.	Kinesiology Education I	ECTS:1.0	
P:mr.sc. Bojan Kovačić , viši predavač P: Luka Marohnić P:dr. sc. Anđa Valent viši predavač P: lvica Vuković A: lvica Vuković A: Luka Marohnić A:dr. sc. Anđa Valent viši predavač A:mr.sc. Bojan Kovačić , viši predavač	Mathematics I	ECTS:7.0	
P: Vladimir Šimović P: Davor Šterc P:mr.sc. Veselko Tomljenović viši predavač A: Davor Šterc A:mr.sc. Veselko Tomljenović viši predavač L: Trpimir Alajbeg L:mr.sc. Darko Lukša dipl.ing L:mr.sc. Darko Lukša dipl.ing. L:pred. Ivan Lujo , dipl. ing. L:pred. Ivan Lujo , dipl.ing. A:mr.sc. Zoran Kovačević predavač L:mr.sc. Zoran Kovačević predavač A:mt.sc. Zoran Kovačević predavač A:mt.sc. Zoran Kovačević predavač L:mr.sc. Zoran Kovačević predavač A:mt.sc. Zoran Kovačević predavač A: Mato Brizar L: Siniša Lacković struč.spec.ing.el. A: Vladimir Šimović L: Vladimir Šimović L: Aleksandar Kiričenko A: Robert Herčeki A: Želimir Ivanović L: Želimir Ivanović	Fundamentals of Electrical Engineering	ECTS:9.0	
P:dr. sc. Mladen Sokele predavač P: Trpimir Alajbeg L: Trpimir Alajbeg L: Andrea Jurman L: Iva Lemac L: Robert Herčeki	Personal computers in electrical engineering	ECTS:4.0	
Undergraduate professional study in electrical engineering elective courses			
P: Marija Krstinić P: Zoran Vulelija A: Marija Krstinić A: Zoran Vulelija	English Language	ECTS:2.0	
P: Doc. dr. sc. Lidija Tepeš Golubić v. pred. A: Doc. dr. sc. Lidija Tepeš Golubić v. pred.	German Language	ECTS:2.0	



Semester 2			
Undergraduate professional study in electrical engineering obligatory courses			
P: Vladimir Šimović	Electricity and magnetism	ECTS:8.0	
P: Davor Šterc			
P:mr.sc. Veselko Tomljenović viši			
predavač			
A: Davor Šterc			
A:mr.sc. Veselko Tomljenović viši			
predavač			
L:mr.sc. Krunoslav Martinčić			
L: Tomislav Đuran , dipl. ing.			
L:mr.sc. Zoran Kovačević predavač			
A: Vladimir Simović			
L: Vladimir Simović			
L: Aleksandar Kiricenko			
L: Zelimir Ivanović			
L: Pelar Turnijanovic			
A. Valioslav Zuppa Baksa			
P: Aloksandar Kiričonko	Electronic Components		
P. Aleksandal Killeliko P.mr.sc. Kruposlav Martinčić		EC13.0.0	
P: Želiko Stojanović			
A: Želiko Stojanović			
I · Želiko Stojanović			
Lenr sc. Darko Lukša dipl.ing			
A·mr.sc. Krunoslav Martinčić			
I :mr.sc. Krunoslav Martinčić			
A: Aleksandar Kiričenko			
L: Aleksandar Kiričenko			
A: Robert Herčeki			
A: Boris Metikoš ,prof.	Kinesiology Education II	ECTS:1.0	
A:Prot.dr.sc. Slavica Cosovic Bajic	Mathematical Tools in Electrical	EC15:2.0	
A:dr.sc. Mandi Orlic Bachier V.pred	Engineering		
A: Goran Sirovatka			
A: Luka Maronnic			
A:mr.sc. Bojan Kovacić , visi predavać			
A: IVICA VUKOVIC Audr. sc. Anđa Valent viči prodavač			
A:df. Sc. Anda valent visi predavac			
P: Luka Marobnić	Mathematics II		
P·mr sc. Bojan Kovačić viši predavač		2013.0.0	
P: Ivica Vuković			
P·dr. sc. Anđa Valent viši predavač			
A: Ivica Vuković			
A: Luka Marohnić			
A:dr. sc. Anđa Valent viši predavač			
A:mr.sc. Bojan Kovačić , viši predavač			
P:pred. Ivan Lujo , dipl.ing.	Electrical Measurements	ECTS:6.0	
P: Aleksandar Kiričenko			
A:pred. Ivan Lujo , dipl.ing.			
L:pred. Ivan Lujo , dipl.ing.			
A: Aleksandar Kiričenko			
L: Aleksandar Kiričenko			
L: Robert Herčeki			
L: Želimir Ivanović			
L: Frane Brkić			



Semester 3			
Electrical power engineering obligatory courses			
P:mr.sc. Veselko Tomljenović viši predavač A:mr.sc. Veselko Tomljenović viši predavač A: Tomislav Đuran , dipl. ing.	Electrical Machines I	ECTS:5.0	
P:mr.sc. Krunoslav Martinčić P: Željko Stojanović L: Željko Stojanović A: Aleksandar Kiričenko L: Aleksandar Kiričenko	Electronic Circuits	ECTS:5.0	
A: Boris Metikoš ,prof.	Kinesiology Education III	ECTS:1.0	
P:mr.sc. Darko Lukša dipl.ing A:mr.sc. Darko Lukša dipl.ing L:mr.sc. Darko Lukša dipl.ing L: Želimir Ivanović	Electrical Measurements	ECTS:6.0	
P:Prof.dr.sc. Krešimir Meštrović A:Prof.dr.sc. Krešimir Meštrović	Switching Equipment	ECTS:4.0	
P: Vesna Alić-Kostešić dipl.ing.stroj. P: Karmen Mott Bingula dipl.ing.stroj. A: Karmen Mott Bingula dipl.ing.stroj.	Engineering Mechanics	ECTS:4.0	
P: Ivor Marković , mag. ing. L: Tomislav Đuran , dipl. ing. A: Ivor Marković , mag. ing. L: Ivor Marković , mag. ing. L: Marko Babić	Transformers	ECTS:5.0	
P: Luka Marohnić P:mr.sc. Bojan Kovačić , viši predavač P:dr. sc. Anđa Valent viši predavač A: Luka Marohnić A:dr. sc. Anđa Valent viši predavač A:mr.sc. Bojan Kovačić , viši predavač	Probability and Statisics	ECTS:3.0	
Ele	ectrical power engineering elect	tive courses	
P: Marija Krstinić P: Zoran Vulelija A: Marija Krstinić	English Language 2	ECTS:2.0	
P: Doc. dr. sc. Lidija Tepeš Golubić v. pred.	German Language 2	ECTS:2.0	
Control and co	 omputer engineering in automa	tion obligatory courses	
P:mr.sc. Krunoslav Martinčić P: Željko Stojanović A: Željko Stojanović L: Željko Stojanović A: Aleksandar Kiričenko L: Aleksandar Kiričenko L: Robert Herčeki	Analog Circuits	ECTS:6.0	
P: Goran Vujisić P: Tomislav Špoljarić d. i. e., v. pred. L: Tomislav Špoljarić d. i. e., v. pred. L: Goran Vujisić	Automation Elements	ECTS:5.0	
A: Boris Metikoš ,prof.	Kinesiology Education III	ECTS:1.0	
P:mr.sc. Darko Lukša dipl.ing	Electrical Measurements	ECTS:6.0	

A:mr.sc. Darko Lukša dipl.ing L:mr.sc. Darko Lukša dipl.ing L: Želimir Ivanović		
P:Pred. Ida Popčević prof. P: Doc. dr. sc. Lidija Tepeš Golubić v. pred.	Social Philosophy	ECTS:2.0
P: Vesna Alić-Kostešić dipl.ing.stroj. P: Karmen Mott Bingula dipl.ing.stroj. A: Karmen Mott Bingula dipl.ing.stroj.	Engineering Mechanics	ECTS:4.0
P: Luka Marohnić P:mr.sc. Bojan Kovačić , viši predavač P:dr. sc. Anđa Valent viši predavač A: Luka Marohnić A:dr. sc. Anđa Valent viši predavač A:mr.sc. Bojan Kovačić , viši predavač	Probability and Statisics	ECTS:3.0
Control and c	omputer engineering in automation e	lective courses
P: Marija Krstinić P: Zoran Vulelija A: Marija Krstinić	English Language 2	ECTS:2.0
P: Doc. dr. sc. Lidija Tepeš Golubić v. pred.	German Language 2	ECTS:2.0
Communica	ation and computer technology obliga	tory courses
P:mr.sc. Krunoslav Martinčić P: Željko Stojanović A: Željko Stojanović L: Željko Stojanović A: Aleksandar Kiričenko L: Aleksandar Kiričenko L: Robert Herčeki	Analog Circuits	ECTS:6.0
A: Boris Metikoš ,prof.	Kinesiology Education III	ECTS:1.0
P:mr.sc. Darko Lukša dipl.ing A:mr.sc. Darko Lukša dipl.ing L:mr.sc. Darko Lukša dipl.ing L: Želimir Ivanović	Electrical Measurements	ECTS:6.0
P:dr. sc. Mladen Sokele predavač L: Vjeran Šimunić A:dr. sc. Mladen Sokele predavač L:dr. sc. Mladen Sokele predavač	Signals, theory and processing	ECTS:6.0
P:mr.sc. Dubravko Žigman viši predavač L: Vedran Tadić struč.spec.ing.techn.inf. L: Tomislav Novak mag. ing. inf. et comm. techn. L: Nikolina Kasunić struč.spec.ing.techn.inf.	Introduction to networking technologies	ECTS:5.0
P: Luka Marohnić P:mr.sc. Bojan Kovačić , viši predavač P:dr. sc. Anđa Valent viši predavač A: Luka Marohnić A:dr. sc. Anđa Valent viši predavač A:mr.sc. Bojan Kovačić , viši predavač	Probability and Statisics	ECTS:3.0
Communie	cation and computer technology elect	ive courses
P:pred. Ivan Lujo , dipl.ing. P: Tomislav Novak mag. ing. inf. et comm. techn. A:pred. Ivan Lujo , dipl.ing.	LabView graphic programming	ECTS:4.0



L:pred. Ivan Lujo , dipl.ing. A: Tomislav Novak mag. ing. inf. et comm. techn. L: Tomislav Novak mag. ing. inf. et comm. techn.		
P: Željko Stojanović A: Željko Stojanović	Linear and Nonlinear Networks	ECTS:4.0
Communic	ation and computer technology electiv	ve courses
P: Marija Krstinić P: Zoran Vulelija A: Marija Krstinić	English Language 2	ECTS:2.0
P: Doc. dr. sc. Lidija Tepeš Golubić v. pred.	German Language 2	ECTS:2.0



Semester 4				
Elect	Electrical power engineering obligatory courses			
P: Tomislav Špoljarić d. i. e., v. pred. P: Goran Vujisić P:v.pred. Mato Fruk dipl.ing. A:v.pred. Mato Fruk dipl.ing. L:v.pred. Mato Fruk dipl.ing. A: Tomislav Špoljarić d. i. e., v. pred. L: Tomislav Špoljarić d. i. e., v. pred. A: Goran Vujisić L: Goran Vujisić A: Ivan Šulekić dipl.ing.el. L: Ivan Šulekić dipl.ing.el.	Automatic Control	ECTS:6.0		
P:mr.sc. Veselko Tomljenović viši predavač A: Tomislav Đuran , dipl. ing. L: Tomislav Đuran , dipl. ing. L: Alan Miletić L: Ivor Marković , mag. ing.	Electrical Machines II	ECTS:6.0		
P:Prof.dr.sc. Krešimir Meštrović A: Ivor Marković , mag. ing. K: Ivor Marković , mag. ing.	Electrical Power Plants	ECTS:7.0		
P: Željko Stojanović A: Željko Stojanović A: Neven Čobanov	Power Electronics	ECTS:5.0		
A: Boris Metikoš ,prof.	Kinesiology Education IV	ECTS:1.0		
Elec	trical power engineering elective cou	rses		
P:v.pred. Mato Fruk dipl.ing. A:mr.sc. Goran Malčić v.pred. L:mr.sc. Goran Malčić v.pred. L: Mario Lučan	Process Measurements	ECTS:5.0		
P: Tomislav Novak mag. ing. inf. et comm. techn. P:Prof.dr.sc. Slavica Ćosović Bajić L: Nikola Majstorović dipl.ing. L: Tomislav Novak mag. ing. inf. et comm. techn. L: Vatroslav Zuppa Bakša	Programming	ECTS:5.0		
Elec	trical power engineering elective cou	rses		
P: Zoran Vulelija P: Marija Krstinić A: Marija Krstinić A: Zoran Vulelija	English Language 3	ECTS:2.0		
P: Doc. dr. sc. Lidija Tepeš Golubić v. pred.	German Language 3	ECTS:2.0		
Control and co	mputer engineering in automation obl	igatory courses		
P: Tomislav Špoljarić d. i. e., v. pred. P: Goran Vujisić P:v.pred. Mato Fruk dipl.ing. A:v.pred. Mato Fruk dipl.ing. L:v.pred. Mato Fruk dipl.ing. A: Tomislav Špoljarić d. i. e., v. pred. L: Tomislav Špoljarić d. i. e., v. pred. A: Goran Vujisić L: Goran Vujisić A: Ivan Šulekić dipl.ing.el. L: Ivan Šulekić dipl.ing.el.	Automatic Control	ECTS:6.0		

P:dr. sc. Mladen Sokele predavač L: Siniša Lacković struč.spec.ing.el. A:dr. sc. Mladen Sokele predavač L:dr. sc. Mladen Sokele predavač	Digital Circuits	ECTS:5.0
A: Boris Metikoš ,prof.	Kinesiology Education IV	ECTS:1.0
P:v.pred. Mato Fruk dipl.ing. A:mr.sc. Goran Malčić v.pred. L:mr.sc. Goran Malčić v.pred. L: Mario Lučan	Process Measurements	ECTS:5.0
P: Tomislav Novak mag. ing. inf. et comm. techn. P:Prof.dr.sc. Slavica Ćosović Bajić L: Nikola Majstorović dipl.ing. L: Tomislav Novak mag. ing. inf. et comm. techn. L: Vatroslav Zuppa Bakša	Programming	ECTS:5.0
P:dr.sc. Davor Petranović dipl.ing.el. P:dr.sc. Ljubivoj Cvitaš dipl.ing.	Quality Management	ECTS:4.0
Control and	computer engineering in automation	elective courses
P: Željko Stojanović A: Željko Stojanović A: Neven Čobanov	Power Electronics	ECTS:5.0
P:mr.sc. Veselko Tomljenović viši predavač A: Tomislav Đuran , dipl. ing. L: Tomislav Đuran , dipl. ing.	Transformers and Electrical Rotating Machines	ECTS:5.0
Control and	computer engineering in automation	elective courses
P: Zoran Vulelija P: Marija Krstinić A: Marija Krstinić A: Zoran Vulelija	English Language 3	ECTS:2.0
P: Doc. dr. sc. Lidija Tepeš Golubić v. pred.	German Language 3	ECTS:2.0
Communi	cation and computer technology oblic	 Iatory courses
P:dr. sc. Mladen Sokele predavač L: Siniša Lacković struč.spec.ing.el. A:dr. sc. Mladen Sokele predavač L:dr. sc. Mladen Sokele predavač	Digital Circuits	ECTS:5.0
P:dr. sc. Mladen Sokele predavač L:dr.sc. Krešimir Osman , dipl.ing. A:dr. sc. Mladen Sokele predavač L:dr. sc. Mladen Sokele predavač	Information, theory and coding	ECTS:5.0
A: Boris Metikoš ,prof.	Kinesiology Education IV	ECTS:1.0
P:dr. sc. Anđa Valent viši predavač P: Ivica Vuković A: Ivica Vuković A:dr. sc. Anđa Valent viši predavač	Numerical Mathematics	ECTS:5.0
P: Tomislav Novak mag. ing. inf. et comm. techn. P:Prof.dr.sc. Slavica Ćosović Bajić L: Nikola Majstorović dipl.ing. L: Tomislav Novak mag. ing. inf. et comm. techn.	Programming	ECTS:5.0

L: Vatroslav Zuppa Bakša		
P:Pred. Ida Popčević prof. P: Doc. dr. sc. Lidija Tepeš Golubić v. pred.	Social Philosophy	ECTS:2.0
P:Prof.dr.sc. Slavica Ćosović Bajić 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. L: Siniša Lacković struč.spec.ing.el. L: Antonio Krajinović mag.ing.inf. et comm.techn	Lines and Antennas	ECTS:5.0
Communic	ation and computer technology election	ve courses
P: Zoran Vulelija P: Marija Krstinić A: Marija Krstinić A: Zoran Vulelija	English Language 3	ECTS:2.0
P: Doc. dr. sc. Lidija Tepeš Golubić v. pred.	German Language 3	ECTS:2.0



Semester 5			
Electrical power engineering obligatory courses			
P: Tomislav Špoljarić d. i. e., v. pred. A: Tomislav Špoljarić d. i. e., v. pred.	Electrical Power Networks	ECTS:5.0	
P: Ivor Marković , mag. ing. L: Tomislav Đuran , dipl. ing. A: Ivor Marković , mag. ing. K: Ivor Marković , mag. ing. L: Ivor Marković , mag. ing. L: Marko Babić	Electrical Motor Drives	ECTS:6.0	
P:dr.sc. Davor Petranović dipl.ing.el. L:dr.sc. Davor Petranović dipl.ing.el.	Lighting and Installations	ECTS:4.0	
P: Zvonimir Meštrović mag. ing. A: Zvonimir Meštrović mag. ing. L: Zvonimir Meštrović mag. ing.	Renewable energy resources	ECTS:6.0	
P:mr.sc. Goran Malčić v.pred. L:mr.sc. Goran Malčić v.pred. L: Ivica Vlašić L: Mario Lučan L: Pavao Maković	Process Control Computers	ECTS:5.0	
Ele	ctrical power engineering elective	courses	
P: Tomislav Špoljarić d. i. e., v. pred. P:mr.sc. Davor Gadže L:mr.sc. Davor Gadže L: Mario Ličanin L: Tomislav Špoljarić d. i. e., v. pred.	Power Plants Construction	ECTS:6.0	
P:pred. Ivan Lujo , dipl.ing. P: Tomislav Novak mag. ing. inf. et comm. techn. A:pred. Ivan Lujo , dipl.ing. L:pred. Ivan Lujo , dipl.ing. A: Tomislav Novak mag. ing. inf. et comm. techn. L: Tomislav Novak mag. ing. inf. et comm. techn.	LabView graphic programming	ECTS:4.0	
Control and co) mputer engineering in automation	n obligatory courses	
P: Goran Vujisić P:v.pred. Mato Fruk dipl.ing. A:v.pred. Mato Fruk dipl.ing. L:v.pred. Mato Fruk dipl.ing. A: Goran Vujisić L: Goran Vujisić	Digital Control	ECTS:5.0	
P:mr.sc. Davor Gadže P: Tomislav Špoljarić d. i. e., v. pred. A:mr.sc. Davor Gadže K:mr.sc. Davor Gadže L:mr.sc. Davor Gadže A: Tomislav Špoljarić d. i. e., v. pred. K: Tomislav Špoljarić d. i. e., v. pred. L: Tomislav Špoljarić d. i. e., v. pred.	Electrical Motor Drives	ECTS:6.0	
P:mr.sc. Goran Malčić v.pred. L:mr.sc. Goran Malčić v.pred. L: Ivica Vlašić L: Mario Lučan L: Pavao Maković	Process Control Computers	ECTS:5.0	
P:mr.sc. Davor Gadže P:mr. sc. Ivan Mišković dipl. ing. pred.	Automation Systems	ECTS:6.0	

A:mr.sc. Davor Gadže L:mr.sc. Davor Gadže A:mr. sc. Ivan Mišković dipl. ing. pred. L:mr. sc. Ivan Mišković dipl. ing. pred. L: Ivan Šulekić dipl.ing.el.		
P:mag.oec Kristina Perec P:mr.sc. Sergej Lugović MBA	Technology Entrepreneurship	ECTS:2.0
Control and c	omputer engineering in automation e	lective courses
P: Marko Miletić L: Siniša Lacković struč.spec.ing.el. L: Marko Miletić	Computers and Computer Systems	ECTS:4.0
P: Tomislav Špoljarić d. i. e., v. pred. P:mr.sc. Davor Gadže L:mr.sc. Davor Gadže L: Mario Ličanin L: Tomislav Špoljarić d. i. e., v. pred.	Power Plants Construction	ECTS:6.0
P:pred. Ivan Lujo , dipl.ing. P: Tomislav Novak mag. ing. inf. et comm. techn. A:pred. Ivan Lujo , dipl.ing. L:pred. Ivan Lujo , dipl.ing. A: Tomislav Novak mag. ing. inf. et comm. techn. L: Tomislav Novak mag. ing. inf. et comm. techn.	LabView graphic programming	ECTS:4.0
Communica	tion and computer technology obliga	tory courses
P: Marko Miletić L: Siniša Lacković struč.spec.ing.el. L: Marko Miletić	Computers and Computer Systems	ECTS:4.0
P:mr.sc. Goran Malčić v.pred. L:mr.sc. Goran Malčić v.pred. L: Ivica Vlašić L: Mario Lučan L: Pavao Maković	Process Control Computers	ECTS:5.0
P:Prof.dr.sc. Slavica Ćosović Bajić P:mr.sc. Krunoslav Martinčić A:mr.sc. Krunoslav Martinčić L:mr.sc. Krunoslav Martinčić L: Siniša Lacković struč.spec.ing.el.	Radiocommunication Techniques and Systems	ECTS:4.0
P:mr.sc. Krunoslav Martinčić L:mr.sc. Krunoslav Martinčić	Radiofrequency and Microwave Electronics	ECTS:5.0
Communio	ation and computer technology elect	ive courses
P:dr.sc. Predrag Valožić prof. vis. šk. L:dr.sc. Predrag Valožić prof. vis. šk.	Digital Signal Processing	ECTS:5.0
P:dr.sc Sonja Zentner Pilinsky prof.v.š. A:dr.sc Sonja Zentner Pilinsky prof.v.š. A: Siniša Lacković struč.spec.ing.el. L: Siniša Lacković struč.spec.ing.el.	Mobile Radiocommunication	ECTS:5.0
P: Tomislav Novak mag. ing. inf. et comm. techn. K: Tomislav Novak mag. ing. inf. et comm. techn. L: Tomislav Novak mag. ing. inf. et comm. techn.	Object-oriented programming	ECTS:5.0

P: Mirko Jukl A: Mirko Jukl L: Mirko Jukl L: Siniša Lacković struč.spec.ing.el.	Radar Systems	ECTS:5.0
P: Bruno Valić P:Mr.sc. Vladimir Lebinac dipl.ing. A:Mr.sc. Vladimir Lebinac dipl.ing. L:Mr.sc. Vladimir Lebinac dipl.ing. L: Bruno Valić	Telecommunication Networks	ECTS:5.0
P:v.pred. Mato Fruk dipl.ing. A:v.pred. Mato Fruk dipl.ing. L: Tomislav Špoljarić d. i. e., v. pred.	Control Devices and Systems	ECTS:5.0



Semester 6			
Electrical power engineering obligatory courses			
P: Davor Šterc A: Davor Šterc	Electrical Engineering	ECTS:6.0	
P:Pred. Ida Popčević prof. P: Doc. dr. sc. Lidija Tepeš Golubić v. pred.	Social Philosophy	ECTS:2.0	
P:mag.oec Kristina Perec P:mr.sc. Sergej Lugović MBA	Technology Entrepreneurship	ECTS:2.0	
Elec	trical power engineering elective cou	irses	
P:pred. Ivan Lujo , dipl.ing. A:pred. Ivan Lujo , dipl.ing. L: Tomislav Novak mag. ing. inf. et comm. techn.	Virtual Instrumentation	ECTS:5.0	
P:dr.sc. Davor Petranović dipl.ing.el. A:dr.sc. Davor Petranović dipl.ing.el.	Protection and Measurements in Switchgear	ECTS:5.0	
Elec	trical power engineering elective cou	irses	
A: Tomislav Špoljarić d. i. e., v. pred.	Practical work	ECTS:6.0	
Elec	trical power engineering elective cou	irses	
P:mr.sc. Milivoj Puzak v. pred P: Trpimir Alajbeg P: Marija Krstinić P: Tomislav Novak mag. ing. inf. et comm. techn.	Final Thesis	ECTS:8.0	
Control and cor	mputer engineering in automation ob	ligatory courses	
P:mr.sc. Davor Gadže P: Tomislav Špoljarić d. i. e., v. pred. L:mr.sc. Davor Gadže L: Boris Peša L: Mario Ličanin L: Tomislav Špoljarić d. i. e., v. pred. L: Ivan Šulekić dipl.ing.el.	Automation of Plants	ECTS:6.0	
P:mr.sc. Branimir Preprotić dipl. inž. stroj. A:mr.sc. Branimir Preprotić dipl. inž. stroj. A: Darko Mitrović	Maintenance	ECTS:5.0	
Control and co	pmputer engineering in automation e	lective courses	
P: Ivica Vlašić P:mr.sc. Goran Malčić v.pred. L: Ivica Vlašić L: Mario Lučan	Programmable Logic Controllers	ECTS:5.0	
P:pred. Ivan Lujo , dipl.ing. A:pred. Ivan Lujo , dipl.ing. L: Tomislav Novak mag. ing. inf. et comm. techn.	Virtual Instrumentation	ECTS:5.0	
Control and computer engineering in automation elective courses			
A: Tomislav Špoljarić d. i. e., v. pred.	Practical work	ECTS:6.0	
Control and co	omputer engineering in automation e	lective courses	
P:mr.sc. Milivoj Puzak v. pred P: Trpimir Alajbeg P: Marija Krstinić P: Tomislav Novak mag. ing. inf. et comm. techn.	Final Thesis	ECTS:8.0	



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Study programme	for academic	year 2018/2019
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Communication and computer technology obligatory courses						
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. L: Siniša Lacković struč.spec.ing.el.	Optical communications	ECTS:5.0				
P:mag.oec Kristina Perec P:mr.sc. Sergej Lugović MBA	Technology Entrepreneurship	ECTS:2.0				
Communic	ation and computer technology electi	ve courses				
P:dr.sc. Predrag Valožić prof. vis. šk. A:dr.sc. Predrag Valožić prof. vis. šk.	Digital Signal Processors	ECTS:5.0				
P:dr.sc Sonja Zentner Pilinsky prof.v.š. K:dr.sc Sonja Zentner Pilinsky prof.v.š. L:dr.sc Sonja Zentner Pilinsky prof.v.š.	4G and 5G mobile networks	ECTS:5.0				
P: Ivica Vlašić P:mr.sc. Goran Malčić v.pred. L: Ivica Vlašić L: Mario Lučan	Programmable Logic Controllers	ECTS:5.0				
P: Marko Miletić K: Marko Miletić L: Marko Miletić S: Marko Miletić	Embedded Systems Design and Applications	ECTS:5.0				
P:pred. Ivan Lujo , dipl.ing. A:pred. Ivan Lujo , dipl.ing. L: Tomislav Novak mag. ing. inf. et comm. techn.	Virtual Instrumentation	ECTS:5.0				
Communic	ation and computer technology electi	ive courses				
A: Tomislav Špoljarić d. i. e., v. pred.	Practical work	ECTS:6.0				
Communication and computer technology elective courses						
P:mr.sc. Milivoj Puzak v. pred P: Trpimir Alajbeg P: Marija Krstinić P: Tomislav Novak mag. ing. inf. et comm. techn.	Final Thesis	ECTS:8.0				

Code WEB/ISVU	23663/169758	ECTS	5.0	Academic year	2018/2019
Name	4G and 5G mobile net	works			
Status	6th semester - Comm	unication and computer	r technology (Redovni ele	ktrotehnika) - elective co	urse
Teaching mode	Lectures + exercises work at home	(auditory + laboratory -	+ seminar + metodology	+ construction)	30+30 (0+15+0+15) 90
Teachers	Lectures:1. dr.sc Sonja Laboratory exercises: Construction exercises	a Zentner Pilinsky prof. dr.sc Sonja Zentner Pilin s:dr.sc Sonja Zentner Pi	v.š. nsky prof.v.š. Ilinsky prof.v.š.		
Course objectives	Student will acquire k with basic concepts of measured data.	nowledges of basic arch f 5G networks. Student	nitecture and functionaliti will acquire skills for 4G o	ies of 4G networks.Studer coverage measurements	nt will get acquainted and analysis of
Learning outcomes:	1.Ability to analize 4G 2.Ability to compare a 3.Ability to compare a 4.Ability to test and a 5.Ability to test and a	network funcionalities dvantages and disadva dvantages and disadva nalyze 4G coverage par nalyze end-user satisfac	for a particular 4G netwo ntages of implementatio ntages of implementatio rameters. Level:6 ction with 4G network per	rk. Level:6 n of various technologies n of various technologies rformance. Level:6	in 4G network. Level:6,7 in 5G network. Level:6,7
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion Questions and answer	'S			
Methods of carrying out laboratory exercises	Laboratory exercises	on laboratory equipmer	it		
How construction exercises are held	Group problem solving Data mining and know Other individual problem sol	g vledge discovery on the lving	Web		
Course content lectures	1.4G Air Interface tecl 2.New physical, logica 3.MBMS (Multimedia E 4.LTE positioning, 2h, 5.SON - Self Organizin 6.Enhancements in MI 7.Small Cells and Fem 8.CoMP, ICIC and eiCl 9.D2D and M2M comn 10.IMS basics, VoLTE 11.5G system develop communications, 2h, 1 12.5G system develop communications, 2h, 1 13.enhanced LTE RAT 14.different antenna co	nnologies in R9-R13, 2h al and transport channe Broadcast Multicast Sev Learning outcomes:1,2 ig Network, 2h, Learnin IMO, 2h, Learning outco tocells technologies, Ho C concept for interferen nunication, 2h, Learning ou basics, 2h, Learning ou omet - technologies for Learning outcomes:3 omet - technologies for Learning outcomes:3 omet - technologies for Learning outcomes:3 and new RAT for highe configurations and mMII e and interference cance	, Learning outcomes:1,2 Is in Air Interface, 2h, Lea ices) and eMBMSservices g outcomes:1,2 mes:1,2 etNet concept, 2h, Learni ce cancelation, 2h, Learn g outcomes:1,2,3 itcomes:1,2 higer bitrates, technologi higer bitrates, technologi r frequencies, 2h, Learnin MO, 2h, Learning outcom elation techniques, 2h, L	arning outcomes:1,2 for LTE, 2h, Learning out ing outcomes:1,2 ning outcomes:1,2 ies for smaller latencies, t ies for smaller latencies, t ng outcomes:3 es:3 earning outcomes:3	comes:1,2 echnologies for critical
Course content laboratory	1.Script making as pre 2.4G measurements of 3.4G coverage measu 4.Analysis of performe 5.Analysis of performe 6.Analysis of performe 8.Analysis of performe 9.Analysis of performe 10.Individual measure 11.Individual task mea 12.Individual task mea 14.Individual task mea 14.Individual task mea	eparation for Nemo Han of end-user satisfaction rements, 1h, Learning of ed measurements in Ne ed measurements in Ne ed measurements in Ne ed measurements in Ex- ed measurements analysis in asurements analysis in asurements analysis in asurements analysis in asurements analysis in asurements analysis in	dy A measurements, 1h, of 4G network performac outcomes:4,5 mo Outdoor, 1h, Learning mo Outdoor, 1h, Learning cel, 1h, Learning outcome cel, 1h, Learning outcome cel, 1h, Learning outcome g outcomes:4,5 Nemo Outdoor and Excel Nemo Outdoor and Excel	Learning outcomes:4,5 e, 1h, Learning outcomes: g outcomes:4,5 g outcomes:4,5 es:4,5 es:4,5 es:4,5 es:4,5 l, 1h, Learning outcomes:- l, 1h, Learning outcomes:- l, 1h, Learning outcomes:- l, 1h, Learning outcomes:- l, 1h, Learning outcomes:-	4,5 4,5 4,5 4,5 4,5 4,5
Course content constructures	1.Analysis of offered t 2.Individual work on a 3.Individual work on a 4.Individual work on a 5.Individual work on a 6.Individual work on a 8.Individual work on a 9.Individual work on a 9.Individual work on a 10.Students present t 11.Students present t 13.Students present t 13.Students present t 14.Students present t	hemes and themes asig signed theme in labora signed theme in labora heir seminars, 1h, Learn heir seminars, 1h, Learn heir seminars, 1h, Learn heir seminars, 1h, Learn heir seminars, 1h, Learn	nment, 1h, Learning out tory, 1h, Learning outcor tory, 1h, Learning outcor ning outcomes:1,2,3,4,5 ning outcomes:1,2,3,4,5 ning outcomes:1,2,3,4,5	comes:1,2,3,4 nes:1,2,3,4,5 nes:1,2,3,4,5 nes:1,2,3,4,5 nes:1,2,3,4,5 nes:1,2,3,4,5 nes:1,2,3,4,5 nes:1,2,3,4,5 nes:1,2,3,4,5	

	15.Analysis of presented seminars, 1h, Learning outcomes:1,2,3,4,5
Required materials	Whiteboard with markers Overhead projector Tools for laboratory exercises computers with instaled Nemo Outdoor
Exam literature	prezentacije s predavanja - RhodeSchwartz: UMTS Long Term Evolution (LTE) Technology Introduction (Application Note) -RhodeSchwartz: LTE Release 9 Technology Introduction (White Paper) -RhodeSchwartz: LTE Advanced Technology Introduction (White Paper) -RhodeSchwartz: LTE Advanced (3GPP Rel.11) Technology Introduction (White Paper) -RhodeSchwartz: LTE Advanced (3GPP Rel.12) Technology Introduction (White Paper) -RhodeSchwartz: LTE Advanced (3GPP Rel.12) Technology Introduction (White Paper) -https://5g-ppp.eu/ -https://sgamericas.org/en/ -http://www.3gpp.org/
Students obligations	5 times during lectures short unexpected test - min. 50% correctly solved out of 20 points Seminar fabrication and presentation - min. 50% out of 80 points To be present to all lab exercises and write final report - min. 50% out of 80 points
Knowledge evaluation during semester	3 semiexams during the semester - each max. 40 points - min. 50% achieved at each semiexam
Knowledge evaluation after semester	Final exam - min. 50% out of 120 points
Remark	This course can be used for final thesis theme
Prerequisites:	Students cannot enroll in this course unless they have completed Mobilne radiokomunikacije

Code WEB/ISVU	22868/22300	ECTS	6.0	Academic year	2018/2019
Name	Analog Circuits		·	-	•
Status	3rd semester - Contro	ol and computer e	ngineering in automation	on (Redovni elektrotehnika) - ok	ligatory course3rd
	semester - Communio	cation and comput	ter technology (Redovn	i elektrotehnika) - obligatory co	urse
Teaching mode	Lectures + exercises	(auditory + labora	atory + seminar + meto	odology + construction)	30+30 (15+15+0+0)
Teachers	Lectures:1. mr.sc. Kru	unoslav Martinčić			120
	Lectures:2. Željko Sto	janović			
	Auditory exercises: A	leksandar Kiričenk	(0		
	Auditory exercises: Ze	eljko Stojanović Pobort Horčoki			
	Laboratory exercises:	Aleksandar Kiriče	enko		
	Laboratory exercises:	Željko Stojanović			
Course objectives	students will acquire	basic knowledge o	of analog circuits, their	applications and properties	
Learning outcomes:	1.Ability to analyze si	mple voltage regu	ulators. Level:6		
	2.Ability to analyze si 3 Ability to construct	simple amplifiers	unipolar transistor amp	lifters. Level:6	
	4.Ability to find ampli	tude and phase re	esponse. Level:6		
	5.Ability to classify ty	pes of analog circ	uits. Level:6,7		
	6.Ability to solve pow	er consumption of	f each component of sir	npler analog circuits. Level:6	
	7.Ability to classify al		ator reeuback types. Let	/el.0,/	
Methods of carrying	Ex cathedra teaching				
out lectures	Case studies				
	Discussion				
	Questions and answe	15			
Methods of carrying	Traditional literature	analysis			
out auditory	Discussion, brainstorr	ming			
exercises	Mind mapping				
	Other Problems solving				
Methods of carrying	Laboratory exercises	on laboratory equ	lipment		
out laboratory	Traditional literature	analysis			
exercises	Discussion, brainstorr	ming			
Course content	1 Introduction 2h Lo	arning outcomes:	5		
lectures	2.One stage amplifier	rs. Common emitt	o er amplifier, 2h, Learnir	ng outcomes:2,3,5,6	
	3.One stage amplifier	s. Common emitte	er amplifier, 2h, Learnir	ng outcomes:2,3,5,6	
	4.One stage amplifier	s. Common emitte	er amplifier, 2h, Learnir	ig outcomes:2,3,5,6	
	5.0ne stage amplifier	s. Common collec	tor amplifier, 2h, Learn	ng outcomes:2,3,5,6	
	Common source amp	lifier, 1h, Learning	outcomes:2,3,5,6	,0	
	7.Common source an	plifier, 1h, Learni	ng outcomes:2,3,5,6		
	Common drain amplif	ier, 1h, Learning of the learn	outcomes:2,3,5,6		
	Multistage amplifiers.	. 1h. Learning out	comes:2.3.5		
	9.Multistage amplifier	rs, 1h, Learning ou	utcomes:2,3,5		
	Amplitude and phase	frequency respon	ise, 1h, Learning outcor	mes:2,3,4,5,6	
	10.Amplitude and pha	ase frequency response frequency responses	ponse, 2h, Learning out ponse, 1h, Learning out	comes: 2, 3, 4, 5, 6	
	Differential amplifier,	1h, Learning out	comes:2,3,5,6		
	12.Differential amplif	ier, 1h, Learning c	outcomes:2,3,5,6		
	Power amplifiers, 1h,	Learning outcome	es:2,3,5,6		
	14.Feedback, 2h. Lea	rning outcomes:2	.3.5.7		
	15.Oscillators, 2h, Lea	arning outcomes:	5,7		
Course content	1.Introduction, 1h, Le	arning outcomes:	2,4,6		
additory	3.One stage amplifier	rs. Common emitt	er amplifier, 1h, Learnir	ng outcomes:2,3,5,6	
	4.One stage amplifier	s. Common emitte	er amplifier, 1h, Learnir	ng outcomes:2,3,5,6	
	5.One stage amplifier	s. Common collec	tor amplifier, 1h, Learn	ing outcomes:2,3,5,6	
	7 Common source an	ntage regulator, 1 Indifier 16 Learni	n, Learning outcomes:1	,0	
	8.Common drain amp	lifier, 1h, Learning	g outcomes:2,3,5,6		
	9.Amplitude and phase	se frequency resp	onse, 1h, Learning outc	omes:2,3,4,5,6	
	10.Amplitude and pha	ase frequency res	ponse, 1h, Learning out	comes:2,3,4,5,6	
	12.Differential amplif	ier. 1h. Learning c	ponse, in, Learning out	comes:2,3,4,5,6	
	13.Power amplifiers,	1h, Learning outco	omes:2,3,5,6		
	14.Power amplifiers,	1h, Learning outco	omes:2,3,5,6		
	15.Repeating and rev	ision, 1h, Learning	g outcomes:2,4,5		
Course content	1.There is no lessons				
laboratory	2.There is no lessons				
	3.There is no lessons				

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	 4.There is no lessons 5.Common emitter amplifier, 2h, Learning outcomes:2,3,5,6 6.There is no lessons 7.Common collector amplifier, 2h, Learning outcomes:2,3,5,6 8.Common source amplifier, 2h, Learning outcomes:2,3,5,6 9.There is no lessons 10.There is no lessons 11.Amplitude and phase frequency response, 2h, Learning outcomes:2,3,4,5,6 12.There is no lessons 13.Differential amplifier, 2h, Learning outcomes:2,5,6 14.Power amplifiers, 2h, Learning outcomes:2,3,5,6
	15.There is no lessons
Required materials	Basic: classroom, blackboard, chalk Special purpose laboratory Whiteboard with markers Maquette Tools Operating supplies Special equipment Transistors, operational amplifiers, various connectors
Exam literature	Basic literature: 1. P. Biljanović, Elektronički sklopovi, Školska knjiga, Zagreb, 1993 2. Ž. Butković, J.Divković-Pukšec, A.Barić, Elektronika II , FER, Zagreb, 2010 3. Ž. Stojanović, Elektronički sklopovi - laboratorijske vježbe, TVZ, Zagreb, 2017 Dodatna: 1. R. Boylestad, L. Nashelsky, Electronic devices and circuit theory, Prentice-Hall, 1987 2. Ž. Butković, G. Zelić, Elektronički sklopovi-Zbirka zadataka, FER, Zagreb, 1995
Students obligations	Students have to earn 50% of total points in laboratory. Assesment: - Attendance - 1 point - Preparation for laboratory - 1 point - Measurement report - 1 point - Exam instead laboratory exercises - 3 points. The total number of points is 18.
Knowledge evaluation during semester	Conditions for passing the exam: - At least 9 points of 18 at laboratory exercises, - At least 43 points of 82 on two partial exams, each exam at least 35%, - Complete oral exam at first terms for exams. Maximum number of points is 42 at first exam and 40 at second exam. Overal scoring: a) - Laboratory exercises - at least 14 points of 18 - Partial exams - at least 56 points of 82, and each exam at least 50% Evaluation 90-100 points - 5 80-90 points - 5 80-90 points - 4 70-80 points - 3 Students do not have to take oral exam. They passed the exam completely. b) - Laboratory exercises - at least 12 points of 18 - Partial exams - at least 43 points of 82, and each exam at least 35% Evaluation 90-100 points - 3 Students do not have to take oral exam. They passed the exam completely. b) - Laboratory exercises - at least 12 points of 18 - Partial exams - at least 43 points of 82, and each exam at least 35% Evaluation 69-76 points - 3 55-69 points - 2 Students have to take oral exam at the first term of exam.
Knowledge	Written exam comprises 5 tasks. Value of each task is 10 points.
evaluation after semester	Evaluation less then 50% points#8594;1 50% - 60% points#8594;2 61% - 74% points#8594;3 75% - 89% points#8594;4 More then 89% points#8594;5 Students who pass the written exam have to take oral exam.
Student activities:	Aktivnost ECTS
	(Experimental work) 1 (Constantly tested knowledge) 5
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22263;
Proposal made by	Željko Stojanović

Code WEB/ISVU	23098/93349	ECTS	6.0	Academic year	2018/2019
Name	Automatic Control			-	
Status	4th semester - Electric	al power engineering (I	Redovni elektrotehnika) -	obligatory course	
Teaching mode	Lectures + exercises (a	auditory + laboratory +	- seminar + metodology -	+ construction)	45+30 (15+15+0+0)
_	work at home				105
Teachers	Lectures:1. v.pred. Mat	to Fruk dipl.ing.			
	Lectures: Tomislav Špo	oljarić d. i. e., v. pred.			
	Lectures: Goran Vujisić				
	Auditory exercises:v.pr	red. Mato Fruk dipl.ing.			
	Auditory exercises: Tor	nislav Spoljarić d. i. e.,	v. pred.		
	Auditory exercises: Iva	n Sulekić dipl.ing.el.			
	Auditory exercises: Goi	ran Vujisić			
	Laboratory exercises:v	.pred. Mato Fruk dipl.ir	ig.		
	Laboratory exercises: I	romisiav Spoljaric d. l. (e., v. pred.		
	Laboratory exercises: I	Van Sulekić ulpi.ing.el. Coron Vujicić			
Course objectives	Educiatory exercises. C	locaribo analyzo and d	acian continuous controll	are of control systems	
Course objectives	Students will learn to d	escribe, analyze and u	esign continuous controlle	ers of control systems	
Learning outcomes:	1.categorize control sy	stems. Level:6			
	2. solve differential equ	lations. Level:0			
	A ability to apply to the	ce domain. Level:0,7	6		
	5 ability to analyze the	nrocess Level.	0		
	6 anivze control eleme	nt Loval.6			
	7 ability to calculate th	e controller narameter	s Level·6		
	8 ability to integrate se	elected type of controll	er into the system. Level:	6.7	
	9.ability to analyze the	operating of automati	c closed-loop system. Lev	vel:6	
	10.ability to test the au	tomatic closed-loop sv	stem. Level:6	cho	
Involvement of	5.1.EE Razumieti princ ⁱ	ip rada električnih rota	ciiskih stroieva. transform	natora, dalekovoda i sklo	opnih aparata: 5h in 180h
learning outcomes		.p			· · · · · · · · · · · · · · · · · · ·
of the course in					
study programme:					
Methods of carrying	Ex cathedra teaching				
out lectures	Case studies				
	Simulations				
	Discussion				
	The mater is presented	by mathematical mod	lels, tables and diagrams	using illustrative examp	ples in practice.
Methods of carrying	Group problem solving				
out auditory	Computer simulations				
exercises	Examples are discusse	d and solved on the bla	ackboard for every topic v	vith student participatio	n
Methods of carrying	Laboratory exercises o	n laboratory equipmen	t		
out laboratory	Laboratory exercises, o	computer simulations			
exercises	Group problem solving				
	Exercises are done on	prepared devices and s	systems		
Course content	1.Introduction, 3h, Lea	rning outcomes:1			
lectures	2.One stage amplifiers	. Common emitter amp	lifier, 3h, Learning outcor	mes:2	
	3.One stage amplifiers	. Common emitter amp	lifier, 3h, Learning outcor	mes:3	
	4.One stage amplifiers.	. Common emitter amp	olifier, 3h, Learning outcor	mes:2,4,5	
	5. One stage amplifiers.	. Common collector am	iplifier, 3n, Learning outco	omes:5	
		fior 1b Loorning outco	maci2 6		
	7 Common source ampli	lifier 3h Learning out	comes:2.6		
	8.Common drain ampli	fier. 3h. Learning outco	omes:6		
	9.Multistage amplifiers	. 3h. Learning outcome	es:5.6		
	10.Amplitude and phase	se frequency response,	3h, Learning outcomes:5	,6	
	11.Amplitude and phas	se frequency response,	3h, Learning outcomes:9		
	12.Differential amplifie	r, 3h, Learning outcom	es:3,4,7,8		
	13.Power amplifiers, 3h	n, Learning outcomes:7	7,8,9,10		
	14.Feedback, 3h, Learr	ning outcomes:5,7,8,9,	10		
	15.Oscillators, 3h, Lear	rning outcomes:5,7,8,9	,10		
Course content	1.No class.				
auditory	2.No class.				
	3.NO CIASS.				2
	4.Laplace transforms o	of differential equations	and transfer functions., 2	2n, Learning outcomes:	2
	6 Time responses of th	e first and second orde	r elements., 211, Learning	outcomes:2,3,5	
	7 Structural and algebr	a block diagrams 2h	Learning outcomes:/	outcomes.2,3,5	
	8 No class	a block diagraffis., 21,	Learning outcomes.4		
	9.Examples of time and	d frequency responses	of various control elemen	nts (PT1,PT2,PT25,PLPD	[1)., 2h. Learning
	outcomes:6			, <u>, , , , , , , , , , , , , , , , , , </u>	
	10.Principle of SG excit	tation and the value of	closed-loop system of SG	excitation control., 2h,	Learning outcomes:5
	11.No class.				-
	12.No class.				
	13.Examples of analysi	is and synthesis of circ	uits automatic control acc	cording to frequency cha	aracteristics., 2h,
	Learning outcomes:7,8	,9,10			
	14.Examples of analysi	is and synthesis of circ	uits automatic control acc	cording to frequency cha	aracteristics., 1h,

	Learning outcomes:7.8.9.10
	15.No class.
Course content	1.No class.
laboratory	2.No class.
-	3.No class.
	4.No class.
	5.No class.
	6.No class.
	7. Experimental determination of transient and frequency response of P. PT1 and Pl element 2h. Learning
	outcomes: 3.5.6
	8. Parametar determination of SG transfer function 2h. Learning outcomes: 5.6
	Parametar determination of power amplifiers 2h Learning outcomes 5.6
	10 Parameter determination of serial BLC circuit _ 2h Learning outcomes:5.6
	11 Parameter determination of DC motor 2b Learning outcomes 5.6
	12 Pl controller cettin in closed loon excitation systems for SG 2h Learning outcomes: 5.6.7.8.9.10
	12. If controller setup in closed loop exclusion systems of SG. 21, Learning outcomes: 5,6,7,8,9,10
	14 No class
	15 No class. 2h
	13.100 Class., 211
Required meterials	
Required materials	Basici Classiooni, biackboard, Chaik
	Special purpose laboratory
	Special pulpose computer laboratory
	Uvernead projector
	operating supplies
	Exercises are done on prepared devices and systems
Exam literature	Obavezna:
	1. N. Peric, Automatsko upravljanje, Zavod za APR FER-a, Zagreb, 1998.
	2. N. Pašalić, Osnovi regulacione tehnike, Zavod za elektrostrojarstvo, ETF Zagreb, 1977.
	3. P.Crnošija, T.Bjažić: Osnove automatike I. Dio, Element, Zagreb, 2011.
	A definition of the sectors
	I. I. Surina, Automatska regulacija, Skolska knjiga, Zagreb, 1981.
	2. Lj. Kuljača, Z. Vukić, Sistemi automatskog upravljanja Skolska
	knjiga, Zagreb, 1985.
	3. D'Azzo, Houpis, Feedback Control System Analysis and Synthesis, McGraw-Hill Book, Tokyo, 1966.
Students obligations	Attend 70 percent of classes and auditory exercises and 100 percent performed labaratory exercises and passed
	preliminary exam of labaratory exercises
Knowledge	3 exams with theoretical and numerical tasks
evaluation during	lerms: Each exam at least 30 percent solved and the total percentage of the combined three exams at least 50 percent
semester	
Knowledge	Written and oral exam
evaluation after	To pass at least 50 percent
semester	
Student activities:	Aktivnost ECTS
	(Practical work) 1
	(Constantly tested knowledge) 1
	(Written exam) 2
	(Oral exam) 2
Remark	This course can be used for final thesis theme
Prereguisites:	No prerequisites.
Proposal made by	Senior Lecturer Mato Fruk dinling
oposul made by	benior rectaren nato rruk, upning.

Code WEB/ISVU	22858/22268	ECTS	6.0	Academic year	2018/2019
Name	Automatic Control				
Status	4th semester - Control	and computer engineeri	ng in automation (Redov	ni elektrotehnika) - oblig	jatory course
Teaching mode	Lectures + exercises (a	auditory + laboratory + s	seminar + metodology +	construction)	45+30 (15+15+0+0)
	work at home				105
Teachers	Lectures:1. v.pred. Mat	o Fruk dipl.ing.			
	Lectures: Tomislav Spo	ljarić d. i. e., v. pred.			
	Auditory exercises y pr	ed Mato Fruk dinling			
	Auditory exercises: V.pr	nislav Špoliarić d. i. e., v	. pred.		
	Auditory exercises: Iva	n Šulekić dipl.ing.el.			
	Auditory exercises: Gor	ran Vujisić			
	Laboratory exercises:v	pred. Mato Fruk dipl.ing			
	Laboratory exercises: I	omislav Spoljaric d. i. e. Van Šulokić dinl ing ol	, v. pred.		
	Laboratory exercises: (Goran Vujisić			
Course objectives	Students will learn to d	escribe, analyze and des	sian continuous controlle	ers.	
Learning outcomes:	1 categorize control sv	stems. Level:6	ign continuouo controne		
	2.solve differential equ	ations. Level:6			
	3.relate time and Lapla	ice domain. Level:6,7			
	4.ability to analyze the	control system. Level:6			
	5.ability to analyze the	process. Level:6			
	6.anlyze control element	nt. Level:6	Lovalia		
	8 ability to calculate th	e controller parameters.	Level:0	vel·6 7	
	9 ability to analyze the	oerfirmances of the close	ed loop system Level.6	vei.0,7	
	10.ability to test the cl	osed loop system. Level:	6		
			-		
Involvement of	5.1.EE Razumjeti princi	p rada električnih rotacij	skih strojeva, transforma	atora, dalekovoda i sklor	onih aparata: 5h in 180h
learning outcomes					
of the course in					
study programme:					
Methods of carrying	Ex cathedra teaching				
out lectures	Case studies				
	Discussion				
	The mater is presented	l by mathematical mode	ls. tables and diagrams u	using illustrative examply	es in practice.
Methods of carrying	Group problem solving	-)	-,	<u> </u>	
out auditory	Computer simulations				
exercises	Examples are discusse	d and solved on the blac	kboard for every topic w	ith student participation	
Methods of carrying	Laboratory exercises of	n laboratory equipment			
out laboratory	Laboratory exercises, c	computer simulations			
exercises	Group problem solving				
	Computer simulations	propared devices and sv	stoms		
Course content	1 Introduction 2b Loo	repared devices and sy	stems		
lectures	2.One stage amplifiers	Common emitter ampli	fier. 3h. Learning outcom	ies:2	
	3.One stage amplifiers	. Common emitter ampli	fier. 3h. Learning outcom	ies:3	
	4.One stage amplifiers	. Common emitter ampli	fier, 3h, Learning outcom	ies:4,5	
	5.One stage amplifiers.	. Common collector amp	lifier, 1h, Learning outco	mes:4,5	
	, 2h, Learning outcome	s:5			
	6.Transistor series volt	age regulator, 2h, Learni	ng outcomes:5		
	Common source amplif	ier, 1h, Learning outcom	ies:b		
	8 Common drain ampli	fier 3h Learning outcom	nnes:0 nes:6		
	9.Multistage amplifiers	. 3h. Learning outcomes:	:6		
	10.Amplitude and phas	e frequency response, 3	h, Learning outcomes:6		
	11.Amplitude and phas	e frequency response, 3	h, Learning outcomes:7,	8,9	
	12.Differential amplifie	r, 3h, Learning outcomes	s:7,8,9		
	13.Power amplifiers, 2h	n, Learning outcomes:9,1	.0		
	, 1h, Learning outcome	s:/,8,9,10			
	14.Feedback, 2n, Learn	11ng outcomes: 7,8,9,10			
	15 Oscillators 2h Lear	r_{10} ning outcomes 7.8.9.10			
	, 1h, Learning outcome	s:5			
Course content	1.No class.				
auditory	2.No class.				
	3.No class.	f difforontial and the	nd transfer functions of	h Loorning automa 2	
	4.Laplace transforms of	r unterential equations a	nu transfer functions., 2	a, Learning outcomes:2	
	6 Determination of time	e response using inverse	L-uansionnation 2h L	earning outcomes:3	
	7.Block diagram algebr	a 2h. Learning outcome	es:1.4	carning outcomes.z	
	8.No class.				
	9.Examples of time and	d frequency responses of	various control element	s (PT1,PT2,PT2S,PI,PDT)	l), 2h, Learning
	outcomes:5,6				
	10.Examples of time ar	nd frequency responses of	of various control elemer	its (PT1,PT2,PT2S,PI,PDT	1), 2h, Learning

	outcomes:5,6 11.No class. 12.No class. 13.Bode stability criteria and determination of controller gain for system., 2h, Learning outcomes:7,8,9,10
	14.Bode stability criteria and determination of controller gain for system., 2h, Learning outcomes:7,8,9,10 15.No class.
Course content laboratory	 1.No class. 2.No class. 3.No class. 4.No class. 5.No class. 5.No class. 6.No class. 7.Transient response and Bode plot of passive and active PT1 and PDT1 controllers., 2h, Learning outcomes:6 8.Transient response and Bode plot of I and PI controllers., 2h, Learning outcomes:6 9.Transient response and Bode plot of passive PT2 and PT2S controllers., 2h, Learning outcomes:6 10.Determining of DC motor transfer function from the response., 2h, Learning outcomes:4,5 11.Determination of transfer functions using System Identification Toolbox., 2h, Learning outcomes:5,6 12.Positioning servo system., 2h, Learning outcomes:9,10 13.Experimental adjustment of the closed loop of PI controller of DC motor rotational speed with regard to the reference and disturbance value, 3h, Learning outcomes:5,6,7,8,9,10 14.No class.
Required materials	Basic: classroom, blackboard, chalk Special purpose laboratory Special purpose computer laboratory Overhead projector Video equipment Operating supplies Special equipment Modern measurment devices. Electrical and mechanical elementsi for designing labaratory models. Matlab with Simulink-om and System identification toolbox.
Exam literature	Basic literature: 1. N. Perić, Automatsko upravljanje, Zavod za APR FER-a, Zagreb, 1998. 2. P. Crnošija, Osnove automatike I.dio , Element, Zagreb, 2011. 3. N. Pašalić, Osnovi regulacione tehnike, Zavod za elektrostrojarstvo, ETF Zagreb, 1977. Additional literature: 1. T. Šurina, Automatska regulacija, Školska knjiga, Zagreb, 1981. 2. Lj. Kuljača, Z. Vukić, Automatsko upravljanje, Kigen, Zagreb, 2005. 3. D'Azzo,Houpis, Feedback Control System Analysis and Synthesis,McGraw-Hill Book,Tokyo,1966.
Students obligations	Attend 70 percent of classes and auditory exercises and 100 percent performed laboratory exercises and passed preliminary exam of labaratory exercises
Knowledge evaluation during semester	3 exams with theoretical and numerical tasks Terms: Each exam at least 30 percent solved and the total percentage of the combined three exams at least 50 percent Written and eral tast
knowledge evaluation after semester	To pass 50 percent
Student activities:	AktivnostECTS(Practical work)1(Constantly tested knowledge)1(Written exam)2(Oral exam)2
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
Proposal made by	Senior lecturer. Mato Fruk, dipl.ing.

Code WEB/ISVU	22855/22264	ECTS	5.0	Academic year	2018/2019		
Name	Automation Elements				-		
Status	3rd semester - Control and computer engineering in automation (Redovni elektrotehnika) - obligatory course						
Teaching mode	Lectures + exercises (a work at home	auditory + laboratory + s	eminar + metodology +	construction)	30+30 (0+30+0+0) 90		
Teachers	Lectures:1. Tomislav Šr	poliarić d. i. e., v. pred.					
	Lectures: Goran Vujisić	· · · · · · · · · · · · · · · · · · ·					
	Laboratory exercises: T	îomislav Špoljarić d. i. e.,	v. pred.				
	aboratory exercises: Goran Vujisić						
Course objectives	students will be introdu	iced to the elements of c	ontrol systems and their	properties			
Learning outcomes:	1.ability to analyze stat	tic and dynamic propertie	es of the automated proc	ess elements. Level:6			
	2.ability to identify the	element transfer functio	n according to the differ	ential equation descripio	in and response		
	3. ability to classify eler	nents according to the o	rder, the number of ener	av storage devices. Lev	el:6		
	4.ability to calculate th	e element response to st	ep change in excitation.	Level:6			
	5.ability to inspect the	properties of voltage cor	verters and choppers. L	evel:6,7			
	ability to inspect the dynamic and static characteristics of DCand synchronous generator. Level:6						
	7.ability to identify cont	7.ability to identify control and regulating characteristics of DC and asynchronous motor. Level:6					
	8.ability to draw the ch	aracteristics of simple no	on-linear elements. Leve	:0			
Methods of carrying	Ex cathodra toaching						
out lectures	Case studies						
	Demonstration						
	Discussion						
	Questions and answers	;					
Methods of carrying	Laboratory exercises or	n laboratory equipment					
exercises							
Course content	1.Introduction, 2h. Lear	rning outcomes:1.2					
lectures	2.One stage amplifiers.	. Common emitter amplif	ier, 2h, Learning outcom	es:1,2,3			
	3.One stage amplifiers.	Common emitter amplif	ier, 2h, Learning outcom	es:2,3			
	4.One stage amplifiers.	. Common emitter amplif	ier, 2h, Learning outcom	es:2,3,4			
	5.One stage amplifiers.	. Common collector ampl	ifier, 2h, Learning outcor	nes:3,4,5			
	6.Transistor series volta	age regulator, 2h, Learni	ng outcomes:3,4,5				
	7.Common source amp	finer, 20	0001				
	9 Multistage amplifiers	2h Learning outcomes	4 5				
	10.Amplitude and phas	se frequency response, 2	h, Learning outcomes:4,	5			
	11.Amplitude and phas	e frequency response, 2	h, Learning outcomes:5,6	ō			
	12.Differential amplifie	r, 2h					
	13.Power amplifiers, 2h, Learning outcomes:5,6,7						
	14.Feedback, 2h, Learning outcomes:6,7						
	15.0scillators, 21, Lean	ning outcomes:1					
Course content	1.No ex						
laboratory	2.Introduction to lab ex	ercise, 2h, Learning out	comes:1,2,3				
	3.First order electrical of	circuits - First order therr	nal system, 3h, Learning	outcomes:1,2,3			
	4.DC generator, 3h, Lea	arning outcomes:4,5					
	5.No exercise	or 2h Loorning outcom	0012.4.5				
	7 No evercise 2h	.01, 511, Learning outcom	es.5,4,5				
	8. Thyristor rectifier . 3	h. Learning outcomes:5.4	5				
	9.Chopper, 3h, Learnin	g outcomes:6					
	10.DC motor - motor co	ontrol characteristics , 2h	, Learning outcomes:6				
	11.DC motor - transfer	function, 3h, Learning ou	itcomes:6,7				
	12.No ex.						
	14 Frequency controlle	d induction motor 3h 14	arning outcomes:8				
	15.Final test, 2h, Learn	ing outcomes: $1, 2, 3, 4, 5, 6$	6,7,8				
		-					
Required materials	Basic: classroom, black	board, chalk					
	Special purpose laborat	tory					
	Overnead projector						
	Maquelle						
Exam literature	Basic literature:						
	1.Pašalić: Osnove regul	lacijske tehnike; FER- ZE	SA, Zagreb 1980.				
	2. M. Puzak: Upute i pri	preme za vježbe radni m	aterijali, web TVZ-ELO				
	3. M. Puzak: Sažeci pre	davanja; web TVZ-ELO					
	Additional literature:	i clijednih custava Ekrint	a Svoučilišto u Zagrabu	108/			
	L. P. CHIUSIJA: Elementi	sijeunin sustava, skript	a, Sveuciliste u Zagrebu	1504.			
Students obligations	regular class attendan	ce, final exam on laborat	ory exercise				
Knowledge	Redovitost pohaa#5#1	0#5; Prakti laboratoriisk	i rad#10#30#20\$; Kolol	vij, numeri zadaci#3#3	0#15\$;Kolokvij,		
evaluation during	teorijska pitanja#3#30	#15\$.,, .				
1	1						



semester			
Knowledge evaluation after semester	Redovitost pohaa#5#10#5\$Kolokvij, numeri zadaci#3#30#15\$Kolokvij, teorijska pitanja#3#30#15\$Prakti rad#10#30#20\$		
Student activities:	Aktivnost	ECTS	
	(Constantly tested knowledge)	1	
	(Written exam)	2	
	(Practical work)	1	
	(Oral exam)	1	
Remark	This course can be used for final thesis them	le	
Prerequisites:	No prerequisites.		
Proposal made by	Mr. sc. Milivoj Puzak, viši predavač		

Code WEB/ISVU	23413/155818	ECTS	6.0	Academic year	2018/2019
Name	Automation of Plants				
Status	6th semester - Control	and computer engineer	ing in automation (Redov	/ni elektrotehnika) - oblig	jatory course
Teaching mode	Lectures + exercises (a	auditory + laboratory +	seminar + metodology +	 construction) 	30+30 (0+30+0+0)
	work at home				120
Teachers	Lectures: 1. mr.sc. Dave	or Gadže			
	Lectures: 2. Tomislav S	poljancia. I. e., v. pred. or sc. Davor Gadže			
	Laboratory exercises: N	Mario Ličanin			
	Laboratory exercises: F	3oris Peša			
	Laboratory exercises: 1	Tomislav Špoljarić d. i. e	., v. pred.		
	Laboratory exercises: I	van Sulekic dipl.ing.el.			
Course objectives	students will acquire ki	nowledge necessary to c	sevelop the plant automa		
Learning outcomes:	1.ability to recognize the	he need for automation a	of a simple technical proc	Cess. Level:0	
	3.ability to extract PLC	components for automa	ation of a simple technica	al process. Level:6	
	4.ability to write a PLC	program for automation	of a simple technical pro	ocess. Level:6,7	
	5.ability to examine the	e operation of PLC for aι	utomation of a simple tec	hnical process. Level:6	
Methods of carrying	Ex cathedra teaching				
outlectures	Ouestions and answers	5			
Methods of carrying	Development and valid	lation of the PLC softwar	e on a laboratory model		
out laboratory					
exercises		waaaaa aawaaatian 2h			
Lourse content	2 Hierarchy structure c	forcess connection, 2n, i	arning outcomes:1,2,3		
	3.Elements of process	control equipment (PLC	and consisting parts), 2h	, Learning outcomes:3	
	4.Elements of process	control equipment (digit	al and analog inputs), 2h	i, Learning outcomes:3	
	5.Elements of process	control equipment (digit	al and analog outputs), 2	2h, Learning outcomes:3	
	6.Elements of process	control equipment (proc	essing units possibilities	and limitations), 2h, Lea	rning outcomes:3
	8.Setting for reliable or	perating protection agai	nst disturbance. 2h. Lear	ning outcomes:3	
	9.Program functions ar	nd blocks in PLC logic fur	nction, timers, counters, l	PWM regulators, 2h, Lea	rning outcomes:1,3,4
	10.PLC programming (I	Ladder and STL, graph),	2h, Learning outcomes:1	1,4	•
	11.Communication net	works, 2h, Learning out	comes:1,5	-	
	12.Process visualization	n - communications, 2h,	Learning outcomes:1,4,5)	
	14.Process visualization	n - screen elements. 2h.	Learning outcomes: 1.4.	5	
	15.Process visualizatio	n - archive, 2h, Learning	outcomes:1,4,5		
Course content	1.no classes, 2h				
laboratory	2.no classes, 2n 3 no classes, 2h				
	4.no classes, 2h				
	5.no classes, 2h				
	6.no classes, 2h				
	7.Examples of simple s	ystems based on PLC pr	ocess controllers, develo	ping a control program,	4h, Learning
	8.testing on process sin	mulator and laboratory r	process models, 4h, Lear	ning outcomes:1	
	9.Positioner control, 4h	, Learning outcomes:1,2	2,3,4,5	5	
	10.Velocity and direction	on measurement applyir	ng pulse encoder, 4h, Lea	arning outcomes:1,2,3,4,	.5
	11.Reversible electric r	notor drive control, 4h, I	Learning outcomes:1,2,3,	,4,5	
	13.Adjustment of indus	strial communication line	s. 4h. Learning outcome	s:1.2.3.4.5	
	14.Review of the proce	ess elements (SCADA), 4	h, Learning outcomes:1,2	2,3,4,5	
	15.Access to PLC via th	ie Internet communicati	ons, 4h, Learning outcom	າes:1,2,3,4,5	
De sur las deservertes de la					
Required materials	Special purpose labora	tory iter laboratory			
	Overhead projector	iter laboratory			
	Maquette				
	Tools				
	Development and valid	lation of the PLC softwar	e on a laboratory model		
Exam literature	Basic literature:	cioron mit SIMATIC Sion	ans Machan 1000		
	2. G. Malčić: Upute i ra	dni materijali za laborat	orijske vježbe. TVZ - ELO		
	Additional literature:				
	1. www.rockwellautom	ation.com - MicroLOGIC	1500 PLC programming		
	2. S7-TIA1 - upute za te	ečaj, Siemens			
Students obligations	laboratory exercises pr	resence			
Knowledge	oral exam on laborator	y classes 100			
semester					
1	1				



Knowledge	oral laboratory exam 90			
evaluation after	pressence classes 10	pressence classes 10		
semester				
Student activities:	Aktivnost	ECTS		
	(Constantly tested knowledge)	6		
Remark	This course can be used for final thesis theme			
Prerequisites:	No prerequisites.			
ISVU equivalents:	22271;			
Proposal made by	Mr. sc. Davor Gadže, viši predavač			

Code WEB/ISVU	23487/156000	ECTS	6.0	Academic year	2018/2019
Name	Automation Systems		I		
Status	5th semester - Control	and computer engine	ering in automatic	on (Redovni elektrotehnika) - ob	ligatory course
Teaching mode	Lectures + exercises (a	auditory + laboratory	+ seminar + meto	odology + construction)	30+45 (15+30+0+0)
_	work at home				105
Teachers	Lectures:1. mr.sc. Davo	or Gadže			
	Lectures:2. mr. sc. Ivar	۱ Mišković dipl. ing. pr	red.		
	Auditory exercises:mr.s	sc. Davor Gadže	ling prod		
	l aboratory exercises m	nr sc. Davor Gadže	. ilig. pieu.		
	Laboratory exercises:m	nr. sc. Ivan Mišković d	lipl. ing. pred.		
	Laboratory exercises: I	van Šulekić dipl.ing.e	l.		
Course objectives	students will acquire kr	nowledge necessary t	o establish automa	ation system of technical proce	sses
Learning outcomes:	1.ability to standardize	different technical pr	rocesses according	to their equivalent properties a	and parameters. Level:6,7
	2.ability to predict the i	impact of control solu	itions on safety and	d reliability of the system. Leve	1:6,7
	4 ability to analyze the	fluid flow control pro		by analysis of experiment. Leve	21.0,7
	5.ability to distinguish	between the propertie	es of thermal proce	esses according to heat transfe	r and their purpose.
	Level:6				
	6.ability to distinguish	between a multiple-in	າput-multiple-outpເ	ut (MIMO) system and the ways	of decoupling their
	7 ability to estimate co	nditions for applying	discrete digital cor	atroller in continuous processes	
	7.ability to estimate co	nucions for applying		teolier in continuous processes	. Level.0,7
Methods of carrying	Ex cathedra teaching				
out lectures	Case studies				
	Discussion				
	<u> </u>				
Methods of carrying	Laboratory exercises, c	computer simulations			
exercises					
Course content	1.Role. level and struct	ure of automation sv	stem. Reliability ar	nd safety of controlled system a	s a technical requirement.
lectures	2h, Learning outcomes	:1,2	, -	,	
	2.Automation tasks set	ting, 2h, Learning out	tcomes:3		
	3.Examination of proce	ess model by analysis	and measurement	: - mathematical models , 2h, Le	earning outcomes:3
	4. Thermal processes, 2 5 Fluid flow process 2	n, Learning outcomes	5:5 ·3		
	6.HVAC systems, 2h, L	earning outcomes:3,4	.5 I		
	7.Energy savingd by pu	ump and fan speed co	ontrol, 2h, Learning) outcomes:5	
	8.Material transport an	d shaping, 2h, Learni	ng outcomes:4		
	9.Mechanical mechanis	sm behavior - vibratio	n and oscilating, 2	h, Learning outcomes:5	
	11 Process and control	Learning outcomes:5,	,o disystem 2h Learr	ning outcomes:6 7	
	12.Analog and digital c	ontroller design, 2h, I	Learning outcomes	3:7	
	13.Conditions for applic	cation of digital discre	ete controllers in co	ontinuous processes. Paramate	rs of A/D and D/A
	converters , 2h, Learnin	ng outcomes:7	14		
	14.Influence of controll	er limits and signal fil	Itering on the syste	em, 2h, Learning outcomes: 7	
		is settings, reed form		, 211, Learning outcomes.7	
Course content	1.mechnical process de	escription. 1h. Learnir	ng outcomes:1		
auditory	2.Description of a subs	titution model of com	plex technical pro	cess from response , 1h, Learni	ng outcomes:1
	3.Description of a subs	titution model of com	plex technical pro	cess from response , 1h, Learni	ng outcomes:2
	4.Description: thermal	systems , 1h, Learnin	ig outcomes:2,3		
	6.systems with fluides.	1, Learning outcomes:	o es:4		
	7.systems with fluides,	2h, Learning outcom	es:4		
	8.characteristics of act	uators of pumps and	fans , 1h, Learning	outcomes:4	
	9.characteristics of act	uators of pumps and t	fans , 1h, Learning	outcomes:4,5	
	11 mechanical process	., In, Learning outcom	nes:4 5		
	12.Economic criteria in	selecting the actuato	ors in automation s	system , 1h, Learning outcomes	::4,6
	13.Economic criteria in	selecting the actuato	ors in automation s	ystem , 1h, Learning outcomes	:5,7
	14.Selection and settin	g of controllers , 1h, l	Learning outcomes	;:6,7	
	15.Selection and settin	g of controllers , 1h, l	Learning outcomes	5:6,7	
Course content					
laboratory	2.Analysis of the system	m behaviour of the Ma	athlab/Simulink mo	odels. Basic elements of the mo	del. 3h. Learning
	outcomes:2				dei, 511, 2001111g
	3.Thermal system , 3h,	, Learning outcomes:3	3		
	4. Mechanical system ,	3h, Learning outcom	es:3,4		
	5.NO exercise 6 Process of the fluids	3h Learning outcom	AS:3 /		
	7. Electromechanical os	cillations in the syste	m. 3h. Learning ou	itcomes:4.5	
	8.Multiple-input-multip	le-output system, 3h,	Learning outcome	25:5	
	9.Test , 2h		-		
	10.System with physica	al and regulatory cons	strains, 2h, Learnir	ng outcomes:6	
	11.Elevator system exa	ample, 3h, Learning o	utcomes:7		
	12.neating and cooling	system, 2n, Learning	joutcomes:/		

	13.pump system control, 2h, Learning outcomes:4 14.Test 2, 2h			
	15.N0 ex			
Required materials	Basic: classroom, blackboard, chalk General purpose computer laboratory Overhead projector Maquette			
Exam literature	Basic literature: 1. Perić, Petrović: Osnove automatizacije postrojenja i procesa; Skripta; FER- ZAPR, Zagreb 2001. Additional literature: 2. ***: Tehnička dokumentacija i upute procesne opreme i regulatora: ABB, Siemens; A. Bradley, Schneider			
Students obligations	25% of lecture attendance, performed all laboratory exercises and passed preliminary exams in the lab exercises			
Knowledge evaluation during semester	Redovitost pohaa#5#10#5\$Kolokvij, numeri zadaci#3#30#15\$Kolokvij, teorijska pitanja#3#30#15\$Prakti rad#10#30#20\$			
Knowledge evaluation after semester	Pismeni ispit#1#50#30\$Usmeni ispit#1#50#30\$			
Student activities:	Aktivnost ECTS (Constantly tested knowledge) 6			
Remark	This course can be used for final thesis theme			
Prerequisites:	No prerequisites.			
ISVU equivalents:	22276;			

Code WEB/ISVU	23479/155989	ECTS	4.0	Academic year	2018/2019
Name	Computers and Compu	iter Systems		·	
Status	5th semester - Control	and computer eng	ineering in automati	on (Redovni elektrotehnika) - ele	ctive course5th semester
Teaching mode	- Communication and o	computer technolog	$\frac{3}{2}$ (Redovni elektrot	ennika) - obligatory course	45+20 (0+20+0+0)
reaching mode	work at home		iy + seminar + met	outrogy a construction,	55
Teachers	Lectures:1. Marko Mile Laboratory exercises: Laboratory exercises:	tić Siniša Lacković stru Marko Miletić	uč.spec.ing.el.		
Course objectives	students will be introd microcontrollers with t	uced to the operati he basics of their d	ing modes of digital i lesigning and progra	microcomputers and computer e mming	quipment based on
Learning outcomes:	1.ability to classify cor 2.ability to design inte 3.ability to identify sof 4.ability to integrate a Level:6,7 5.ability to design an 6 6.ability to write driver language. Level:6,7 7.ability to test the op	ability to design interfaces for connecting sensors and control elements to embedded systems. Level:6 ability to identify software and hardware components of embedded systems. Level:6 ability to integrate a microcomputer or a microcontroller and peripherals uniits into a whole performing a given task. evel:6,7 .ability to design an embedded system using a microcontroller. Level:6,7 i.ability to write drivers and applications for a microcontroller-based embedded systems using C programming anguage. Level:6,7 '.ability to test the operating of embedded system using modelling and simulation program. Level:6			
Methods of carrying out lectures	Ex cathedra teaching Case studies Demonstration Simulations Questions and answer Classical lectures with	s overhead slides ar	nd blackboard. The s	tudents are motivated to particip	ate in discussions.
Methods of carrying out laboratory exercises	Laboratory exercises of Laboratory exercises, Computer simulations Workshop Lab excercises are dor involve work in micror	n laboratory equip computer simulatio ne alone or in pairs, troller simulator ar	ment ins , with the intent of ir nd on 8-bit and 32-bi	idependant svrha work on course t microcontroller evaluation boar	e subject. Lab exercises ds.
Course content lectures	1.History of microproc 2.definition and recogn 3.characteristics and t 4.explanation of the op 5.explanation of the op 6.memory models, 3h, 7.architecture of stanc 9.components necessa 10.digital inputs and o 11.analog inputs and o 12.characteristics and 13. interrupts and inte Learning outcomes:4,5 14. interrupts and inte Learning outcomes:4,5 15.no class, 3h	essors and microco nition of embedded echniques of developerating mode of m Derating mode of m Learning outcome lard 8-bit microcont ary for construction utputs, 3h, Learnin butputs, 3h, Learnin techniques of micr errupt service routin 5,6 rrupt service routin 5,6	Introller, 3h, Learning systems, 3h, Learn opment and testing incroprocessor on mi iscroprocessor on mi s:1,2,3 troller, 3h, Learning of a device, 3h, Learning of a device, 3h, Learning of a device, 3h, Learning outcomes:2,3,5 ng outcomes:2,3,5 ng outcomes:2,3,5 n	g outcomes:1,3 ing outcomes:1,3,4,5 of embedded systems, 3h, Learn nimal architecture, 3h, Learning nimal architecture, 3h, Learning outcomes:1,3,4,5 outcomes:1,3,4,5 arning outcomes:1,2,3,4,5,7 ming, 3h, Learning outcomes:2,5 roller and processing in the C pro-	ing outcomes:1,3,4,5,6,7 outcomes:1,3 outcomes:1,3 ,6,7 ,9gramming language , 3h, ogramming language , 3h,
Course content laboratory	1.no class, 2h 2.no class, 2h 3.no class, 2h 4.introduction to devel 5.introduction to devel 6.usage of digital inpu 8.usage of digital inpu 9.usage of digital inpu 10.midterm, 1h, Learn 11.Debouncing and nc 12.Key debouncing an 13.Interrupts - I group 14.Interrupts - I group 15.Final exam, 1h, Lear	lopment system - I lopment system - II ts and outputs for of ts and outputs for of ts and outputs over ing outcomes:1,2,3 in blocking coding - d non blocking codi , 3h, Learning outco arning outcomes:1,;	group, 3h, Learning group, 3h, Learning control of outside cor r auxiliary componer r auxiliary componer 3,4,5,6,7 - I group, 3h, Learnin ing - II group, 3h, Learnin ing - II group, 3h, Learnin comes:2,3,4,5,6,7 2,3,4,5,6,7	outcomes:2,3,4,5,6,7 outcomes:2,3,4,5,6,7 mponents - I group, 3h, Learning mponents - II group, 3h, Learning its (buffers) - I group, 3h, Learnin ts (buffers) - II group, 3h, Learni g outcomes:2,3,4,5,6,7 arning outcomes:2,3,4,5,6,7	outcomes:2,3,4,5,6,7 outcomes:2,3,4,5,6,7 g outcomes:2,3,4,5,6,7 ng outcomes:2,3,4,5,6,7
Required materials	Basic: classroom, blac Special purpose labora Special purpose comp Whiteboard with mark Overhead projector Maquette Special equipment Embedded developme Basic literature:	kboard, chalk itory uter laboratory ers nt boards, electron	ic components, NI M	yDAQ	
	1. S. Predanić: nastavr	ni materijali i projek	ti dostupni u sustav	u za udaljeno učenje	

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	2. D. Ćika: nastavni materijali i projekti dostupni u sustavu za udaljeno učenje				
	3. BUDIN, LEO: Mikroračunala i mikroupravljači. Element, Zagreb, ISBN 953-6098-69-5, 2001., 328 str.				
	Dodatna:				
	1. PETRINOVIĆ, DAVOR, VUČIĆ, MLADEN: Osnove projektiranja računalnih sustava. Skripta FER - Fakultet elektrotehnik i računarstva, Zagreb, 2007., 120 str.				
	2. VUČIĆ, MLADEN: Upotreba mikrokontrolera u ugrađenim računalnim sustavima. Skripta FER - Fakultet elektrotehnike i računarstva, Zagreb, 2007., 124 str.				
	3. VUČIĆ, MLADEN, PETRINOVIĆ, DAVORKA: Projektiranje ugrađenih računalnih sustava - laboratorijske vježbe. Skripta FER - Fakultet elektrotehnike i računarstva, Zagreb, 2007., 193 str.				
Students obligations	All lab exercises done and minimum of 50% from laboratory work				
Knowledge evaluation during semester	Midterm and final term, question about theory and practice - minimum of 50%				
Knowledge	Written exam - 50% of final mark				
evaluation after semester	Oral exam - 50% of final mark				
Student activities:	AktivnostECTS(Written exam)1(Oral exam)1(Constantly tested knowledge)1(Activity in class)1				
Remark	This course can be used for final thesis theme				
Remark Prerequisites:	This course can be used for final thesis theme Students cannot enroll in this course unless they have completed Digitalni sklopovi E				
Remark Prerequisites: ISVU equivalents:	This course can be used for final thesis theme Students cannot enroll in this course unless they have completed Digitalni sklopovi E 22279;22305;83429;85699;				

Code WEB/ISVU	22874/22315	ECTS	5.0	Academic year	2018/2019
Name	Control Devices and Sys	stems			
Status	5th semester - Commur	nication and computer te	chnology (Redovni elekt	rotehnika) - elective cou	Jrse
Teaching mode	Lectures + exercises (a work at home	uditory + laboratory + s	eminar + metodology +	construction)	30+30 (15+15+0+0) 90
Teachers	Lectures:1. v.pred. Mate	o Fruk dipl.ing.			
	Auditory exercises:v.pre	ed. Mato Fruk dipl.ing. Iomislav Špoliarić d. i. e	v pred		
Course objectives	Students will learn to describe analyze and design continuous controllers				
Learning outcomes:	1 ability to analyze the	control system. Level:6		15	
	2.ability to analyze the	process. Level:6			
	3.ability to calculate the	e controller parameters .	Level:6		
	4.ability to integrate the	e selected type of contro	ller into the system. Lev	el:6,7	
	6.sketch open and close	ed control loop. Level:6	21:0		
	7.write a linear differen	tial equation. Level:6,7			
	8.calculate analytical re	esponse of prime elemen	ts. Level:6		
	9.calculate the system i	transfer function . Level:	6		
	11 write a discrete tran	sfer function Level 6 7			
	12.create mathematica	l model. Level:6,7			
Methods of carrying	Ex cathedra teaching				
out lectures	Case studies				
	Modelling				
	The matter is presented	d by mathematical mode	ls, tables and diagrams	using illustrative examp	les in practice.
Methods of carrying	Group problem solving				
out auditory	Examples are discussed	d and solved on the boar	d for every topic with stu	udents participation.	
Methods of carrying	l aboratory exercises or	laboratory equipment			
out laboratory	Laboratory exercises, co	omputer simulations			
exercises	Group problem solving				
	Exercises are done on p	prepared devices and sys	stems.		
Course content	1.Introduction, 2h, Lear	ning outcomes:6 Common omittor amplif	ior 1h Learning outcom	00:6	
lectures	. 1h. Learning outcomes	s:8	ier, In, Leanning outcom	65.0	
	3.One stage amplifiers.	Common emitter amplif	ier, 2h, Learning outcom	es:8	
	4.One stage amplifiers. Common emitter amplifier, 2h, Learning outcomes:9				
	5.One stage amplifiers.	Common collector ampl	ifier, 2h, Learning outcor	mes:10	
	7.Common source ampl	lifier, 2h, Learning outco	mes:7,8,10		
	8.Common drain amplif	ier, 2h, Learning outcom	es:7,8,10		
	9.Multistage amplifiers,	2h, Learning outcomes:	1,2,5,10	5 5 1 6	
	10.Amplitude and phase	e frequency response, 21	1, Learning outcomes:1,	2,5,10 2 3 4 5 0 10	
	12.Differential amplifier	r, 2h, Learning outcomes	:6	2,3,4,3,3,10	
	13.Power amplifiers, 2h	, Learning outcomes:6			
	14.Feedback, 2h, Learn	ing outcomes:11			
	15.Oscillators, 2h, Leari	ning outcomes:1,2,6			
Course content	1.No class.				
auditory	2.No class.				
	3.No class.			<u> </u>	
	4.Laplace transform and 5 Transfer functions and	d response determinatio d frequency characterist	n., 2h, Learning outcome ics of basic dynamic eler	25:6,8 ments 2h Learning out	romes 7 8 9 10
	6.Transfer functions and	d frequency characterist	ics of basic dynamic eler	nents., 2h, Learning out	comes:7,8,9,10
	7.Examples of the analy	ysis and synthesis of con	tinuous systems for stat	ic control systems., 2h,	Learning
	outcomes:1,2,3,4,5	usis and synthesis of con	tinuque exetome for acta	tic control systems 2h	Loorning
	outcomes:1.2.3.4.5	ysis and synthesis of con	cinuous systems for asia	itic control systems., 21	, Leanning
	9.Analysis of feedback of	control system in time ar	nd frequency domain., 2	h, Learning outcomes:2,	3,5,10
	10.Example of a discret	e system analysis and s	nthesis., 2h, Learning o	utcomes:11	
	11.Example of a discret	e system analysis and s	nthesis., In, Learning o	utcomes:11	
	13.No class.				
	14.No class.				
	15.No class.				
Course content	1.No class				
laboratory	2.No class.				
	3.No class.				
	4.No class.				
	6.No class.				
	7.Transfer function of p	assive and active eleme	nts in the control of the f	first order systems., 3h,	Learning outcomes:10
	8.Transfer function of p	assive and active eleme	nts in the control of the	second order systems., 2	2h, Learning

	outcomes:10 9.Transfer functiones of dead time elements, 2h, Learning outcomes:10 10.Basics of Simulink., 2h, Learning outcomes:12 11.Examples of simulation and analysis of elements using Simulink program., 2h, Learning outcomes:2,3,4,5,10 12.Examples of simulation and analysis of closed loop systems using Simulink program., 2h, Learning outcomes:2,3,4,5,10 13.Examples of simulation and analysis of closed loop systems using Simulink program., 2h, Learning outcomes:2,3,4,5,10 14.No class. 15.No class.		
Required materials	Basic: classroom, blackboard, chalk Special purpose laboratory General purpose computer laboratory Overhead projector Maquette Exercises are done on prepared devices and systems.		
Exam literature	Basic literature: 1. N.Perić, Automatsko upravljanje, Zavod za APR FER-a, Zagreb, Interna skripta. Additional literature: 1. T.Šurina, Automatska regulacija, Školska knjiga, Zagreb, 1981. 2. Lj.Kuljača, Z.Vukić, Automatsko upravljanje,Kigen, Zagreb, 2005. 3. P.Katz, Digital Control Using Microprocessors, Prentice-Hall In		
Students obligations	Attend 70 percent of lectures Attend 70 percent of auditory lectures Performed laboratory exercises and passed preliminary tests in the lab exercises		
Knowledge evaluation during semester	Preliminary exams: 2 exams with numerical problems at least 50 percent to pass 1 exam with theoreticl problems at least 50 percent to pass		
Knowledge evaluation after semester	Preliminary examination on laboratory exercises Written and oral examination		
Student activities:	AktivnostECTS(Practical work)1(Written exam)2(Oral exam)2		
Remark	This course can be used for final thesis theme		
Prerequisites:	No prerequisites.		
Proposal made by	Senior lecturer Mato Fruk, dipl.ing		

Code WEB/ISVU	23015/63208	ECTS	5.0	Academic year	2018/2019
Name	Digital Circuits				
Status	4th semester - Control	and computer engineering	ng in automation (Redov	ni elektrotehnika) - oblig	atory course4th
	semester - Communica	tion and computer techn	ology (Redovni elektrote	hnika) - obligatory cours	se
Teaching mode	Lectures + exercises (a work at home	auditory + laboratory + s	seminar + metodology +	construction)	45+30 (15+15+0+0) 75
Teachers	Lectures:1. dr. sc. Mlac Auditory exercises:dr. s	len Sokele predavač sc. Mladen Sokele predav	/ač		
	Laboratory exercises: S	Siniša Lacković struč.spe	c.ing.el.		
Course abiastives	Laboratory exercises:d	r. sc. Mladen Sokele pred	lavac		
Course objectives	students will learn now	to describe, analyze and	a design digital circuits	.6.7	
Learning outcomes.	2.ability to calculate co 3.ability to distinguish 4.ability to distinguish 5.ability to determine t 6.ability to suggest cor	mplex logic circuits on the between simple logic circuits between description met the causes of chaotic beh rection in logic circuits to	he basis of the desired b cuits in real electronic cir hods of electronic circuit aviour in logical circuits.	.0,7 ehaviour. Level:6 'cuits and systems. Leve :s and of the systems. Le . Level:6,7 our. Level:6,7	וו:6 ≥vel:6
Methods of carrying	Ex cathedra teaching				
out lectures	Case studies				
	The subject matter is taught by presenting a great number of real examples, in order to reach abigh level of				
	understanding.	aught by presenting a gr		pies, in order to reach a	nightevel of
Methods of carrying	Group problem solving				
out auditory	Traditional literature an	nalysis			
exercises	Interactive problem sol	lving			
Markhard and an and an an	Problems are analysed	and solved with the full	participation of students		
Methods of carrying	Laboratory exercises of	n laboratory equipment			
exercises	Interactive problem sol	lvina			
	The exercises are done	in a laboratory by using	scale models specially p	prepared for the work wi	th digital
Course content	1.Fundamentals of digi	tal technology.Logical al	gebra and logical functio	ns, 3h, Learning outcom	ies:1,3
lectures	2. Logical algebra and	logical functions.Numeric	systems and codes, 3h,	, Learning outcomes:1,2	,3
	3.Groups of integrated	logical circuits, 3h, Learr	ning outcomes:1,2,4		
	5 Complex combination	n logical circuits (coder, r	ator arithmetic circuits)	3h Learning outcomes	.134
	 5.Complex combination logical circuits (comparator, arithmetic circuits), 3h, Learning outcomes:1,3,4 6.Midterm, 3h, Learning outcomes:5,6 7.Detecting flaws in combination logical circuits, 3h, Learning outcomes:1,2,3,4,5,6 8.Synchronous and asynchronous circuits, 3h, Learning outcomes:1,3,4 9. Types of flip flops., 3h, Learning outcomes:3,4 10.II Midterm, 3h, Learning outcomes:1,3,4 11.Complex digital circuit synthesis. Registers and counters, 3h, Learning outcomes:1,2,3,4 12.Monostable and astable multivibrators, 3h, Learning outcomes:1,2,3,4 				
	13.Detecting flaws in s	equential logical circuits.	RAM , 3h, Learning outo	omes:1,3,5,6	
	14.final exam, 3h, Lear	ming outcomes:1,2,3,4,5	,6		
	15.no class				
Course content	1 AD/DA conversion n	umber systems 2h Lear	ning outcomes:1.2		
auditory	2.number systems, sim	ple logical algebra and l	ogical functions, 2h, Lea	rning outcomes:1,2,3	
	3. logical functions, 2h,	, Learning outcomes:1,2,	3	-	
	4.complex logical funct	tions, 2h, Learning outco	mes:1,2,3,4		
	6 multiplexer 2h Lear	r_{1} r_{1} r_{2} r_{2	4		
	7.adder, comparator, 2	h, Learning outcomes:1,	2,3,4		
	8.preparation for the la	b. exercise - working wit	h circuits of different fan	nilies, 2h, Learning outco	omes:1,2,3,4
	9.detecting flaws in co	mbination logical circuits	, 2h, Learning outcomes	3:1,2,5,6	
	11 using synchronous and as	sequential circuits for au	tomata 2h Learning out	comes: 1, 2, 3, 4	
	12.counters - synchron	ious sequential circuits, 2	h, Learning outcomes:1	,2,3,4	
	13.counters - asynchro	nous sequential circuits	(ripple counter etc.), 2h,	Learning outcomes:1,2,	3,4
	14.Detecting flaws in s	equential logical circuits,	2h, Learning outcomes:	1,2,5,6	
	15.10 Class, 21				
Course content	1.no class				
laboratory	2.no class				
	3.no class				
	4.no class				
	5.no class				
	7.no class				
	8.no class				
	9.basic logic circuits - s	similarities of families of i	integrated logical circuits	s, 3h, Learning outcome	s:1,2,3,4
	10.basic logic circuits -	usage in complex circuit	s and diagnostic, 3h, Lea	arning outcomes:1,2,3,4	,5,6
	11.no class	as and differences 24	orning outcomest 2.2	1	
	13.registers and count	ers. 3h. Learning outcom	es:1.2.3.4	ł	
	14.astabile and monos	table multivibrators. flip	flops, 3h, Learning outco	omes:1,2,3,4	
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	15.no class		
Required materials	Basic: classroom, blackboard, chalk Special purpose laboratory Maquette		
Exam literature	Basic literature: 1. U. Peruško, Digitalna elektronika, Školska knjiga, Zagreb 1996. 2. U. Peruško, V. Glavinić; Digitalni sustavu, Školska knjiga, Zagreb, 2005. Additional literature: 1. A. Szabo, Impulsna i digitalna elektronika, skripta Sveučilista u Zagrebu 2. H. Taub; D.Schilling, Digital Integrated Electronics, McGraw-Hill, 1977.		
Students obligations	50% of maximum points on element: * quick test on lecturestest na predavanjima (blic) * midterm * homework * validation of work on lab exercises		
Knowledge evaluation during semester	Curve grading on minimum requirements is used.		
Knowledge evaluation after semester	Students who passed the midterms have oral exam. Others: written exam 50%, oral exam 50%		
Student activities:	AktivnostECTS(Classes attendance)1(Practical work)2(Written exam)1(Oral exam)1		
Remark	This course can be used for final thesis theme		
Prerequisites:	Students cannot enroll in this course unless they have passed Osnove elektrotehnike II Students cannot enroll in this course unless they have completed Analogni sklopovi E		
ISVU equivalents:	22269;		
Proposal made by	Stipe Predanić, dipl.ing, 4.2.2014		

Code WEB/ISVU	23640/158578	ECTS	5.0	Academic year	2018/2019			
Name	Digital Control	•	•	•				
Status	 5th semester - Control and computer engineering in automation (Redovni elektrotehnika) - obligatory course							
Teaching mode	Lectures + exercises (a	auditory + laboratory + s	eminar + metodology +	construction)	30+30 (10+20+0+0)			
	work at home				90			
Teachers	Lectures:1. v.pred. Mat	o Fruk dipl.ing.						
	Lectures: Goran Vujisic	od Mato Fruk dial ing						
	Auditory exercises: V.pr	ran Vuiisić						
	Laboratory exercises: v.pred. Mato Fruk dipl.ing.							
	Laboratory exercises: (Goran Vujisić						
Course objectives	students will learn to d	escribe, analyze and des	ign control systems emp	loying digital controllers	>			
Learning outcomes:	1.ability to analyze continuous control system. Level:6							
	2.ability to create mathematical model of the system in Simulink. Level:6,7							
	3.ability to calculate parameters of standard types of digital controllers. Level:6							
	4.ability to integrate a selected type of digital controller into the system. Level:6,7 5.ability to verify the system perfromances with incorporated digital controller on Simulink model. Level:6							
	6.associate analog and digital systems. Level:6,7							
	7.ability to calculate parameters of standard types of analog controllers. Level:6							
	8.solve difference equation. Level:6							
	9.write discrete transfe	er functions of elements.	Level:0,7					
Methods of carrying	Ex cathedra teaching							
out lectures	Case studies							
	Simulations							
	Modelling							
	Discussion	d by mathematical mode	ls tables and diagrams	ucina illustrativo ovamo	los in practica			
Methods of carrying	Group problem solving	a by mathematical mode	eis, lables and diagrams	using muscracive examp	les in practice.			
out auditory	Computer simulations							
exercises	Examples are discusse	d and solved on the blac	kboard for every topic wi	ith students participation	n.			
Methods of carrying	Laboratory exercises, c	computer simulations						
out laboratory	Group problem solving							
exercises	Computer simulations							
Course content	Exercises are performe	rning outcomocul 6	ng Matlab programs.					
lectures	. 1h. Learning outcome	rning outcomes.1,0						
	2.One stage amplifiers.	. Common emitter amplif	ier, 2h, Learning outcom	ies:6				
	3.One stage amplifiers.	. Common emitter amplif	ier, 2h, Learning outcom	ies:6				
	4.One stage amplifiers.	. Common emitter amplif	ier, 2h, Learning outcom	les:1				
	5.One stage amplifiers.	. Common collector ampl	ifter, In, Learning outcor	mes:5				
	6.Transistor series volt	age regulator, 1h. Learni	na outcomes:5					
	Common source amplif	fier, 1h, Learning outcom	es:9					
	7.Common source amp	lifier, 1h, Learning outco	mes:9					
	Common drain amplifie	er, 1h, Learning outcome	S:/					
	9. Multistage amplifiers	. 1h. Learning outcomes:	7					
	Amplitude and phase fi	requency response, 1h, L	earning outcomes:6,9					
	10.Amplitude and phas	se frequency response, 2	h, Learning outcomes:6,9	9				
	11.Amplitude and phas	se frequency response, 1	h, Learning outcomes:6,9	9				
	Differential amplifier, 1	n, Learning outcomes:4						
	13.Power amplifiers, 2h	n, Learning outcomes:2,3	5,2,5,4,5,6,7,8,9					
	14.Feedback, 2h, Learr	ning outcomes:1,2,3,4,5,0	6,7,8,9					
	15.Oscillators, 2h, Lear	ning outcomes:1,2,3,4,5	,6,7,8,9					
Course contout	1 No alaga							
Course content	1.NO CIASS. 2 No class							
	3.Examples of synthesi	is of PI controller by mag	nitude optimum., 1h, Lea	arning outcomes:7				
	4.Examples of synthesi	is of PI controller by mag	nitude optimum., 1h, Lea	arning outcomes:7				
	5.No class.							
	6.N0 Class. 7 Discrete Laplace tran	sform and stop response	of discroto alamants 1	h Learning outcomes:8				
	8.Discrete Laplace tran	sform and step response	e of discrete elements., 1	h. Learning outcomes:8				
	9.Discrete Laplace tran	sform and step response	e of discrete elements., 1	h, Learning outcomes:8				
	10.Discrete Laplace tra	insform and step response	se of discrete elements.,	1h, Learning outcomes:	8			
	11.Block diagram algeb	ora of discrete systems.,	1h, Learning outcomes:	5,9				
	12.Block diagram algebra of discrete systems., 1h, Learning outcomes:6,9							
	14.Analysis and synthe	sis of feedback discrete	control system., 1h, Lear	ning outcomes:1,2,3,4,5	5.6.7.8.9			
	15.No class.		, , , ,	5				
Course content	1.No class.							
laboratory	2.NO Class. 3 No class							
	4.No class.							
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	5.Introduction to Matlab and Simulink programming systems., 2h, Learning outcomes:2						
	6.Responses and Bode plot with setting the continuous controller by magnitude optimum., 2h, Learning outcomes						
	7.Responses and Bode plot with setting the continuous controller by magnitude optimum., 2h, Learning outcomes:2,3						
	8.Responses and Bode plot with setting the continuous controller by symmetric frequency characteristics., 2h, Learning						
	outcomes:2,3						
	9. Responses and Bode plot with setting the continuous controller by symmetric frequency characteristics., 2h, Learning						
	outcomes:2,3						
	10.Responses and Bode plots of discrete PT1, PDT1, PI, PID controllers., 2h, Learning outcomes: 2,3,4,9						
	11.Responses and Bode plots of discrete PT1, PDT1, PI, PID controllers., 2h, Learning outcomes: 2, 3, 4, 9						
	12. Responses and Bode plot of the systems with discrete controllers., 2h. Learning outcomes: 1, 2, 3, 4, 5, 6, 7, 8, 9						
	13.Responses and Bode plot of the systems with discrete controllers., 2h. Learning outcomes: 1.2.3.4.5.6.7.8.9						
	14 Responses and Bode plot of the systems with discrete controllers. 2h Learning outcomes: 1 2 3 4 5 6 7 8 9						
	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 with Simulink 8.1. and Control System Toolbox						
Exam literature	Basic literature:						
	1. N. Perić, O. Bego: Digitalni sustavi upravljanja, FESB, Split 2002.						
	Additional literature:						
	1. T. Šurina, Automatska regulacija, Školska knjiga, Zagreb, 1981.						
	2. Lj. Kuljača, Z. Vukić: Automatsko upravljanje, Kigen, Zagreb, 2005.						
	3. P. Katz, Digital Control Using Microprocessors, Prentice-Hall International, 1981.						
Students obligations	Attend 66 percent of classes						
	Attend 70 percent of auditory exercises						
	Attend 100 percent of labaratory exercises						
Knowledge	Preliminary exams:						
evaluation during	2 exams with numerical problems at least 50 percent to pass						
semester	1 exam with theoreticl problems at least 50 percent to pass						
Knowledge	Preliminary examination on laboratory exercises						
evaluation after	Written and oral examination						
semester							
Student activities:	Aktivnost ECTS						
	(Practical work) 1						
	(Constantly tested knowledge) 1						
	(Written exam) 2						
	(Oral exam) 1						
Remark	This course can be used for final thesis theme						
Prerequisites:	No prerequisites.						
ISVU equivalents:	22272;						
Proposal made by	Senior lecturer Mato Fruk,dipl.ing.						

Code WEB/ISVU	22875/22316	ECTS	5.0	Academic year	2018/2019			
Name	Digital Signal Processi	ng	•	•	•			
Status	5th semester - Commu	inication and computer t	echnology (Redovni elek	trotehnika) - elective co	urse			
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) 30+30 (0+30+0+0)							
	work at home				90			
Teachers	Lectures:1. dr.sc. Predrag Valožić prof. vis. šk.							
	Laboratory exercises:d	Laboratory exercises:dr.sc. Predrag Valožić prof. vis. šk.						
Course objectives	students will be familiar with theoretical principles and basic algorithms of digital signal processing							
Learning outcomes:	 1.ability to generate harmonic, periodic and random signal with defined properties, off-line generated. Level:6,7 2.ability to compose a complex algorithm of linear and non-linear processing of a communication signals. Level:6,7 3.ability to inspect the properties of digital system model. Level:6 4.ability to design digital filters. Level:6 5.ability to integrate several digital signal procedures into a single, complex one. Level:6,7 6.ability to analyze the system of digital signal processing (DSP). Level:6 7.ability to calculate optimal parameters for a block of the complex DSP system. Level:6 8.ability to predict the characteristics of output signal of a part and of a complex DSP system. Level:6,7 							
Methods of carrying	Ex cathedra teaching							
out lectures	Case studies							
	Simulations							
	Discussion							
	Uiscussion Lectures are incorporated in laboratory work (workshop). Teaching and learning are in a multimedia computer							
	laboratory. Work is ind	laboratory. Work is individual, collaboration and ad-hoc groups are welcomed. Educator performs lecturing sequences						
	(on-line introductions f	or laboratory work) as a	coach directs student					
Methods of carrying	Laboratory exercises o	n laboratory equipment						
out laboratory	Laboratory exercises, computer simulations							
exercises	Group problem solving	ina						
	Computer simulations	iing						
	Workshop							
	Integrated with lecturi	ng. Exercises to be finish	ed at home.					
Course content	1.Introduction. System	, information and signal.	, 3h, Learning outcomes:	:6				
lectures	2.Signals, presentation	and analysis, 3h, Learni	ing outcomes:1					
	3. Signals, A / D conversion: $_{-}$ S	sion, 3n, Learning outcol ampling aliasing - Quant	ites:1	se 3h Learning outcom	96.3			
	5.DFT and FFT: Algorit	hm: Excel. MatLab. prope	erties. 2h. Learning outco	mes:1.3	63.5			
	6.Z transform - The co	ncept and application of	Z-transform in the analy	sis of discrete systems.,	2h, Learning			
	outcomes:3			-	-			
	7.A discrete, time-inva	riant, linear systems - ap	plication of Z-transform	in the analysis of linear	discrete systems, 2h,			
	Learning outcomes:2	o process of designing E	IR digital filtors. 2h. Loar	ning outcomosi4				
	8.FIK aigital filters - The process of designing FIK digital filters, 2h, Learning outcomes:4 9.FIR digital filters - Examples of design FIR digital filters, 2h, Learning outcomes:4							
	10.IIR digital filters - The process of designing FIR digital filters. 2h. Learning outcomes:4							
	11.IIR digital filters - Ex	kamples of design FIR dig	gital filters, 2h, Learning	outcomes:4				
	12.Modulation - Gener	ate AM, SSB and PSK sig	nal., 2h, Learning outcom	nes:2,5,6,8				
	13.Demodulation - AM	, SSB and PSK receiver si	mulation, 2h, Learning o	utcomes:2,5,6,8				
	15.No lectures							
Course content	1.Signal presentation r	epetitorium, 1h, Learnin	g outcomes:1					
laboratory	2.Signals, presentation	and analysis, 2h, Learni	ing outcomes:1		-			
	3.A / D conversion: - Sa	ampling, aliasing - Quant	ization, quantization nois	se, 2h, Learning outcom	es:3			
	5.DFT and FFT: Algorit	hm: Excel. MatLab. prope	erties. 2h. Learning outco	omes:2	63.5			
	6.DFT and FFT; Algorit	hm: Excel, MatLab, prope	erties, 2h, Learning outco	omes:3				
	7.A discrete, time-inva	riant, linear systems - ap	plication of Z-transform	in the analysis of linear	discrete systems, 2h,			
	Learning outcomes:2	o process of designing E	IR digital filtors. 2h. Loar	ning outcomosi4				
	9.FIR digital filters - Th	e process of designing F	IR digital filters, 3h, Lean	ning outcomes:4				
	10.IIR digital filters - Th	ne process of designing F	IR digital filters, 3h, Lea	rning outcomes:4				
	11.The modulation and	d demodulation of AM, SS	5B and PSK, 3h, Learning	outcomes:5,7				
	12.The modulation and	demodulation of AM, SS	5B and PSK, 3h, Learning	outcomes:5,7				
	13.Standalone project	work, Learning outcome	5:Z					
	15.Presentation and di	scussion of projects, 2h,	Learning outcomes:6					
Required materials	Special purpose labora	itory						
	Special purpose comp	uter laboratory						
	Overhead projector							
	mbed LPC 1768: Analo	g System Lah Kit PRO						
Exam literature	Basic literature	g ogotern Luo Kit i KO						
	1. Steven W. Smith, Th	e Scientist and Engineer	's Guide to Digital Signal	Processing na www.DSI	Pguide.com			
	2. P. Valošić, Digitalna obrada signala - izravni pristup, MM e-skripta s predlošcima za vježbe, objavljena na web-u.							
	Additional literature:							
I	L. Sanjit K. Mitra, Digit	ai signai Processing, A C	omputer Based Approact	i, The McGraw-Hill Comp	James, Inc. 1998			
	 Samuel D. Stearns, Ruth A. David, Signal Processing Algorithms in Matlab, Prentice-Hall, Inc. 1996. A.V.Oppenheim R.W.Schafer, Discrete Time Signal Processing, Prentice-Hall, 1992. D.F.Elliott: Handbook of Digital Signal Processing, Academic. 1987. 							
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	5. P. Valožić, Harmonijski titraji i njihov prikaz, recenzirani nastavni materijal, TVZ, 2004.							
Students obligations	15 Regular attendance and completed exercises.							
Knowledge evaluation during semester	Regular attendance Preparation and laboratory work Made all the exercises and projects The appearance of reports and projects 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	Submission and presentation of the project							
semester	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 ECTS (Classes attendance) 1 (Activity in class) 1 (Constantly tested knowledge) 2 (Report) 1							
Remark	This course can be used for final thesis theme							
Prerequisites:	Students cannot enroll in this course unless they have passed Signali i procesi							
Proposal made by	Dr.sc.Predrag Valožić, prof.vis.šk.							

Code WEB/ISVU	23089/85715	ECTS	5.0	Academic year	2018/2019			
Name	Digital Signal Processor	rs						
Status	6th semester - Commu	nication and computer te	echnology (Redovni elekt	trotehnika) - elective coι	ırse			
Teaching mode	Lectures + exercises (a work at home	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) 30+30 (30+0+0+0) work at home 90						
Teachers	Lectures:dr.sc. Predrag Auditory exercises:dr.s	Lectures:dr.sc. Predrag Valožić prof. vis. šk. Auditory exercises:dr.sc. Predrag Valožić prof. vis. šk						
Course objectives	students will understand architecture and the DSP operating principle, practise building software for selected examples							
Learning outcomes:	Lability to generate harmonic, periodic and random signal with defined properties in real time. Level 6.7							
	 2.ability to compose a complex algorithm of linear and non-linear real-time processing of a communication signal. Level:6,7 3.ability to inspect the properties of modeled digital system. Level:6 4.ability to design digital filters. Level:6 5.ability to integrate a single signal processing procedure into a complex one. Level:6,7 6.ability to sketch a digital signal processing system. Level:6,7 7.ability to suggest optimal parameters of a complex system for digital and hybrid signal processing system. Level:6,7 8.ability to define characteristics of the output signal of the parts of a complex digital signal processing system. Level:6,7 9.ability to verify designed and obtained performances of the parts of a digital signal processing system. Level:6 							
Methods of carrying	Ex cathedra teaching							
out lectures	Case studies Simulations Modelling Discussion Workshop							
Methods of carrying	Laboratory exercises or	n laboratory equipment						
out auditory exercises	Laboratory exercises, c Group problem solving Data mining and knowl Discussion, brainstormi Computer simulations Interactive problem sol Workshop	omputer simulations edge discovery on the W ing ving	/eb					
Course content	1.Applications of digital	l signal processing, 2h, L	earning outcomes:9					
lectures	2.Real time generation 3.Checking of the mode 4.Real time generation 5.FIR digital filters, desi 6.IIR digital filters, desi 7.The digital version of 8.Communication chann 9.Analog transmission 10.Digital transmission 11.Spectrum inversion 12.Analog transmission 13.Digital transmission 14.Project presentation 15.Project presentation	of harmonic signals with aled digital system to op- of periodic and random : ign, programming, testing analog modulation syste nel: BP filter and Gaussia in baseband, 2h, Learnin of the speech signal, 2h, with modulation, 2h, Lea- with modulation, 2h, Lea- with discussion, 2h, Lea- with discussion, 2h, Lea-	n desired properties, 2h, erate in real time, 2h, Le signals with desired prop ag and implementation, 2 g and implementation, 2 em, 2h, Learning outcome an noise, 2h, Learning ou g outcomes:5,6,8,9 ng outcomes:5,6,8,9 , Learning outcomes:6,7, arning outcomes:1,2,3,4 arning outcomes:9 arning outcomes:9	Learning outcomes:1 arning outcomes:3 perties, 2h, Learning outc 2h, Learning outcomes:3 h, Learning outcomes:3, es:2,5,6,7 utcomes:2,3,6,7,8,9 8,9 ,5,6,7,8,9 5,6,7,8,9	comes:1 ,4 4			
auditory	2.Real time generation 3.Checking of the mode 4.Real time generation 5.FIR digital filters, desi 6.IIR digital filters, desi 7.The digital version of 8.Communication chan 9.Analog transmission 10.Digital transmission 11.Spectrum inversion 12.Analog transmission 13.Digital transmission 14.Project presentation 15.Project presentation	of harmonic signal processing, 2n, L of harmonic signals with eled digital system to opp of periodic and random sign, programming, testing analog modulation syste nel: BP filter and Gaussia in baseband, 2h, Learnin in baseband, 2h, Learnin of the speech signal, 2h, with modulation, 2h, Lea with modulation, 2h, Lea with discussion, 2h, Lea with discussion, 2h, Lea	a desired properties, 2h, erate in real time, 2h, Le signals with desired prop and implementation, 2 g and implementation, 2 em, 2h, Learning outcom an noise, 2h, Learning ou g outcomes:5,6,8,9 ng outcomes:5,6,8,9 , Learning outcomes:1,2,3,4 arning outcomes:1,2,3,4, arning outcomes:9 arning outcomes:9	Learning outcomes:1 arning outcomes:3 perties, 2h, Learning outcomes:4 h, Learning outcomes:4, es:2,5,6,7 utcomes:2,3,6,7,8,9 8,9 ,5,6,7,8,9 ,5,6,7,8	comes:1 ,5 5			
Required materials	Special purpose compu Video equipment Special equipment	ter laboratory						
	mbed LPC 1768	cientist and Engineering	Cuido to Digital Cineral Dr					
Students obligations	Rob Toulson, Tim Wilms	shurst: Fast and Effective	e Embedded Systems De	esign: Applying the ARM	mbed			
	Presence in rectures an	norcont						
evaluation during	Programming example	70 percent						

semester	Practical work 20 percent 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	Regular attendance 10 percent Programming example 70 percent Practical work 20 percent 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 (Classes attendance) (Activity in class) (Constantly tested knowledge) (Report)	ECTS 1 1 2 1	
Remark	This course can be used for final thesis th	ieme	
Prerequisites:	Students cannot enroll in this course unle Students cannot enroll in this course unle	ess they have passed Signali i procesi less they have completed Digitalna obradba signala	
Proposal made by	PhD Predrag Valožić prof. May, 31, 2013		

24043/189957	ECTS	6.0	Academic year	2018/2019				
Electrical Engineering								
6th semester - Electri	cal power engine	ering (Redovni elektrote	hnika) - obligatory course					
Lectures + exercises work at home	(auditory + labor	atory + seminar + meto	dology + construction)	45+45 (45+0+0+0) 90				
Lectures:1. Davor Ste Auditory exercises: Da	rc avor Šterc							
students will understa accept forthcoming en	and modern powe nergy processes i	r generation technologie n electrical engineering	es and energy relations and be of the 21st century	able to calculate and				
 1.ability to get insight and explain the importance of energy and energy supply, energy constraints, describe and classiffy energy and energy sources. Level:6 2.ability to describe and explain energy conversion in thermal power plants. Level:6 3.ability to introduce and exploit the properties of ideal gas in energy processes in both open and closed systems describe, solve and draw corresponding diagrams for relevant cyclic processes. Level:6 4.ability to understand the limitations in transformationsof various energy forms into energy (mechanical work), formulate and apply both the first and the second law of thermodynamics . Level:6 5.knowledge of procedures of increasing thermal efficiency in power plants with steam turbines, knowledge of basics of conversion of chemical into thermal energy processes in hydro electric power plants. Level:6 6.ability to describe and explain energy processes in hydro electric power plants. Level:6 7.awareness of controversies of nuclear engineering, knowledge of the basics of energy transformation and processes in nuclear power plants and their risks and reliability. Level:6 								
Case studies Modelling Discussion Questions and answer Seminar, students pre Other Lectures are delivered exercise solving with processes and transfor viewed and studied at onesthese processes approximationconstitu leans heavily on the principle of entropy in it and transform and of demandedprocesses	rs esentation and dis d with emphasis of the participation ormations of the r s one dimensiona include the flow of ute a sound descr orinciples of conse orinciples of conse deliver it, in the e which convert end	scussion on basic problems illustry of students and the mor nost varied forms of ene Il stationary processes. F of fluids; so they are stree ription of electrical powe ervation of mass and ene vhich absorb energy for ind, back to the environr ergy into electrical energy	ated with examples and applica itoring of their progress. Ratio ergy into mechanical work and surthermore, in open systemsco aming processes whichin the fi er plants and equipment. The a ergy, the equation of state for a the environment, store this ene ment. This cycle enables us to r gy.	ations. Recitations involve hale. Here, the energy electrical energy are ontrary to the closed rst halysis of these processes an ideal fluid, and the ergy in a system, transport modelboth imagined and				
Traditional literature a	analysis	ergy into creethear energy	5)·					
Data mining and know	vledge discovery	on the Web						
Discussion, brainstorr	ning							
Other Lectures are delivered exercise solving with processes and transfo viewed and studied as onesthese processes approximationconstitu leans heavily on the p principle of entropy in it and transform and of demandedprocesses	d with emphasis of the participation ormations of the r s one dimensiona include the flow of ute a sound descr orinciples of conse corease in fluids w deliver it, in the which convert end	on basic problems illustr of students and the mor nost varied forms of ene il stationary processes. F of fluids; so they are stre ription of electrical powe ervation of mass and en- which absorb energy for ind, back to the environm ergy into electrical energy	ated with examples and application itoring of their progress. Ratio ergy into mechanical work and furthermore, in open systems of aming processes whichin the fi er plants and equipment. The ai ergy, the equation of state for a the environment, store this ene ment. This cycle enables us to r gy.	ations. Recitations involve nale. Here, the energy electrical energy are ontrary to the closed rst nalysis of these processes an ideal fluid, and the ergy in a system, transport modelboth imagined and				
1. Introductory consid	lerations: importa	ance of energy, energy s	upply. Energy in the modern w	orld, energy constraints.,				
 3h, Learning outcome 2. Energy classificatio energy; energy, exerg 3. Basic energy converget outcomes:1,7 4. Conversion of intertor to mechanical energy 5.Direct energy converget magneto-hydrodynam outcomes:1 6. Power plants for pr 7.Production, transmit 8. Energy for transporg 9. Energy balance., 31 10. Efficiency of energy 11. Energy balance., 31 12. Environmental im Learning outcomes:1, 13. Sustainable devel 14. Energy efficiency 	es:1 in and supply: pri gy and anergy., 3 ersions. Conversion nal (thermal) ene , conversion of m ersions to electric nics generators). (oduction of electric sistic, distribution tation. Transport h, Learning outco pact of utilization 4,6,7 opment and ener 3h, Learning outco and alternatives.	mary (conventional and h, Learning outcomes:1, on of chemical and nucle ergy to mechanical energy techanical energy to elec al energy (thermoelectri Conversion of electrical rical energy., 3h, Learnin h, and consumption of el and delivery energy tha mes:1,4,6,7 Bh, Learning outcomes:2 omes:6,7 i, conversion and consur rgy., 3h, Learning outcor omes:1,4,6,7 , 3h, Learning outcomes	non-conventional), useful, stor 7 aar energy to internal thermal e gy, conversion of gravitational (ctrical energy., 3h, Learning ou ic, thermionic, photoelectric tra energy to other forms of energ ng outcomes:2,3,4,7 ectrical energy, 3h, Learning o at is not electrical, 3h, Learning ,4,5 nption of energy. Pollution and nes:1,4,6,7 :1,2,4,6,7	ed, and transitional energy., 3h, Learning potential) energy of water tcomes:1,2,3 nsformation, fuel cells, y., 3h, Learning utcomes:4,7 outcomes:1,3,4 climate change., 3h,				
	24043/189957 Electrical Engineering 6th semester - Electri Lectures + exercises work at home Lectures:1. Davor Šte Auditory exercises: D students will understa accept forthcoming e 1.ability to get insight classiffy energy and e 2.ability to describe a 3.ability to introduce describe, solve and d 4.ability to understan formulate and apply b 5.knowledge of proce conversion of chemica 6.ability to describe a 7.awareness of contro in nuclear power plan Ex cathedra teaching Case studies Modelling Discussion Questions and answe Seminar, students pro Other Lectures are delivered exercise solving with processes and transfor viewed and studied at onesthese processes approximationconstit leans heavily on the p principle of entropy ir it and transform and o demandedprocesses of Traditional literature at Data mining and know Discussion, brainstorr Other Lectures are delivered exercise solving with processes and transfor viewed and studied at onesthese processes approximationconstit leans heavily on the p principle of entropy ir it and transform and of demandedprocesses of 1. Introductory consid 3h, Learning outcomes 2. Energy classificatio energy; energy, exerg 3. Basic energy conve outcomes:1,7 4. Conversion of inter to mechanical energy 5.Direct energy conve outcomes:1,7 4. Conversion of inter to mechanical energy 5.Direct energy conve outcomes:1,7 5. Energy for transpoi 9. Energy energy energy 1. Sustainable devel 1. Sustainable devel 1. Energy efficiency	24043/189957 JECTS Electrical Engineering 6th semester - Electrical power engine Lectures: 1. Davor Šterc Auditory exercises: Davor Šterc Students will understand modern powe accept forthcoming energy processes 1.ability to get insight and explain the classiffy energy and energy sources. L 2.ability to describe and explain the classiffy energy and energy sources. L 3.ability to introduce and explain the pi describe, solve and draw correspondin 4.ability to understand the limitations i formulate and apply both the first and 5.knowledge of procedures of increasin conversion of chemical into thermal erg 7.awareness of controversies of nuclear in nuclear power plants and their risks Ex cathedra teaching Case studies Modelling Discussion Questions and answers Seminar, students presentation and dis Other Lectures are delivered with emphasis of exercise solving with the participation processes and transformations of the riviewed and studied as one dimensional onesthese processes include the flow capproximationconstitute a sound descreters principle of entropy increase in fluids vit and transform and deliver it, in the ed demandedprocesses which convert envitations of ther riviewed and studied as one dimensional onesthese processes include the flow capproximationconstitute a sound descreters principle of entropy increase in fluids vit and transfor	24043/189957 JECTS J6.0 Electrical Engineering Electrical Engineering Electrical Engineering Ght semester - Electrical power engineering (Redowni elektrote burk at home Lectures: 1. Davor Sterc Auditory exercises: Davor Sterc Students will understand modern power generation technologic accept forthcoming energy sources. Level:6 Lectures:1. 2.ability to get insight and explain the importance of energy and classiffy energy and energy sources. Level:6 Level:6 2.ability to introduce and exploit the properties of ideal gas in describe, solve and draw corresponding diagrams for relevant 4.ability to introduce and exploit the properties of ideal gas in nuclear power plants and the limitations in transformationsof vari formulate and apply both the first and the second law of therm 5.nowledge of procedures of increasing thermal efficiency in 1 conversion of chemical into thermal energy. Level:6 6.ability to describe and explain energy and their risks and reliability. Level:6 Ex cathedra teaching Case studies Modelling Discussion Questions and answers Seminar, students presentation and discussion Other Lectures are delivered with emphasis on basic problems illustre exercise solving with the participation of students and the environ demandedprocesses which convert energy into electrical energy fraditional literature analysis </th <th>24043/189957 [ECTS [6.0] Academic year Electrical Engineering Electrical power engineering (Redowni elektrotehnika) - obligatory course Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home Lectures + Lectrcise (auditory + laboratory + seminar + metodology + construction) work at home Lability to introduce and explain the importance of energy and energy supply, energy constructions (assifty energy and energy sources. Level:6 2. ability to introduce and explain energy conversion in thermal power plants. Level:6 2. ability to introduce and explain energy processes in both open describe, solve and draw corresponding diagrams for relevant cyclic processes. Level:6 4. ability to understand the limitations in transformations of various energy forms into energy to constance of energy trans in nuclear power plants and their risks and reliability. Level:6 6. ability to describe and explain energy processes in hydro electric power plants. Level:6 6. ability to describe and explain energy processes. Furthermore, in open systems with the describe and explain energy into electrical power plants. Level:6 6. ability to describe and explain energy intoreclasses induced the moletoring of their progress. Ratio processes induced the flow of fluids; to describe and explain energy intoreclasses induced thenergy intoreclasses induced their stasenteneig (assecrice pregy</th>	24043/189957 [ECTS [6.0] Academic year Electrical Engineering Electrical power engineering (Redowni elektrotehnika) - obligatory course Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home Lectures + Lectrcise (auditory + laboratory + seminar + metodology + construction) work at home Lability to introduce and explain the importance of energy and energy supply, energy constructions (assifty energy and energy sources. Level:6 2. ability to introduce and explain energy conversion in thermal power plants. Level:6 2. ability to introduce and explain energy processes in both open describe, solve and draw corresponding diagrams for relevant cyclic processes. Level:6 4. ability to understand the limitations in transformations of various energy forms into energy to constance of energy trans in nuclear power plants and their risks and reliability. Level:6 6. ability to describe and explain energy processes in hydro electric power plants. Level:6 6. ability to describe and explain energy processes. Furthermore, in open systems with the describe and explain energy into electrical power plants. Level:6 6. ability to describe and explain energy intoreclasses induced the moletoring of their progress. Ratio processes induced the flow of fluids; to describe and explain energy intoreclasses induced thenergy intoreclasses induced their stasenteneig (assecrice pregy				

Zagreb University of Applied Sciences

Course content	1. Introductory considerations: importance of energy, energy supply. Energy in the modern world, energy constraints.,
auditory	3h, Learning outcomes:1
	2. Energy classification and supply: primary (conventional and non-conventional), useful, stored, and transitional
	energy; energy, exergy and anergy., 3n, Learning outcomest.,/
	5. Basic energy conversions. Conversion of chemical and nuclear energy to internal thermal energy, 51, Learning
	 4. Conversion of internal (thermal) energy to mechanical energy, conversion of gravitational (potential) energy of water to mechanical energy, conversion of mechanical energy to electrical energy., 3h, Learning outcomes:1,2,3 5.Direct energy conversions to electrical energy (thermoelectric, thermionic, photoelectric transformation, fuel cells, magneto-hydrodynamics generators). Conversion of electrical energy to other forms of energy., 3h, Learning outcomes:1 6. Power plants for production of electrical energy., 3h, Learning outcomes:3,4,7 7. Production, transmission, distribution, and consumption of electrical energy, 3h, Learning outcomes:4,7 8. Energy for transportation. Transport and delivery energy that is not electrical, 3h, Learning outcomes:1,3,4 9. Energy balance., 3h, Learning outcomes:1,4,6,7 10. Efficiency of energy conversions., 3h, Learning outcomes:2,4,5 11. Energy balance., 3h, Learning outcomes:6,7 12. Environmental impact of utilization, conversion and consumption of energy. Pollution and climate change., 3h, Learning outcomes:1,4,6,7 13. Sustainable development and energy., 3h, Learning outcomes:1,4,6,7 14. Energy storage., 3h, Learning outcomes:1,4,6,7
	15. Energy efficiency and alternatives., 3h, Learning outcomes:1,2,4,6,7
Required materials	Basic: classroom, blackboard, chalk Overhead projector
Exam literature	Udžbenik:
	Vladimir Mikuličić, Davor Šterc (2012) Energetske pretvorbe i procesi u elektroenergetici. ISBN 978-953-7048-24-2. Dopunska literatura: pregledni članci (i poglavlja knjiga), npr: Nathan S. Lewis (2007) Powering the Planet. Engineering Science. Vol. 70, Phillip F. Schewe (2006) The Grid. ISBN 9780309102605, John R. Fanchi (2010) Energy in the 21st Century. ISBN 981432454X. Dodatna literatura: Vladimir Mikuličić et al. (2011) Energijske pretvorbe. ISBN [u pripremi], Vladimir Knapp (1993) Novi izvori energije. ISBN 953-0-30633-4. Referentna strana literatura: John R. Fanchi (2004) Energy: Technology and Directions for the Future. ISBN 980122482915, Hadi Sadaat (2010) Power System Analysis. ISBN 0-98-454380-5, T. K. Nagsarkar M. S. Sukhija (2007) Power System Analysis. ISBN 0-19-568451-6.
Remark	Vladimir Mikuličić, Davor Šterc (2012) Energetske pretvorbe i procesi u elektroenergetici. ISBN 978-953-7048-24-2. Dopunska literatura: pregledni članci (i poglavlja knjiga), npr: Nathan S. Lewis (2007) Powering the Planet. Engineering Science. Vol. 70, Phillip F. Schewe (2006) The Grid. ISBN 9780309102605, John R. Fanchi (2010) Energy in the 21st Century. ISBN 981432454X. Dodatna literatura: Vladimir Mikuličić et al. (2011) Energijske pretvorbe. ISBN [u pripremi], Vladimir Knapp (1993) Novi izvori energije. ISBN 953-0-30633-4. Referentna strana literatura: John R. Fanchi (2004) Energy: Technology and Directions for the Future. ISBN 980122482915, Hadi Sadaat (2010) Power System Analysis. ISBN 0-98-454380-5, T. K. Nagsarkar M. S. Sukhija (2007) Power System Analysis. ISBN 0-19-568451-6. This course can be used for final thesis theme
Remark Prerequisites:	Vladimir Mikuličić, Davor Šterc (2012) Energetske pretvorbe i procesi u elektroenergetici. ISBN 978-953-7048-24-2. Dopunska literatura: pregledni članci (i poglavlja knjiga), npr: Nathan S. Lewis (2007) Powering the Planet. Engineering Science. Vol. 70, Phillip F. Schewe (2006) The Grid. ISBN 9780309102605, John R. Fanchi (2010) Energy in the 21st Century. ISBN 981432454X. Dodatna literatura: Vladimir Mikuličić et al. (2011) Energijske pretvorbe. ISBN [u pripremi], Vladimir Mikuličić et al. (2011) Energijske pretvorbe. ISBN [u pripremi], Vladimir Knapp (1993) Novi izvori energije. ISBN 953-0-30633-4. Referentna strana literatura: John R. Fanchi (2004) Energy: Technology and Directions for the Future. ISBN 980122482915, Hadi Sadaat (2010) Power System Analysis. ISBN 0-98-454380-5, T. K. Nagsarkar M. S. Sukhija (2007) Power System Analysis. ISBN 0-19-568451-6. This course can be used for final thesis theme No prerequisites.
Remark Prerequisites: ISVU equivalents:	Vladimir Mikuličić, Davor Šterc (2012) Energetske pretvorbe i procesi u elektroenergetici. ISBN 978-953-7048-24-2. Dopunska literatura: pregledni članci (i poglavlja knjiga), npr: Nathan S. Lewis (2007) Powering the Planet. Engineering Science. Vol. 70, Phillip F. Schewe (2006) The Grid. ISBN 9780309102605, John R. Fanchi (2010) Energy in the 21st Century. ISBN 981432454X. Dodatna literatura: Vladimir Mikuličić et al. (2011) Energijske pretvorbe. ISBN [u pripremi], Vladimir Knapp (1993) Novi izvori energije. ISBN 953-0-30633-4. Referentna strana literatura: John R. Fanchi (2004) Energy: Technology and Directions for the Future. ISBN 980122482915, Hadi Sadaat (2010) Power System Analysis. ISBN 0-98-454380-5, T. K. Nagsarkar M. S. Sukhija (2007) Power System Analysis. ISBN 0-19-568451-6. This course can be used for final thesis theme No prerequisites. 22293;

Code WEB/ISVU	22977/26091	ECTS	5.0	Academic year	2018/2019			
Name	Electrical Machines I	<u>, I</u>		, ,				
Status	and semester Electrical newer engineering (Redevini elektrotebnika), obligatory course							
Topshing mode	Locturos Lovorsioos (a	dipower engineering (Re			20 + 20 (20 + 0 + 0 + 0)			
reaching mode	work at home	100101y + 1aboratory + s	eminar + metodology +	construction)	00 00			
Toochors	Locturocul mr.cc. Voco		lavač		30			
reachers	Auditory oversises, Ter	niclay Duran dial ing	lavac					
	Auditory exercises: Tor	nislav Đuran , dipi. ing.	viči prodavač					
Common a la la catilación	Additory exercises:	se. veserko ronnjenović u		la a sé al a stua na a sha a ba				
Course objectives	scuteris win acquire basic knowledge and understand operating principles of electromechanical conversion of energy							
Learning outcomes:	1.ability to calculate re	Lability to calculate required energy conversions. Level:0						
	2.ability to sketch cons	truction of windings . Lev	vel:6					
	3.ability to solve magne	etic circle of an electric n	hachine. Level:6					
	E ability to calculate M	ME of monophase and no	lung . Level:0,7	1.6				
		or of monophase and po	hypnase excitation. Leve	1:0				
Involvement of	5 1 EE Bazumioti princi	n rada olektričnih rotacij	ckih strojova transforma	tora dalakavada i sklar	nih aparata, 20h in			
learning outcomes		p rada elektrichin rotaciji	skill strojeva, transforma		nin aparata. 2011 in			
of the course in	15011							
study programme								
Methods of carrying	Ex cathodra toaching							
out lectures	Discussion							
outlectures	Questions and answers							
	Lecturing is performed	with the help of PowerPc	oint presentations					
Mothods of corrying	Crown problem colving		presentations.					
out auditory	Discussion brainstormi	ing						
exercises	Examples with active n	articination of students						
Course content	1 Eurodomontols of alos	tromochanical operav co	nuorsion 2h Loorning	outcomoci1				
Loctures	2 Construction of a con	version machine 2h Le	arping outcomes:1	butcomes:1				
lectures	3 Construction of a con	version machine, 21, Le	arning outcomes:1					
	4 Magnetic circuit 2h	Learning outcomes:3	arming outcomes.1					
	5.Magnetic circuit., 2h,	Learning outcomes:3						
	6.Model of a DC machir	ne., 2h. Learning outcom	es:2					
	7.Model of an AC mach	ine., 2h. Learning outcor	nes:2					
	8.Model of an AC mach	ine., 2h, Learning outcor	nes:2					
	9.Current and MMF diag	grams., 2h, Learning out	comes:5					
	10.Alternating current	MMF diagrams., 2h, Lear	ning outcomes:5					
	11.Polyphase winding N	4MF diagrams., 2h, Learr	ning outcomes:5					
	12.Torque., 2h, Learnin	ig outcomes:1						
	13.Induced voltage., 2h	i, Learning outcomes:1						
	14.Factory tour., 2h, Le	earning outcomes:1						
	15.Final examination.,	2h, Learning outcomes:1						
Course content	1.Numerical examples	of electromechanical ene	ergy conversion , 2h, Lea	rning outcomes:1				
auditory	2.Numerical examples	of electromechanical ene	ergy conversion , 2h, Lea	rning outcomes:1				
	3.Numerical examples	of electromechanical ene	ergy conversion , 2h, Lea	rning outcomes:1				
	4. Magnetic circuit calcu	liations., 2n, Learning ou	itcomes:3					
	5.Magnetic circuit calcu	lations., 2h, Learning ou	itcomes:3					
	7 Calculation of magne	tic core losses 2h Lear	ning outcomes:3					
	8 Calculation of magne	tic core losses 2h Lear	ning outcomes:3					
	9 Current and magneto	motive force diagrams	2h Learning outcomes:	5				
	10 Current and magnet	notive force diagrams.	21, Learning outcomes	5 s:5				
	11.Current and magnet	o motive force diagrams	2h. Learning outcome	s:5				
	12.Current and magnet	to motive force diagrams	2h. Learning outcome	s:5				
	13. Torgue and induced	voltage calculation., 2h,	Learning outcomes:1					
	14.Torque and induced	voltage calculation., 2h,	Learning outcomes:1					
	15.Torque and induced	voltage calculation., 2h,	Learning outcomes:1					
Required materials	Basic: classroom, black	board, chalk						
	Overhead projector							
Exam literature	Basic literature:							
	1. R. Wolf, Osnove elek	tričnih strojeva, Školska	knjiga, Zagreb, 1991.					
	2. L. M. Piotrovskij, Elek	<trični strojevi,="" tehnička<="" th=""><th>knjiga, Zagreb, 1974.</th><th></th><th></th></trični>	knjiga, Zagreb, 1974.					
	Additional literature:							
	1. D. Ban, V. Stivčević,	 Gašparac, Osnove elek 	kromehaničke pretvorbe	energije i električnih str	ojeva, Zbirka zadataka i			
	ispitnih pitanja, Elemer	it, 1996.						
	2. I. Mandić: Električni s	strojevi I, Bilješke s preda	avanja (PowerPoint forma	at)				
Students obligations	Successfully performed	exercises.						
Knowledge	Mid-term, numerical ta	sks#3#50#40\$Mid-term	, theoretical questions#3	3#50#50\$				
evaluation during								
semester								
Knowledge	Written examination#1	.#50#40\$Oral examinati	on#1#50#50\$					
evaluation after								
semester								



Student activities:	Aktivnost	ECTS				
	(Constantly tested knowledge)	1				
	(Written exam)	2				
	(Oral exam)	2				
Remark	This course can be used for final thesis theme					
Prerequisites:	No prerequisites.					
Proposal made by	Mr.sc. Veselko Tomljenović, v.pred.					

Code WEB/ISVU	23414/155820	ECTS	6.0	Academic year	2018/2019			
Name	Electrical Machines II				-			
Status	4th semester - Electrica	al power engineering (Re	dovni elektrotehnika) - o	obligatory course				
Teaching mode	Lectures + exercises (a work at home	auditory + laboratory + s	eminar + metodology +	construction)	45+45 (30+15+0+0) 90			
Teachers	Lectures:1. mr.sc. Veselko Tomljenović viši predavač Auditory exercises: Tomislav Đuran , dipl. ing. Laboratory exercises: Tomislav Đuran , dipl. ing. Laboratory exercises: Ivor Marković , mag. ing. Laboratory exercises: Alan Miletić							
Course objectives	students will acquire ba	asic knowledge in the fie	ld of construction, prope	rties and use of electrica	al rotating machines			
Learning outcomes:	 ability to test the operating of synchronous generator . Level:6 ability to present synchronous motor operating on infinite busbar. Level:6,7 ability to distinguish between the operating of salient pole synchronous generator and cylindrical rotor synchronous generator . Level:6 ability to differentiate the types of asynchronous motors. Level:6 ability to calculate the impact of resistance on the properties of asynchronous motor . Level:6 ability to propose a type of a multipurpose commutator. Level:6,7 distinguish small electrical machines. Level:6 							
Involvement of learning outcomes of the course in study programme:	5.1.EE Razumjeti princi 180h	p rada električnih rotacij	skih strojeva, transforma	atora, dalekovoda i sklop	onih aparata: 40h in			
Methods of carrying	Ex cathedra teaching							
out lectures	Discussion Questions and answers Lecturing is performed	; with the help of PowerPo	pint presentations.					
Methods of carrying	Group problem solving	·	· · ·					
out auditory	Discussion, brainstorm	ing	nto					
Methods of carrying	Laboratory exercises of	n laboratory equipment	115.					
out laboratory	Group problem solving	in aboratory equipment						
exercises	Discussion, brainstorm	ing						
	lest of student readine	ess for the excercise, exe	rcises in small groups, ir	idividual preparation of t	the report, test of the			
Course content	1 Physical processes in	a synchronous machine	3h Learning outcome	s·1				
lectures	2.Synchronous machinu 3.Construction and par 4.Basics of a synchrono 5.Physical processes in 6.Construction and pro 7.Starting, reversing ar 8.Basics of induction m 9.Physical processes in 10.Design and properti 11.Basics of DC machin 12.Output curves of DC 13.Basics of DC machin 14.Small electrical mac	e on an infinite busbar., ameters of synchronous bus machine testing., 3h, an induction machine., perties of induction machine achine testing., 3h, Learning achine testing., 3h, Learning DC machines., 3h, Learning the regulation., 3h, Learning the testing., 3h, Learning chines: construction, para chines: construction, para	3h, Learning outcomes:2 machines., 3h, Learning Learning outcomes:1 3h, Learning outcomes:4 hines., 3h, Learning outco outcomes:5 ning outcomes:6 Learning outcomes:6 g outcomes:6 outcomes:6 ameters and use., 3h, Le	outcomes:3 comes:4 earning outcomes:7 earning outcomes:7				
Course content auditory	 Physical processes in 2.Synchronous machim 3.Construction and par 4.Construction and par 5.Physical processes in 6.Construction and pro 7.Starting, reversing ar 8.Starting, reversing ar 9.Physical processes in 10.Design and properti 11.Basics of DC machir 12.Output curves of DC 13.Output curves of DC 13.Small electrical mac 15.Small electrical mac 	a synchronous machine e on an infinite busbar., i ameters of synchronous ameters of synchronous a an induction machine., i perties of induction machine d braking., 2h, Learning DC machines., 2h, Learning DC machines., 2h, Learning C machines., 2h, Learning C machines., 2h, Learning chines: construction, pari- chines: construction, pari-	., 2h, Learning outcomes: 2h, Learning outcomes:2 machines., 2h, Learning machines., 2h, Learning 2h, Learning outcomes:4 hines., 2h, Learning outco outcomes:5 outcomes:5 ning outcomes:6 g outcomes:7 g outcomes	earning outcomes:7				
Course content laboratory	1.No-load characteristi 2.Short circuit characte 3.Synchronization., 1h, 4.Regulation character 5.Regulation character 6.No-load characteristi 7.No-load characteristi 8.Torque characteristic	cs of synchronous machi eristics of synchronous m Learning outcomes:1 istics of synchronous ma istics of synchronous ma cs of induction motor., 11 cs of induction motor., 11 :s of induction motor., 11	ne., 1h, Learning outcom achine, 1h, Learning ou chine., 1h, Learning out chine., 1h, Learning out h, Learning outcomes:4 h, Learning outcomes:4 h, Learning outcomes:4	tes:1 tcomes:1 comes:1 comes:1				

	 9. Torque characteristics of induction motor., 1h, Learning outcomes:4 10. Load and external characteristics of a DC motor., 1h, Learning outcomes:6 11. Load and external characteristics of a DC motor., 1h, Learning outcomes:6 12. Regulation of a DC motor., 1h, Learning outcomes:6 13. Regulation of a DC motor., 1h, Learning outcomes:6 14. Introduction to specialized test laboratories for rotating electrical machinery., 1h, Learning outcomes:1
Required materials	Basic: classroom, blackboard, chalk Special purpose laboratory Overhead projector
Exam literature Students obligations	 Basic literature: 1. R.Wolf: Osnove električnih strojeva, Školska knjga, Zagreb, 1991. 2. I. Mandić, V. Tomljenović, M. Pužar: Sinkroni i asinkroni električni strojevi, Tehničko veleučilište u Zagrebu, 2012., http://nastava.tvz.hr/el-strojevill/SinAsink.pdf 3. B.Jurković, Z.Smolčić: Kolektorski strojevi, Školska knjiga, Zagreb, 1986. 4. R.Wolf: Ispitivanje električnih strojeva II i III, Elektrotehnički fakultet u Zagrebu, 1972. Additional literature: 1. I. Mandić: Električni strojevi II, Bilješke s predavanja (PowerPoint format) 2. V. Tomljenović: Električni strojevi 2, Zbirka rješenja, Tehničko veleučilište u Zagrebu, 2012. 3. A.Dolenc: Asinhroni strojevi, Elektrotehnički fakultet u Zagrebu, 1970. 4. D. Ban, V. Štivčević, I. Gašparac: Osnove elelekromehaničke pretvorbe energije i električnih strojeva, Zbirka zadataka i ispitnih pitanja, Element, Zagreb, 1996. 5. Z. Sirotić, Z. Maljković: Sinhroni strojevi, Fakultet, Zagreb, 1996. 5. Successfully performed exercises.
Knowledge evaluation during semester	Mid-term, numerical tasks#3#50#40\$Mid-term, theoretical questions#3#50#50\$
Knowledge evaluation after semester	Written examination#1#50#40\$Oral examination#1#50#50\$
Student activities:	AktivnostECTS(Constantly tested knowledge)1(Experimental work)1(Written exam)2(Oral exam)2
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	26092;
Proposal made by	Mr. sc. Veselko Tomljenović, v.pred.

Code WEB/ISVU	23484/155994	ECTS	6.0	Academic year	2018/2019			
Name	Electrical Measurements							
Status	3rd semester - Electrica and computer technolog in automation (Redovni	il power engineering (Re gy (Redovni elektrotehni elektrotehnika) - obligat	dovni elektrotehnika) - c ika) - obligatory course3 tory course	obligatory course3rd sem rd semester - Control an	ester - Communication d computer engineering			
Teaching mode	Lectures + exercises (a work at home	uditory + laboratory + s	eminar + metodology +	construction)	30+45 (15+30+0+0) 105			
Teachers	Lectures:1. mr.sc. Darko Lukša dipl.ing Auditory exercises:mr.sc. Darko Lukša dipl.ing Laboratory exercises: Želimir Ivanović Laboratory exercises:mr.sc. Darko Lukša dipl.ing							
Course objectives	Students will acquire basic knowledge of measurements in engineering particularly in electrical engineering; be introduced to the basic electrical measuring instruments, measuring procedures and methods; give a proper interpretation of the obtained measurement results.							
Learning outcomes:	 1.ability to identify the measurement results according to the source . Level:6 2.ability to differentiate measurement results according to the value of readings. Level:6 3.ability to classify the measurement reults by statistical methods . Level:6,7 4.ability to follow precaution and safety procedure in measurements . Level:6,7 5.ability to relate the measurement results obtained by different methods and procedures. Level:6,7 6.ability to estimate accuracy and errors of the obtained measurement resuls. Level:6,7 7.ability to distinguish between different measurement methods used for measurement of the same electrical values. Level:6 8.ability to test components and DC and AC circuit using a universal instrument . Level:6 9.ability to make a report on measurement results. Level:6,7 							
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion Presentations including	pictures, photos, diagra	ms and tables.					
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstormi Presentations including	ng pictures, photos, diagra	ms and tables.					
Methods of carrying out laboratory exercises	Laboratory exercises or The new knowledge fro instruments, their readi	n laboratory equipment m lectures is demonstra ngs and proper interpret	ted and supplemented. S tation of measurement r	Students acquire necess esults.	ary skills for connecting			
lectures	Measurement error, err 2.Measurement error, err 2.Measurement error, err 2.Measurement parame 4.Presentation of measu computer display of the 5.Measuring resistors, c outcomes:7 6.Principles of electrical electronic (digital instru Magnetic principle of cc Darsonval)., 1h, Learnir 7.Magnetic principle of cc Darsonval)., 1h, Learnir Measurement methods ohmmeter., 1h, Learnin 8.Measurement methods ohmmeter., 1h, Learnin 8.Measurement methods ohmmeter., 1h, Learnin 9.Electric power consun 10.Measuring bridges a 11.Electronic instrumen Digital instruments with outcomes:5,6,7 13.Digital instruments with outcomes:5,6,7 14.Measurement procee outcomes:2,5,7,9 15.Maintenace of instrume outcomes:2,5,7 Written exams., 1h	In the statistical data is a statistical data is based on instruments w g outcomes: 7 based on instruments w g outcomes: 7 is based on instruments g outcomes: 7 is based on instruments g outcomes: 7 is based on instruments g outcomes: 6 in the statistical data is: oscilloscope., 2h, Lea is: oscilloscope., 2h, Lea is: oscilloscope., 1h, Lea is: oscilloscope., 1h, Lea is: on AD converter, voltage of with AD converter, voltage of with AD converter, voltage of ints and equpment (handown ments and equpment (handown is a statistical data is a statisti	http://www.comment.comments.co	ning outcomes:3,6 ning outcomes:3,6 nes:1,2 tion of the two, graphs, f tors, dividers, amplifiers agnetic, electrostatic, th ent magnet (as a univer- anent	tables, functions, , filters., 2h, Learning lermal, chamical, sal instrument, ersal instrument, oltmeter, ampermeter, voltmeter, ampermeter, ay., 1h, Learning isplay., 2h, Learning on., 1h, Learning cing)., 1h, Learning			
Course content auditory	1.Measurement error, e 2.Measurement error, e 3.Measurement error, e 4.Measurement parame 5.Measurement parame 6.Universal instrument. 1h, Learning outcomes:	rror limits, statistical dat rror limits, statistical dat rror limits, statistical dat eters and waveform valu eters and waveform valu Magnetic principle of co 2,5	ta processing., 1h, Learn ta processing., 1h, Learn ta processing., 1h, Learn es., 1h, Learning outcom es., 1h, Learning outcom nversion, universal voltr	ning outcomes:2,5 ning outcomes:2,5 nes:2,5 nes:2,5 nes:2,5 metar, ampermetar, omr	netar and vatmetar.,			

	 7.Universal instrument. Magnetic principle of conversion, universal voltmetar, ampermetar, ommetar and vatmetar., 1h, Learning outcomes:2,5 8.Measuring bridges and compensators., 1h, Learning outcomes:2,5 9.Measuring bridges and compensators., 1h, Learning outcomes:2,5 10.Electric power consumption measurement., 1h, Learning outcomes:2,5 11.Electric power consumption measurement., 1h, Learning outcomes:2,5 12.Electronic instruments: function generator and oscilloscope., 1h, Learning outcomes:2,5 13.Electronic instruments: function generator and oscilloscope., 1h, Learning outcomes:2,5 14.Digital instruments with AD converter., 1h, Learning outcomes:2,5 15.Digital instruments with AD converter., 1h, Learning outcomes:2,5
Course content	1.No laboratory exercises.
laboratory	2.No laboratory exercises. 3 No laboratory exercises
	4.No laboratory exercises.
	5.Measurement error, error limits and statistical data processing., 3h, Learning outcomes:2,3,5
	6.Extension and calibrate analog universal instrument., 3h, Learning outcomes:2,5
	/.measurement values parameters waveforms voltage and current., 3h, Learning outcomes:2,4 8 Measuring bridges and compensators - 3h, Learning outcomes:2.4
	9.Measuring bridges and compensators., 3h, Learning outcomes:2.4.5
	10.Measurement values parameters waveforms voltage and current on oscilloscope., 3h, Learning outcomes:2,4,5
	11.Measurement in (X - Y) mode values parameters waveforms voltage and current on oscilloscope., 3h, Learning
	outcomes:2,4,6 12 Massurement in FET mode values parameters waveforms - 3h Learning outcomes:2.4.6
	13.Compare analog and digital measurement methods 3h, Learning outcomes:2.4.5
	14.Written and oral exam., 3h
	15.No laboratory exercises.
Required materials	Basic: classroom, blackboard, chalk Special purpose laboratory General purpose computer laboratory Special purpose computer laboratory
	Overhead projector
	Maquette
	Operating supplies The new knowledge from lectures is demonstrated and supplemented. Students acquire personal stills for expective
	instruments, their readings and proper interpretation of measurement results.
Exam literature	Basic literature:
	1. D. Lukša; Bilješke sa predavanja.
	2. V. Bego; Mjerenja u elektrotehnici, Tehnička knjiga, Zagreb, 1996.
	Vodatna: 1. France Mlakar: Onća električna mierenia. Tehnička knjiga, Tehnička knjiga, Godina: 2003.
	2. A. Šantić; Elektronička instrumentacija, Školska knjiga, Zagreb. 1998.
Students obligations	Attendance 80 % lectures and auditory exercises. All laboratory exercises.
Knowledge	Preliminary exam in the subject matter of exercises; the written and the oral exam.
evaluation during	Two written exams.
semester	
Knowledge	iwritten and oral exam.
semester	
Remark	This course can not be used for final thesis theme
Prerequisites:	Students cannot enroll in this course unless they have passed Matematika I
	Students cannot enroll in this course unless they have passed Osnove elektrotehnike I
	Students cannot enroll in this course unless they have completed Matematika II
	students cannot enroll in this course unless they have completed Usnove elektrotehnike li
ISVU equivalents:	22252;22277;85629;185689;
Proposal made by	Mr.sc. Darko Lukša dipl.ing.

Code WEB/ISVU	23998/185689	ECTS	6.0	Academic year	2018/2019				
Name	Electrical Measurements								
Status	2nd semester - Under	graduate profe	ssional study in electrica	l engineering (Redovni elektrote	ehnika) - obligatory course				
Teaching mode	Lectures + exercises work at home	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) 30+45 (15+30+0+0) work at home 105							
Teachers	Lectures:1. pred. Ivan Lectures:2. Aleksanda Auditory exercises: Al Auditory exercises: pre Laboratory exercises: Laboratory exercises: Laboratory exercises: Laboratory exercises:	Lujo , dipl.ing. ar Kiričenko eksandar Kiriče ed. Ivan Lujo , c Frane Brkić Robert Herček Želimir Ivanov Aleksandar Kir pred. Ivan Lujo	enko lipl.ing. ić ićenko , dipl.ing.						
Course objectives									
Remark	This course can not be	e used for final	thesis theme						
Prerequisites:	No prerequisites.								
ISVU equivalents:	22252;22277;85629;1	L55994;							

Code WEB/ISVU	24041/189955	ECTS	6.0	Academic year	2018/2019	
Name	Electrical Motor Drives					
Status	5th semester - Electrica	al power engineering (Re	edovni elektrotehnika) - o	obligatory course		
Teaching mode	Lectures + exercises (a work at home	auditory + laboratory + s	seminar + metodology +	- construction)	30+55 (30+10+0+15) 95	
Teachers	Lectures:1. Ivor Markov Auditory exercises: Ivor Laboratory exercises: N Laboratory exercises: T Laboratory exercises: N Construction exercises:	/ić, mag. ing. r Marković, mag. ing. Marko Babić Γomislav Đuran, dipl. inς vor Marković, mag. ing. : Ivor Marković, mag. ing.	j. a.		·	
Course objectives	students will quire know	wledge to identify the pr	ocess requirements driv	e elements and to selec	t motor drives	
Course objectives Learning outcomes:	1.ability to analyze properties and requirements of working mechanisms in static and dynamic operating conditions . Level:6 2.ability to create a single-pole motor drive scheme with DC controlled speed motor . Level:6,7 3.ability to assess capacities of asynchronous motor fed from constant voltage network and via frequency converter . Level:6,7 4.ability to propose the choice of motor type and energy converter in accordance with the requirements of technical procedure. Level:6,7 5.ability to establish operating conditions of the motor (cooling and environmental protection) and motor protection requirements. Level:6,7 6.ability to plan construction, maintaining and modernizing of a motor drive. Level:6,7					
Methods of carrying out lectures	Ex cathedra teaching Case studies Questions and answers Oral and PowerPoint pr	; resentation				
Methods of carrying out auditory exercises	Traditional literature ar Discussion, brainstormi	nalysis ing				
Methods of carrying out laboratory exercises	Laboratory exercises or Laboratory exercises, c	n laboratory equipment computer simulations				
How construction exercises are held	Group problem solving Discussion, brainstormi	ing				
Course content lectures	1.lectric motor drive as Learning outcomes:1 2.motoring regime, bra 3.Power flow control in 4.Requirements for ene 5.DC motor drive contro 6.Constant speed induc 7.Electric motor drive w 8.Frequency converter 9.Adjustment of motor 10.Design of electric m 11. Drive operating mo 12.Design of electric m Learning outcomes:2,3 13.Synchronous motor 14.Motor and converter 15.Testing and commis outcomes:6	an element of a technic electrical drive system., ergy supply in static and ol , 2h, Learning outcom ction motor drive, 2h, Le with asynchronous motor for AC motor drive, 2h, L and converter parameter lotor drive controls accor- dots. Exvivalent mpotor for otor drive controls accor- dive. Servo drive, 2h, L r selection - energy cons- ssioning of electric motor	al or work process (1). M mes:2 . 2h, Learning outcomes: dynamic conditions of a les:3 arning outcomes:3,4 r speed control. Scalar ar Learning outcomes:3,4 ers , 2h, Learning outcom rding to static and dynan torque and power. , 2h, L rding to static and dynan earning outcomes:5 sumtion criteria, 2h, Lear r drive. Maintenance an i	Taterial, energy and infor 2 motor , 2h, Learning out nd vector control, 2h, Lea nes:4 nic load , 2h, Learning ou _earning outcomes:5,6 nic load . Motor and drive ming outcomes:5 retrofit of a motor drive,	mation flow , 2h, tcomes:3 arning outcomes:3,4 utcomes:5,6 e protection, 2h, 2h, Learning	
Course content auditory	L.nv 2.Machine mechanical 3.Machine mechanical 4.Calculations of prope 5.Constant speed Induc 6.Induction motor start 7.Induction motor spee 8 test, 2h 9.Design of variable sp 10.Design of variable sp 11.Motor lads during st 12.nv - test 2, 2h 13.Synchronous motor 14.Motor selection on e 15.nv	needs torque speed pow needs torque speed pow rties and behaviour of: E ction motor drive supply up current lowering, 2P d control by voltage and eed induction motor driv peed induction motor driv art up and speed revers drive, 2h, Learning outc energy consumption crui	ver, 2h, Learning outcom ver, 2h, Learning outcom DC motor drive, 2h, Learn from ac network, 2h, Learn n, Learning outcomes:3,4 d frequency, 2h, Learning ve - motor and converter rive - motor and converte al - efective torque, 2h, I comes:4,5 iteria, High efficiency mo	es:1,2 es:1,2 hing outcomes:2,3 arning outcomes:3,4 outcomes:4,5 selecting, 2h, Learning outcomes:2,3,4 Learning outcomes:2,3,4 tors, 2h, Learning outcor	outcomes:2,3,4,5,6 ı outcomes:3,4,5 mes:6	
Course content laboratory	1.ne 2.ne 3.ne 4.ne 5.ne					

	6.ne 7.ne 8.DC motor drive properties, 2h, Learning outcomes:2 9.Mains supplied induction motor drive, 1h, Learning outcomes:3 10.Induction motor drive with reduced start current Y/D conection and soft start, 1h, Learning outcomes:3,4,5 11.Frequency control of induction motor, 2h, Learning outcomes:3,4,5,6 12.Frequency converter paramater setting, 2h, Learning outcomes:4,5,6 13.Servo drive, motor drive for elevator, 2h, Learning outcomes:4,5,6 14.Large drives with induction and SMPM motor - test laboratory visit, 1h, Learning outcomes:4,5,6 15.ne
Course content constructures	1.ne 2.ne 3.ne 4.ne 5.ne 6.ne 7.task sharing. Design rules, 1h, Learning outcomes:4,5,6 8.Solving exampe, 3h, Learning outcomes:6 9.Solving exampe, 3h, Learning outcomes:6 10.Individual task solving, 2h, Learning outcomes:6 11.Individual task solving, 2h, Learning outcomes:6 12.Solving review, 1h, Learning outcomes:5 14.Solving review, 1h, Learning outcomes:5,6 15.Solve presentation , 2h, Learning outcomes:6
Required materials	Basic: classroom, blackboard, chalk Special purpose laboratory Whiteboard with markers Overhead projector Maquette Special equipment
Exam literature	Basic literature: 1. B.Jurković, Elektromotorni pogoni, Školska knjiga, Zagreb,1990. 2. G Erceg: Elektromotorni pogoni: Inženjerski priručnik 20. pp1017-1074 Školska knjiga 2002. Additional literature: 1. J. Bonal: Variable speed electric drives; Intercept , London, Paris , New York, 1999.
Students obligations	Individual project design of selected EMD elements for the given technical process (10)
Knowledge evaluation during semester	Redovitost pohaa#5#10#5\$Kolokvij, numeri zadaci#3#50#30\$Programski zadatak#1#30#20\$Usmena provjera znanja#1#10#5\$
Knowledge evaluation after semester	Pismeni ispit#1#40#25\$Usmeni ispit#1#40#25\$Project work 1#20#10\$
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22295:155987:
Proposal made by	Mr. sc. Milivoj Puzak, viši predavač
i toposat made by	

Code WEB/ISVU	23478/155988	ECTS	6.0	Academic year	2018/2019
Name	Electrical Motor Drive	s			
Status	5th semester - Contro	ol and computer en	gineering in automation	on (Redovni elektrotehnika) - obli	gatory course
Teaching mode	Lectures + exercises	(auditory + laborat	tory + seminar + mete	odology + construction)	30+45 (20+10+0+15)
-	work at home				105
Teachers	Lectures:1. mr.sc. Da	vor Gadže			
	Lectures:2. Tomislav	Špoljarić d. i. e., v.	pred.		
	Auditory exercises:mi	r.sc. Davor Gadže	i o v prod		
	l aboratory exercises. It	mr sc. Davor Gadž	. i. e., v. preu.		
	Laboratory exercises:	Tomislav Špoliarić	d. j. e., v. pred.		
	Construction exercise	s:mr.sc. Davor Gao	dže		
	Construction exercise	s: Tomislav Špoljar	rić d. i. e., v. pred.		
Course objectives	students will acquire	knowledge to reco	gnize requirements of	a motor drive and select the type	es and elements of
	electric motor drives				
Learning outcomes:	1.ability to create a si	ingle-pole motor dr	rive scheme with DC c	ontrolled speed motor . Level:6	
	2.ability to assess pos	ssibilities of an asy	nchronous motor powe	er supplied from constant voltage	network via frequency
	3 ability to propose th	he choice of a moto	or type and energy cor	werter according to the requirem	ents of technical
	process. Level:6.7		si type and energy cor	iverter decording to the requirem	
	4.ability to determine	the motor operation	ng conditions (cooling	and environmental protection) a	nd necessity of motor
	protection . Level:6,7				
	5.Be able to draw sing	gle line AC variable	e speed motor drive. L	evel:6	
	6.ability to plan const	ruction, maintenar	nce and modernization	of a motor drive. Level:6	
	7.carry out the constr	uction, maintenece	e and retront motor dr	Ive. Level:0,7	
Methods of carrying	Ex cathedra teaching				
out lectures	Demonstration				
	Oral and PowerPoint	presentation			
Methods of carrying	Traditional literature	analysis			
out auditory					
exercises					
Methods of carrying	Laboratory exercises	on laboratory equi	pment		
exercises					
How construction	project				
exercises are held					
Course content	1.Electric motor drive	as an element of a	a technical or work pro	ocess (1). Material, energy and in	formation flow (1)., 2h,
lectures	Learning outcomes:1			_	
	2.Material, energy an	d information flow,	2h, Learning outcome	es:2	
	4 Requirements for e	nergy now control	in unives, 2n, Learning	tions of a motor 2h Learning or	itcomes:2
	5.DC motor drive con	trol. 2h. Learning o	outcomes:3.4		
	6.Constant speed ind	uction motor drive,	, 2h, Learning outcome	es:4,5	
	7.Electric motor drive	with asynchronous	s motor speed control.	Scalar and vector control. , 2h, I	earning outcomes:4,5-
	8.Frequency converte	er for AC motor driv	/e, 2h, Learning outco	mes:3,4,5	
	9.Adjustment of moto	or and converter pa	rameters, 2h, Learnin	g outcomes:4,5,6	utcomocif 7
	11 Mechanical constr	uction of motors C	Sooling systems Drive	operating modes 2h Learning o	utcomes:4.5
	12.Protection of drive	components., 2h.	Learning outcomes:5.	6	utcomes.4,5
	13. Synchronous mot	or drive. Servo driv	ves, 2h, Learning outco	omes:5,6	
	14.Testing and comm	issioning of electri	c motor drive , 2h, Lea	rning outcomes:7	
	15.Maintenance of a i	motor drive.Motor o	drive design acording	to energy consumption, 2h, Lear	ning outcomes:6,7
Course content	1 NO ox				
auditory	2. Task calculation por	wer, torque speed.	2h. Learning outcome	s:1.2	
	3.Task calculation po	wer, torque speed,	2h, Learning outcome	s:1,2	
	4.behavior of DC mot	or drive, 2h, Learni	ing outcomes:2,3		
	5.Constant speed Ind	uction motor drive	supply from ac netwo	rk, 2h, Learning outcomes:3,4	
	6.Startig current redu	iction of induction r	motor, 2h, Learning ou	Itcomes:6,7	
	7.Induction motor cor	itrol by variable fre	equency and voltage, A	2n, Learning outcomes:4,5,6,7	
	9.Design of variable s	peed induction mo	otor drive - motor and	converter selecting, 2h. Learning	outcomes:4.5
	10.Design of variable	speed induction m	notor drive - motor and	converter selecting, 2h, Learnin	g outcomes:4,5,6
	11.Motor loadig durig	starting and speed	d reversal - efective to	rque, 2h, Learning outcomes:5,6	7
	12.no ex		-		
	13.Synchronous drive	e, Ih, Learning outo	comes: /	v drive the Learning outcomes.	7
	15.no ex	now energy consu	imption - nigh enicient	Ly drive, in, Learning outcomes.	'
Course content	1.No ex				
laboratory	2.No ex				
	3.No ex				
	5.No exercise				
	6.No ex				

	 7.No exercise 8.DC motor drive properties, 2h, Learning outcomes:1,2 9.Induction motor drive supply from constant voltage network, 1h, Learning outcomes:3 10.Inductio motor drive with reduced start current Y/D and soft start, 1h, Learning outcomes:4 11.Frequency control of induction motor, 2h, Learning outcomes:3,4 12.Frequency converter paramater setting, 2h, Learning outcomes:3,4 13.Servo drive, motor drive for elevator, 1h, Learning outcomes:4,5
	14.Large drives with induction and SMPM motor - test laboratory visit, 1h, Learning outcomes:5,6 15.No ex
Course content	1 no ex
constructures	
	no exercise
	4.no exercise
	5.no exercise
	6.no exercise
	7.Task sering, 1h
	8.example 1, 3h, Learning outcomes:1,2,3
	9.example 2, 3h, Learning outcomes:2,3
	10.individual student work - support, 2h, Learning outcomes:2,4,5,6,7
	11.ndividual student work - support, 2h, Learning outcomes:2,3,4,5,6,7
	12.result control, 2h, Learning outcomes:7
	13.result control, 1h, Learning outcomes:7
	14.result control, 1h, Learning outcomes:7
	15.result presentation, 2h, Learning outcomes:6
Required materials	Special purpose laboratory
	General purpose computer laboratory
	Overnead projector
	Maquette
	Special equipment
	project
Exam literature	Basic literature:
	I. B.Jurković, Elektromotorni pogoni, Skolska knjiga, Zagreb, 1990.
	2. J. Weidauer: Električna pogonska tehnika, Siemens, Graphis Zagreb 2013
	3. G Erceg: Elektromotorni pogoni: inzenjerski priručnik 20. pp1017-1074 Skolska knjiga 2002.
	Dogarna:
	1.). Bonai: Variable speed electric drives; intercept , London, Paris , New York, 1999.
Students obligations	Individual project development of the selected electric motor drive (EMD) elements for the given technical process (10)
Knowledge	Redovitost ponaa#5#10#5\$Kolokvij, numeri zadaci#3#50#30\$Programski zadatak#1#30#20\$Usmena provjera
evaluation during	znanja#1#10#5\$
semester	
Knowledge	Pismeni ispit#1#40#20\$Usmeni ispit#1#40#30\$Seminarski rad#1#20#10\$
evaluation after	
semester	
Student activities:	Aktivnost ECTS
	(Constantly tested knowledge) 6
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22283;
Proposal made by	Mr. sc. Milivoj Puzak, viši predavač

Code WEB/ISVU	22866/22294	ECTS	5.0	Academic year	2018/2019
Name	Electrical Power Netw	works	I		4
Status	5th semester - Electr	rical power engine	ering (Redovni elektrote	hnika) - obligatory course	
Teaching mode	Lectures + exercises	(auditory + labo	ratory + seminar + meto	odology + construction)	45+30 (30+0+0+0)
	work at home				75
Teachers	Lectures:1. Tomislav	Špoljarić d. i. e.,	v. pred.		
	Auditory exercises: T	omislav Špoljarić	d. i. e., v. pred.		
Course objectives	Acquiring technical k	nowledge in the f	field of electrical power n	etworks	
Learning outcomes:	1.ability to formulate	e calculations for o	certain types of electric p	ower lines and electric transm	ission lines . Level:6,7
	2.ability to identify re	equired equipmer	nt for balanced construct	ion of distribution power lines	and transmission lines.
	Level:6				_
	3.ability to analyze to	ransients at switc	hing on and interrupting	voltage in power lines. Level:6	j -
	4.ability to identify so	cnemes for cost-e	efficient power transmiss	ION. Level:6,7	Lovalia
	6 ability to inspect of	namenance pro	of solutions and operation	a principles of some parts of p	. Level:0
	7.ability to formulate	e requirements for	r efficiency improvement	in some parts of power netw	ork. Level:6
	, ,		· · · · · · · · ·		
Involvement of	5.1.EE Razumjeti prir	ncip rada električi	nih rotacijskih strojeva, t	ransformatora, dalekovoda i sk	lopnih aparata: 20h in
learning outcomes	150h	•			
of the course in					
study programme:					
Methods of carrying	Ex cathedra teaching	9			
out lectures	Case studies				
	Modelling				
	Discussion	arc			
	Other				
	Drawings, tables and	l diagrams are us	ed to ease understanding	g. The specific examples are al	so shown through
	photographs, design,	, project and test	documentation. All expo	sed materials are analyzed an	d discussed with students
	toachieve their active	e participation. It	is necessary to a have b	lackboard, LCD projector and I	aptop.
Methods of carrying	Group problem solvir	ng			
out auditory	Data mining and kno	wledge discovery	on the Web		
exercises	Interactive problem s	solving			
	Other Calification	a secola a that a last	6		
	Solving numerical ex	amples that clari	ry particular topics of lec	tures, discussion on applied m	ethods, solution quality
Course content	1 Notwork objective	main parts type	s load conditions 3h Lo	arning outcomes:1	
lectures	2 Constructional cha	racteristics of ove	s, load conditions, 51, Le	3h Learning outcomes:1.2	
	3.Ouadruples and lin	e parameters (1):	resistance, inductance,	geometric mean distance met	hod. around return.
	grounding conductor	, bundle, impedai	nce, 3h, Learning outcom	nes:1,2	
	4.Quadruples and lin	e parameters (2):	capacitance, ground ret	urn effect, partial capacitance	, admittance, corona, 3h,
	Learning outcomes:1	,2			
	5.Distributive networ	rk (1): calculation	of voltage differences ar	nd power losses, transformer ir	Ifluence, 3h, Learning
	outcomes:1,2	rk (2), Londod ling	(at coveral paints at or	d continuously and complay	hath sided fod line)
	cutting technique 3h	k (2). Ludueu iire	mocil 2	iu, continuousiy and complex,	both-sided led line),
	7.Distributive networ	rk (3): Network tra	ansfiguration (star-polyg	on, delta-star, neutrals voltage	. connecting and
	disconnecting of sou	rce- points, load o	displacement, unbalance	d three phase load), 3h, Learni	ing outcomes:1,2
	8.Equivalent schema	tics of transmissi	on lines: voltage calculat	ions, quadruple chains, two-sy	stem transmission line,
	interlace, 3h, Learnir	ng outcomes:1,4,5	5		
	9.Line voltage regula	ation and compen	sation, compensator pov	ver calculations, 3h, Learning c	utcomes:1,4,5
	10.Maximum current	s, temperature de	ependence on external ir	iffuences, 3n, Learning outcom	185:1,4,5
	12 Direct and indirec	t touch protection	n 3h Learning outcome	s:1 3	i, Learning buccomes.1,4,5
	13.Protective around	lina. liahtnina stri	ke protection, 3h, Learni	ng outcomes:1.3	
	14.Environmental im	pact, energy qua	lity, 3h, Learning outcom	nes:1,5	
	15.Lecture not sched	luled - ending exa	am, 3h, Learning outcom	es:1,5,6,7	
Course content	1.Transmission line p	parameters - exan	nples in electrical networ	'k design and calculation (1): li	ne inductance, resistance,
auditory	geometric mean dist	ance method, 2h,	Learning outcomes:6,7	de design and selevistics (2).	
	canacitance line adr	nittance 2h Lear	npies in electrical networ	k design and calculation (2): II	ne capacity, partiai
	3.Distributive networ	rks - examples in	electrical network design	and calculation (1): direct cur	rent networks, one-side
	supplied transmissio	n line with multip	le loads, 2h, Learning ou	tcomes:6,7	
	4. Distributive networ	rks - examples in	electrical network desigr	and calculation (2): single and	d two phase load
	extensions in three p	hase networks, 2	h, Learning outcomes:2,	4,6,7	
	5.Distributive networ	rks - examples in	electrical network desigr	and calculation (3): closed loo	op distributive networks,
	2h, Learning outcom	es:2,4	rk reduction and recenct	ruction 2h Learning outcome	e.7
	7 Network transfigur	ations (1) - netwo	tion and reconstruction of	f radial networi with three pha	5:7 se loads 2h Learning
	outcomes:7			i radiar networj with three pha	se loads, zil, Learning
	8.Lecture not schedu	led - exam sched	luled, 2h, Learning outco	mes:2,4,6,7	
	9.Network calculation	n methods - brand	ch voltages and currents	, nod voltages, loop currents, 2	2h, Learning
	outcomes:2,4,6,7				-
	10.Transmission line	and transformer	equivalents, 2h, Learning	g outcomes:2,4,6,7	
	11.Simple transmissi	ion network calcu	lations, power flow calcu	lation, 2h, Learning outcomes:	2,4,6,7
I	Lz.Complex transmis	ssion networks: po	ower now calculations, 2	n, Learning outcomes:2,4,6,7	

	13.Examples in mechanical network design and calculation (1): one material conductors (aluminium, copper), 2h, Learning outcomes:6,7 14.Examples in mechanical network design and calculation (2) - two material conductors (aluminium-steel), 2h, Learning outcomes:6,7 15.Examples of thermal calculations in electrical network design, 2h, Learning outcomes:6,7
Required materials	Whiteboard with markers Overhead projector Video equipment Special equipment Laptop with touch screen and digitizer pen
Exam literature	Basic literature: 1. M. Ožegović, K. Ožegović: Električne energetske mreže, I-V, FESB, Split, 2002. 2. S. Nikolovski: Elektroenergetske mreže I - Zbirka riješenih zadataka, ETF, Osijek, 1998. Dodatna: 1. Prijenos električne energije auditorne vježbe, FER, Zagreb, 2002. 2. M. Padelin: Zaštita od groma, Školska knjiga, Zagreb, 1987. 3. A. Pabla: Electric Power Distribution, McGraw-Hill, N.Y., USA, 2005.
Students obligations	Lecture attendance
Knowledge evaluation during semester	Lecture attendance 10% Preliminary exams (numerical problem solving) 90%
Knowledge evaluation after semester	Written exam 75% Verbal exam 25%
Student activities:	Aktivnost ECTS (Constantly tested knowledge) 5
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
Proposal made by	Tomislav Špoljarić, dipl. ing.

Code WEB/ISVU	24039/189953	ECTS	7.0	Academic year	2018/2019
Name	Electrical Power Plants				
Status	4th semester - Electrica	al power engineering (Re	edovni elektrotehnika) - o	obligatory course	
Teaching mode	Lectures + exercises (a work at home	uditory + laboratory +	seminar + metodology +	· construction)	60+45 (30+0+0+15) 105
Teachers	Lectures:1. Prof.dr.sc. K Auditory exercises: Ivor	Krešimir Meštrović Marković , mag. ing.	a		
Course objectives	construction exercises.	chnical knowledge in th	y. o field of modium and hi	ah valtaga alastris nawa	r plante
Learning outcomes:	1.ability to formulate th	eoretical calculations of	f specific types of power	plants. Level:6,7	i plants
	2.ability to identify app 3.ability to analyze trar 4.ability to identify scho 5.ability to generate ma 6.ability to test function 7.ability to formulate re	ropriate equipment for l isients at switching on a emes of medium and hig aintenance procedure of hality of the plant opera equirements for improve	balanced operating of a p and off in a power plant. I gh-voltage installations. I f power plants. Level:6 ting. Level:6 ement of efficiency in pov	ower plant. Level:6 Level:6 Level:6,7 wer plants . Level:6	
Methods of carrying out lectures	Ex cathedra teaching Modelling Discussion Questions and answers The material is exposed tables to facilitate unde documentation. With st necessary to have a no	d with previous prepared rstanding. Showing con udents are discussed su tebook and overhead pr	dness of students and an crete examples through ıbject material to which t ojector.	ld maximizing the use of photographs, construction they actively participated	drawings, diagrams and onal, project and test d in teaching. It is
Methods of carrying	Group problem solving				
out auditory	Other			, and discussion of the a	welled weath a data as a sur
exercises	quality solutions.	nples that illustrate part	icular themes of lectures	, and discussion of the a	pplied methodology and
How construction	Group problem solving				
exercises are held	Other Solving complex exam	ples that follow the ther	me of lectures.		
Course content	1 Introductory lecture	2h			
	3.Three-phase AC elect 4.Short circuit and mod 5.Short circuit and mod Elements of power syst 6.Elements of power syst 7.Elements of power syst 8.First interexams, 2h 9.Elements power systen 10.Elements of power s 11.Elements of power s 12.Elements of power s 13.Transformer substat 14.The secondary circu Earthing, 2h, Learning of 15.Second interexams,	(a), (a), (a), (b), (b), (c), (c), (c), (c), (c), (c), (c), (c	EPS, 4h, Learning outcomes: 1,2,3,4 EPS, 4h, Learning outco EPS, 2h, Learning outco rators, 2h, Learning outco restors, 2h, Learning outcomes ers, 2h, Learning outcomes ers, 2h, Learning outcom isses, 2h, Learning outco d fuses, 4h, Learning outco d fuses, 4h, Learning outco sformers and measuring and stress of isolation, 4 tors, disconnectors, 4h, L omes: 2,3,4 gears, protection and con	mes:1,2,3,4 mes:1,2,3,4 omes:2,3 tcomes:2,3 s:2,3 ies:2,3 imes:2,3 comes:2,3 i, 4h, Learning outcomes:2, i, 4h, Learning outcomes:2,3,4 itrol, 2h, Learning outcor	:2,3 ,3 nes:2,3,4
auditory	2.Examples of electrica 3.Examples of electrica 4.Examples of determir 5.Examples of determir 6.Examples of determir 7.First interexams, 1h 8.Calculation of short-c 9.Calculation of short- 10.Calculation of short- 11.Calculation of short- 11.Calculation of short- 13.Solving problems in 14.Second interexams, 15.Repeat first or the s	I calculations in power s I calculations in power s I calculations in power s ning the replacement sc ning the replacement sc ircuit current relevant for circuit current relevant for circuit current relevant selected power systems selected power systems 1h econd interexams, 2h	system with balanced and system with balanced and heme of electrical faciliti heme of electrical faciliti heme of electrical faciliti or sizing the plant, 2h, Le for sizing the plant, 2h, Le for sizing the plant, 2h, Le for sizing the plant, 2h, Le s design, 2h, Learning ou s design, 2h, Learning ou	d unbalanced loads, 2h, 1 d unbalanced loads, 2h, 1 es in the network, 2h, Le es in the network, 2h, Le es in the network, 2h, Le es in the network, 2h, Le :arning outcomes:6,7 .earning outcomes:6,7 .earning outcomes:6,7 itcomes:6,7	Learning outcomes:6,7 Learning outcomes:6,7 Parning outcomes:6,7 Parning outcomes:6,7 Parning outcomes:6,7 Parning outcomes:6,7
Course content constructures	1. Display method of ca 2. Display method of ca 3. Display method of ca 4. Display method of ca 5. Display method of ca 6. Display method of ca 7. Display method of ca 8. Making independent o outcomes: 6, 7	Iculating the particular (lculating the particular (design solution of the pl	units of power plants , 1h units of power plants , 1h ant with the necessary c	 Learning outcomes:6,7 	s, 1h, Learning

	9.Making independent design solution of the plant with the necessary calculations and drawings, in, Learning
	10.Making independent design solution of the plant with the necessary calculations and drawings, 1h, Learning outcomes:6.7
	11.Making independent design solution of the plant with the necessary calculations and drawings, 1h, Learning outcomes:6.7
	12.Making independent design solution of the plant with the necessary calculations and drawings, 1h, Learning outcomes:6,7
	13.Making independent design solution of the plant with the necessary calculations and drawings, 1h, Learning outcomes:6,7
	14.Making independent design solution of the plant with the necessary calculations and drawings, 1h, Learning outcomes:6,7
	15.Making independent design solution of the plant with the necessary calculations and drawings, 1h, Learning outcomes:6,7
Required materials	Basic: classroom, blackboard, chalk
	Whiteboard with markers
	Overhead projector
	Special equipment
Exam literature	
	pasic licelacure. 1 H. Požar: Visokonanonska rasklonna nostrojenja. Tehnička knjiga. Zagreh. 1980.
	2. H. Požar: Osnove elektroenergetike I/II. Tehnička knjiga, Zagreb, 1972.
	Additional literature:
	1. M.E. El-Hawayar: Electrical Power Systems, IEEE Press, 1983.
	2. Electrical Power Engineering Handbook: Power Systems, CRC Press, 2007.
	3. Electrical Power Engineering Handbook: Eledctric Power Generation, Transmission and
	Distribution, CRC Press, 2007.
	4. Electrical Power Engineering Handbook: Electric Power Functions Engineering, CRC Press, 2007.
	3. Electrical Power Engineering Handbook. Electric Power Substations Engineering, ChC Fless, 2007.
Students obligations	Attending lectures and exercises. Making a construction task
Knowledge	Written examination:
evaluation during	Erist mid-term - four tasks, 12 points
semester	Second mid-term - four tasks, 12 points
	For passage should be #8805; 50% of both mid-term exams.
	Oral exam:
	First mid-term - 5 questions, 15 points
	Second muclem - 3 questions, 13 points
Knowlodgo	Neither even (a prerequisite for the oral even) of tesk 12 metrics
evaluation after	Winden exam to prefequisite for the oral example 4 task, 12 points
semester	
Semester	Constructional task (a prerequisite for the oral examination).
	Oral exam: 10 questions, 30 points.
	For passage should be #8805; 50%
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	26093;
Proposal made by	Prof.Ph.d. Krešimir Meštrović

Study programme	for academic year	2018/2019
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Code WEB/ISVU	23959/184788	ECTS	8.0	Academic year	2018/2019
Name	Electricity and magnet	ism			
Status	2nd semester - Underg	graduate profess	sional study in electrical e	ngineering (Redovni elektroteh	nika) - obligatory course
Teaching mode	Lectures + exercises (auditory + labo	ratory + seminar + metod	lology + construction)	45+60 (45+15+0+0)
	work at home				135
Teachers	Lectures:1. Davor Šter	с			
	Lectures:2. mr.sc. Ves	elko Tomljenovi	ć viši predavač		
	Lectures: Vladimir Sim	OVIĆ limir luonović			
	Auditory exercises. Ze	ninii Ivanović			
	Auditory exercises: Via	vor Šterc			
	Auditory exercises:mr.	sc. Veselko Tom	nljenović viši predavač		
	Auditory exercises: Va	troslav Zuppa B	akša		
	Laboratory exercises:	Frane Brkić			
	Laboratory exercises:	I omislav Đuran	, dipl. ing.		
	Laboratory exercises.	Želimir Ivanović			
	Laboratory exercises:	Aleksandar Kirič	enko		
	Laboratory exercises:r	nr.sc. Zoran Kov	vačević predavač		
	Laboratory exercises:r	nr.sc. Krunoslav	Martinčić		
	Laboratory exercises:	Vladimir Simovie	Ć		
Course abiantiuse	Laboratory exercises:	Petar Tomijanov			
Course objectives	students will acquire b	asic knowledge	of electromagnetism		
Learning outcomes:	2 ability to solve proble	ems in the field	of electrostatics. Level:6		
	3.ability to find out sol	utions to the pro	oblems in the field of elec	tromagnetism. Level:6.7	
	4.ability to experiment	ally verify (by n	neasurements) some basi	c physical laws important in ele	ectrical engineering.
	Level:6				
	5.ability to analyze the	given problem	, calculate required values	s and estimate the physical asp	ect of calculated values .
	Level:6				
Mothods of corrying	Ex cathodra toaching				
out lectures	Case studies				
	Discussion				
	Questions and answer	S			
	Lecturing is carried ou	t with the help o	of PowerPoint presentation	ns and continuous testing of ac	quired knowledge.
Methods of carrying	Group problem solving	l			
out auditory	Discussion, brainstorm	ling		action of convinced skills	
exercises Mothods of corruing	Examples with active p	participation of s	students and continuous t	esting of acquired skills.	
out laboratory	Group problem solving	in laboratory eq	uipment		
exercises	Test of student reading	ess for the exer	cise, exercises in small gro	pups of students,10individual p	reparation of the report,
	and test of the acquire	d knowledge.		•	
Course content	1.Basic ideas of electri	city, Coulomb, 3	3h, Learning outcomes:1		
lectures	2.Gauss law, Electric p	otential, energy	of the electric field., 3h,	Learning outcomes:1	
	3.Electrical dipole, con	ductor in the ele	ectrostatic field, Dielectric	is in the electrostatic field, disp	lacement vector., 3h,
	4.Electric capacitance.	. 3h. Learning o	utcomes:1		
	5.Prvi kolokvij., 3h, Lea	arning outcomes	5:1		
	6.Motion of charges in	conductor, elec	tric resistance, Ohm, 3h,	Learning outcomes:2	
	7.Work and power of e	lectric energy o	f alternating voltage, sim	ole current circuit, the maximu	m power transfer
	theorem, efficiency., 3	h, Learning out	comes:2		
	9.Drugi kolokvij., 3h. l	earning outcom	es:2		
	10.Magnetic field, Biot	-Savart, 2h, Lea	rning outcomes:3		
	11.Forces in the magn	etic field. Magne	etic characteristics of mat	ter., 3h, Learning outcomes:3	
	12.Magnetic circuit., 3	h, Learning outo	comes:3		
	13.Electromagnetic ind	duction., 3h, Lea	arning outcomes:3	2001	
	15 Energy and forces i	n the magnetic	field 2h Learning outcor	nes:3	
	Zavrni ispit., 1h, Learn	ing outcomes:3			
		-			
Course content	1.Vectors and operation	ons with vectors	, basic units of measurem	ent., 3h, Learning outcomes:5	
auditory	2.Basics of electricity,	Coulomb, 3h, Le	earning outcomes:5	–	
	3.Gausss law, Electric	potential, Energ	ly of the electric field., 3h,	Learning outcomes:5	
	5 Electric capacitance	3h Learning o	utcomes:5		
	6.Motion of charges in	the conductor,	Electric resistance, Ohm,	3h, Learning outcomes:5	
	7.Simple current circui	ts, The maximu	m power transfer theoren	n, Efficiency, 3h, Learning outc	omes:5
	8.Complex electric circ	uits, Kirchoff, 3	h, Learning outcomes:5	-	
	9.Complex electric circ	uits, Kirchoff, 3	h, Learning outcomes:5		
	11 Forces in the magnetic	-Savart, 3h, Lea	rning outcomes:5	ter 3h Learning outcomos	
	12.Magnetic circuit 3	h. Learning out	comes:5	ter., 5n, Learning outcomes:5	
	13.Electromagnetic inc	duction., 3h, Lea	arning outcomes:5		
	14.Self-inductance and	l mutual inducta	ance,, 3h, Learning outcor	nes:5	
	15.Energy and forces i	n the magnetic	field., 3h, Learning outcor	mes:5	

Course content	1.Measuring equipment., 1h, Learning outcomes:4
laboratory	2.Measuring equipment., 1h, Learning outcomes:4
	J.Measuring equipment., 1h, Learning outcomes:4
	4. Electric charge and electric induction., 1n, Learning outcomes:4
	5. Electric charge and electric induction., 10, Learning outcomes:4
	5. Electric charge and electric induction, 1n, Learning outcomes:4
	Connections of capacitors, 1h, Learning outcomes:4
	o. Connections of capacitors, 1h, Learning outcomes:4
	10 Magneticm and forces. The Learning outcomes:4
	11 Magnetism and forces. The Learning outcomes:4
	12 Magnetism and forces. The Learning outcomes:4
	13 Electromagnetic induction 1h Learning outcomes:4
	14. Electromagnetic induction., 1h. Learning outcomes:4
	15.Electromagnetic induction., 1h, Learning outcomes:4
Required materials	Basic: classroom, blackboard, chalk
	Special purpose laboratory
	Overhead projector
Exam literature	Basic literature:
	1. B. Kuzmanović, Osnove elektrotehnike I, Element, Zagreb, 2004.
	2. Branislav Kuzmanović: Osnove elektrotehnike I, Zbirka zadataka i pitanja, Element, Zagreb, 2005.
	Additional literature:
	1. V. Pinter, Osnove elektrotehnike I, Tehnička knjiga, Zagreb, 1994.
	[2. Mandić: Osnove elektrotehnike 1, Bilješke s predavanja (PowerPoint format)
	3. E. Senovic, M. Tkalic, I. Felja, Usnove elektrotennike - zbirka primjera, I dio, Skolska knjiga, Zagreb, 1984.
Students obligations	Attendance of all laboratory exercises and 70% of lectures
Knowledge	Mid-term, numerical tasks#3#50#40\$Mid-term, theoretical questions#3#50#40\$
evaluation during	
semester	
Knowledge	Written examination#1#50#40\$Oral examination#1#50#50\$
evaluation after	
semester	
Remark	This course can not be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22241;
Proposal made by	Dr. sc. Gordana Lukić, prof.v.šk., Mr.sc. Veselko Tomljenović, v. pred.

Code WEB/ISVU	22863/22287	ECTS	5.0	Academic year	2018/2019		
Name	Electronic Circuits						
Status	3rd semester - Electri	cal power enginee	ring (Redovni elektrot	ehnika) - obligatory course			
Teaching mode	Lectures + exercises	(auditory + labora	tory + seminar + met	odology + construction)	30+30 (15+15+0+0) 90		
Teachers	Lectures:1. mr.sc. Krunoslav Martinčić Lectures:2. Željko Stojanović Auditory exercises: Aleksandar Kiričenko Laboratory exercises: Željko Stojanović						
Course objectives	students will acquire	basic knowledge o	f analog, pulse and dig	gital circuits and their propertie	s and applications		
Learning outcomes: Methods of carrying	1.Ability to analyze si 2.Ability to analyze si 3.Ability to construct 4.Ability to find ampli 5.Ability to classify ty 6. Ability to solve pow 7.Ability to distinguish Ex cathedra teaching	mple voltage regu mple bipolar and u simple amplifiers. tude and phase fre pes of electronic c ver consumption of h basic pulse and c	lators. Level:6 inipolar transistor amp Level:6,7 equency response. Lev ircuits. Level:6,7 f each component of s digital circuits. Level:6	olifiers. Level:6 el:6 imple analog circuits. Level:6			
out lectures	Case studies Discussion Questions and answe	rs					
Methods of carrying out auditory exercises	Traditional literature a Discussion, brainstorr Other Problems solving	analysis ning					
Methods of carrying out laboratory exercises	Laboratory exercises Traditional literature a Discussion, brainstorr Mind mapping	on laboratory equi analysis ning	pment				
Course content lectures	1.Introduction, 2h, Le 2.One stage amplifier 3.Common emitter an 4.Common emitter ar Common collector am 5.Common collector an 7.Common dain amp 8.Amplitude and phas 9.Amplitude and phas 10.Amplitude and phas 10.Amplitude and phas Pulse electronics - Co 11.Pulse electronics - Mu 12.Pulse electronics - Mu 12.Amplitude and phas Compile circuits - Sec 15.AD and DA conver	arning outcomes:5 s. Common emitte nplifier, 2h, Learni nplifier, 1h, Learni implifier, 1h, Learni age regulator, 1h, 1 aplifier, 2h, Learning lifier, 2h, Learning ise response, 2h, Le ase response, 2h, Le ase response, 2h, Le mparators, 1h, Lear Comparators, 1h, Lear Comparators, 1h, Lear Multivibrators, 1h, Lear nbinational circuits, ters, 2h, Learning	; r amplifier, 2h, Learnin ng outcomes:2,3,5,6 ng outcomes:2,3,5,6 ng outcomes:2,3,5,6 log outcomes:2,3,5,6 carning outcomes:2,3,5,6 outcomes:2,3,5,6 outcomes:2,3,5,6 carning outcomes:2,3, earning outcomes:2,3, arning outcomes:5,7 Learning outcomes:5,7 , Learning outcomes:5,7 , Learning outcomes:5,7 an algebra, 1h, Learnin s, 2h, Learning outcomes 2h, Learning outcomes outcomes:5,7	ng outcomes:2,3,5,6 4,5,6 4,5,6 4,4,5,6 7 7 ,7 ng outcomes:7 hes:5,7 es:5,7			
Course content auditory	1.Introduction, 1h, Le 2.Introduction, 1h, Le 3.One stage amplifier 4.One stage amplifier 5.Common collector a 6.Transistor series vo 7.Common source am 8.Common drain amp 9.Amplitude and phas 10.Amplitude and phas 11.Amplitude and phas 12.Pulse electronics a 13.Pulse electronics a 14.Logic circuits, 1h, 15.Logic circuits and a	arning outcomes:2 arning outcomes:2 s. Common emitte s. Common emitte implifier, 1h, Learning lifier, 1h, Learning lifier, 1h, Learning se frequency response frequency response frequen	2,4,6 2,4,6 2,4,6 2,4,6 2,4,6 2,4,6 2,4,7,	ng outcomes:1,6 ng outcomes:2,3,5,6 1,6 comes:2,3,4,5,6 tcomes:2,3,4,5,6 tcomes:2,3,4,5,6 tcomes:2,3,4,5,6			
Course content laboratory	1.There is no lessons 2.There is no lessons 3.There is no lessons 4.There is no lessons 5.Common emitter ar 6.There is no lessons 7.Common collector a	nplifier, 2h, Learni Implifier, 2h, Learr	ng outcomes:2,3,5,6 ning outcomes:2,3,5,6				

	8.Common source amplifier, 2h, Learning outcomes:2,3,5,6
	9. There is no lessons
	10. There is no lessons 11 Amplitude and phase response 2b. Learning outcomes: 2.3.4.5.6
	12.There is no lessons
	13.Pulse electronics, 2h, Learning outcomes:5,7
	14.Logic circuits, 2h, Learning outcomes:5,7
Required materials	Basic: classroom, blackboard, chalk
	Special purpose laboratory Whiteboard with markers
	Maquette
	Tools
	Operating supplies
	special equipment The new knowledge from lectures is demonstrated with real life practical examples. The laboratoryexercises include
	measurements and recording of charactreristics that confirm the presented theory of operation. The excercises are
	conducted by teams of two students per team.
Exam literature	Basic literature:
	1. P. Biljanovic, Elektronicki sklopovi, Skolska knjiga, Zagreb, 1993 2. Ž. Butković i Divković-Pukšec. A Barić, Elektropika II., EEB. Zagreb, 2010.
	3. A. Szabo, Impulsna i digitalna elektronika I, II, COUO Ruđer Bošković, Zagreb 1988
	4. Ž. Stojanović, Elektronički sklopovi - laboratorijske vježbe, TVZ, Zagreb, 2017
	Dodatna: 1. B. Beylestad, L. Nachalaky, Electropic devices and circuit theory, Prentice Hall, 1997
	1. R. Boylestad, L. Nasnelsky, Electronic devices and circuit theory, Prentice-Hall, 1987 2. Ž. Butković, G. Zelić, Elektronički sklopovi-Zbirka zadataka, FER, Zagreb, 1995
Students obligations	Students have to earn 50% of total points in laboratory.
-	Assesment:
	- Attendance - 1 point Proparation for Jahoratony - 1 point
	- Measurement report - 1 point
	- Exam instead laboratory exercises - 3 points.
	The total number of points is 18.
Knowledge	Conditions for passing the exam: - At least 9 points of 18 at laboratory exercises
semester	- At least 43 points of 82 on two partial exams, each exam at least 35%.
	- Complete oral exam at first terms for exams.
	Maximum number of points is 40 at first exam and 42 at second exam.
	Overal scoring:
	- Laboratory exercises - at least 14 points of 18
	- Partial exams - at least 56 points of 82, and each exam at least 50%
	Evaluation
	80-90 points - 4
	70-80 points - 3
	Students do not have to take oral exam. They passed the exam completely.
	b)
	- Laboratory exercises - at least 12 points of 18
	- Partial exams - at least 43 points of 82, and each exam at least 35%
	Evaluation
	55-69 points - 2
	Students have to take oral exam at the first term of exam.
Knowledge	Written exam comprises 5 tasks. Value of each task is 10 points.
evaluation after	Evaluation
Schlester	50% - 60% points#8594;2
	61% - 74% points#8594;3
	75% - 89% points#8594;4 Mare then 80% points#8504.5
	Students who pass the written exam have to take oral exam.
Student activities:	Aktivnost ECTS
	(Experimental work) 1
B	(Constantly tested knowledge) 4
Remark	I his course can be used for final thesis theme
Proposal made by	jivo prerequisites. Želiko Stojanović
sposa made by	Penjiko skojanovne

Code WEB/ISVU	22852/22244	ECTS	6.0	Academic year	2018/2019
Name	Electronic Component	ts			
Status	2nd semester - Under	graduate professio	nal study in electrical	engineering (Redovni elektrot	ehnika) - obligatory course
Teaching mode	Lectures + exercises work at home	(auditory + laborat	ory + seminar + meto	odology + construction)	45+30 (15+15+0+0) 105
Teachers	Lectures:1. mr.sc. Kru Lectures:2. Željko Sto Lectures: Aleksandar Auditory exercises: Ro Auditory exercises: Al Auditory exercises:mr Auditory exercises: Že Laboratory exercises: Laboratory exercises: Laboratory exercises: Laboratory exercises: Laboratory exercises:	noslav Martinčić janović Kiričenko obert Herčeki eksandar Kiričenko :.sc. Krunoslav Mart aljko Stojanović Aleksandar Kiričen mr.sc. Darko Lukša mr.sc. Krunoslav M Željko Stojanović	tinčić Iko I dipl.ing artinčić		
Course objectives	students will acquire t	basic knowledge in	the field of semicondi	uctors and electronic compone	ents
Learning outcomes:	1.ability to calculate e 2.ability to calculate c 3.ability to construct s 4.ability to calculate t 5.ability to draw simp 6.ability to calculate t 7.ability to draw symt	electron-hole balance contact potential an simple rectifiers and he common emitte le circuits with oper the values of eleme bols of semiconduct	ce in a semiconductor id electric field in the d voltage stabilizers. L r amplifier, draw stati rational amplifier and ints in a basic thyristo tor components and n	. Level:6 PN barrier. Level:6 .evel:6,7 c and dynamic characteristics. describe its operating principl r circuit . Level:6 ame the electrodes. Level:6	Level:6 e. Level:6
Methods of carrying	Ex cathedra teaching				
out lectures	Discussion Questions and answer Explanations include t application notes from	rs theory of operation n component manu	, use of circuit diagrar facturers.	ns, tables, and real life examp	les including the
Methods of carrying out auditory exercises	Specific examples are lectures. The regularly	used to demonstra y required homewo	ate principles of opera rk is used to stimulate	tion and reinforce the new30k e independent student studies	nowledge presented during at home
Methods of carrying out laboratory exercises	The new knowledge fr measurements and re conducted by teams o	om lectures is dem cording of character of two students per	nonstrated with real lif eristics that confirm the team.	e practical examples. The10la ne presented theory of operation of the second s	boratory exercises include on. The exercises are
Course content	1.Semiconductors. 3h	. Learning outcome	s:1.2.3		
lectures	2.PN Junction, I(V) Cha 3.Zener Diode, Varica 4.LED, Solar Cells, 3h, 5.BJT I(V) Characterist 6.BJT, Active Mode, CE 7.BJT, CC Amplifier, 3h 8.BJT as a Switch, 3h, 9.Unipolar Transistor- 10.Unipolar Transistor 11.Unipolar Transistor 12.Operational Amplif 13.Inverting and Noni 14.OP-Amp: Adder, Cc 15.Thyristor, IGBT, 3h	aractesristics, Recti p Diode, Voltage Ro , Learning outcome tics, 3h, Learning ou E Amplifier, h-mode n, Learning outcome FET, I(V) Characteri r-MOSFET, I(V) Characteri r-MOSFET, I(V) Characteri res Amplifiers, 3h, Le fier Basic Properties nverting Amplifier, omparator, Differen n, Learning outcome	ifier, 3h, Learning outo egulator, 3h, Learning s:1,2,3 utcomes:4 el, 3h, Learning outcor es:4 istics, 3h, Learning out racteristics, 3h, Learning earning outcomes:4,5 s, 3h, Learning outcome htiator, Integrator, 3h, es:6,7	comes:1,2,3 outcomes:1,2,3 nes:4 tcomes:4,5 ing outcomes:4,5 nes:5 se:5 Learning outcomes:5	
Lourse content auditory	 Libide I(V) Charactel Rectifiers, 1h, Learn Voltage Regulators, Limiters, 1h, Learnir S.BJT I(V) Characterist 6.H-model, 1h, Learnir 7.BJT-CE Circuit, 1h, L 8.BJT-CC Circuit, 1h, L 9.JFET I(V) Characteris 10.JFET- CS Amplifier, 11.MOSFET- CS Amplifier, 12.Op-Amp Inverting 13.Op-Amp Adder Circ 14.Op-Amp Differentia 15.Thyristor and IGBT 	ristic, 1n, Learning ing outcomes:1,2,3 1h, Learning outco ng outcomes:1,2,3 itcs, 1h, Learning or ng outcomes:4 earning outcomes: earning outcomes: stics, 1h, Learning o 1h, Learning outco fier, 1h, Learning o and Noninverting <i>A</i> cuit, 1h, Learning o ator Circuit, 1h, Learn	outcomes:1,2,3 imes:1,2,3 utcomes:4 4 4 5 outcomes:4,5 outcomes:4,5 amplifier, 1h, Learning utcomes:5 arning outcomes:5 ing outcomes:6,7	g outcomes:5	
Course content laboratory	1.Diode I(V) Character 2.Zener Diode I(V) Ch 3.Bipolar Junction Trar 4.Common Emitter An 5.J-FET Output Charac 6.Basic Operational Ar 7 8 9	ristics and Rectifier aracteristics and Vo nsistor (BJT) Output nplifier, 2.5h, Learn :teristics (CS), 2.5h, mplifier Circuits, 2.	, 2.5h, Learning outco oltage Regulator, 2.5h t Characteristics (CE), ning outcomes:4,7 , Learning outcomes:5 5h, Learning outcome	omes:1,2,3,7 a, Learning outcomes:1,2,3,7 2.5h, Learning outcomes:4,7 5,7 s:5,6,7	

	10 11 12 13 14 15
Required materials	Basic: classroom, blackboard, chalk Special purpose laboratory Overhead projector
Exam literature	Basic literature: 1. P. Biljanović, Poluvodički elektronički elementi, Školska knjiga, Zagreb, 1996. 2. Ž.Butković, J.Divković-Pukšec, A.Barić: Elektronika I, 1., 2., 3. dio FER, Zagreb.2009 3. J. Šribar, J. Divković-Pukšec, Elektronički elementi, Zbirka zadataka, Element, 1996. 4. M. Dozet, Ž. Stojanović, K.Martinčić: Zbirka zadataka-u pripremi Dodatna: 1. Katalozi proizvođača elektroničkih komponenti.
Students obligations	maximum of 3 absences from exercises
Knowledge evaluation during semester	Redovitost pohaa#6#6#100\$Kolokvij, numeri zadaci#2#70#35\$Kolokvij, teorijska pitanja#2#12#35\$Prakti rad#6#12#50\$
Knowledge evaluation after semester	Written and oral examination.
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
Proposal made by	mr. sc. Krunoslav Martinčić, lecturer

Study programme	for academic	year 2018/2019
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Code WEB/ISVU	23040/75867	ECTS	5.0	Academic year	2018/2019
Name	Embedded Systems [esign and App	lications	• · · · · · · · · · · · · · · · · · · ·	
Status	6th semester - Comm	unication and	computer technology (Redo	vni elektrotehnika) - elective o	ourse
Teaching mode	Lectures + exercises	(auditory + lab	ooratory + seminar + metod	dology + construction)	30+45 (0+15+15+15)
	work at home				75
Teachers	Lectures:1. Marko Mil	etić			
	Laboratory exercises:	Marko Miletić			
	Construction exercises: M	arko Mileti s: Marko Mileti	ć		
Course objectives	students will be intro	duced to embe	dded systems, their designi	ng and programming and the	examples of their
	applications in which	the microcontr	oller based embedded syste	ems perform their operations v	vithin a more complex
	system		•	· ·	
Learning outcomes:	1.ability to analyze fu	nctional requir	ements when designing sys	tems with embedded microco	ntroller. Level:6
	2.ability to draw a cir	cuit diagram of	embedded system with mi	crocontroller. Level:6	anal anacifications. Lough
	A ability to integrate t	their own soluti	ions to sensors and controll	ers with evaluation board Lev	
	5.ability to inspect the	e operating of I	real time embedded system	with microcontroller using de	bugger. Level:6
	6.ability to compare 8	B-bit and 32-bit	microcontrollers with regar	d to their properties and avail	able resources. Level:6,7
	7.ability to test the op	perating of emb	pedded system circuits usin	g the programs for simulating	the circuit and modeling
	the operating system	. Level:6	station and a wiki project pa		
	o.ability to prepare pr	oject documer	itation and a wiki project pa	ige : Level.0,7	
Involvement of	6.5.KIRT Izabrati tran	sformatore. na	dzemne vodove i sklopne a	parate za prijenos i distribuciju	električne eneraiie: 10h
learning outcomes	in 150h				
of the course in					
study programme:					
Methods of carrying	Ex cathedra teaching				
outliectures	Simulations				
	During lectures, exan	nples will be sh	own to demonstrate practic	al work with development boa	rds which students will
	use during lab exercis	ses and/or inde	pendent project work (cons	truction program).	
Methods of carrying	Laboratory exercises	on laboratory e	equipment		
out laboratory	Laboratory exercises,	computer sim	ulations		
exercises	Laboratory exercises	, accompany leo	tures, but can also represe	nt a rounded whole project (wo	ork in extensions that
	continues at home). S	Students work i	ndividually or at most in tw	os at one development board.	Teams are formed
	depending on the pro	ject and an exa	ample for establishing comr	nunication between different k	oards. Preparations for
	the exercise are perfo	ormed at home	, in consultation and guidar	ice in class before exercise.	
Methods of carrying	Fssay writing	analysis			
out seminars	Discussion, brainstori	ning			
	Computer simulations	5			
	Other				
	Seminar deals with a	selected topic	In the field of working with	microcontrollers and embedde	d systems. Does not seek
	by defending seminar	rs throughout t	he semester before the inst	ructor and other students. Stu	dents who have only
	seminars and laboratory exercises without realization of project can not make final theses in this fiels. Seminar is made				
	independently at hom	ne and can not	be teamwork. Each student	s seminar is defended indeper	idently and graded paper
	represents written ex	am.			
How construction	Laboratory exercises	on laboratory e	equipment		
exercises are neid	Computer simulations	S S			
	Other				
	Construction program	is the realizat	ion of the project tasks. The	project is selected independe	ntly with the approval of
	teachers from the list	of proposed pl	rojects. It implies work at no	ome with consultation during the final paper. Only student	s who have chosen the
	construction task can	choose the fin	al theses in this course. It is	possible to work in a team of	more members. After
	successfully defendin	g construction	progran, members of the te	am will be assessed proportio	nal to their contribution
	(points awarded by th	ne team leader	within given quota). Studer	nts who work construction proc	ram are not required to
Course content	attend the lab. exerci	ses, except for	the consultation and the us	se of development boards and	measurement equipment.
lectures	1.Application of embe	aded systems	with microcontrollers in the	industry and telecommunicat	ons. , zh, Learning
	2.Comparison of feat	ures of 8-bit an	d 32-bit microcontrollers (8	051 and ARM). , 2h, Learning o	outcomes:3,4,6
	3.Characteristic featu	res of microco	ntroller programming in C p	rogramming language., 2h, Le	arning outcomes:3,5
	4.Analog and digital i	nterfaces for e	nvironment and the user. , 2	2h, Learning outcomes:2,3,4	
	5.Communication inte	erfaces and pro	tocols that are often used i erfaces for embedded syste	n embedded applications., 2h,	Learning outcomes:2,3,4
	7.Detecting hardware	and software	faults and testing programs		,5,4,0
	8.Software tools for s	imulation of mi	crocontroller and their envi	ronment., 2h, Learning outcom	1es:2,3,4,5,6,7
	9.Software tools for d	ocumenting pr	ogram., 2h, Learning outco	mes:2,7,8	
	10. Maintenance prog	rams and vers	ion control. , 2h, Learning o	utcomes:3,5,7,8	
	12. Operating system	s and software	tools are open source (One	en Source)., 2h. Learning outco	mes:3.7.8
	13. Programming to v	vork in real tim	e (RTOS). , 2h, Learning out	tcomes:3,6,7	/ - / -
	14.Distributed embed	lded systems.,	2h, Learning outcomes:2,4		
	15.no class, 2h, Learr	ning outcomes:	3		
1	1				



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Course content	1.no class, 2h
laboratory	2.no class, 2h
	3. introductory exercise, 2h, Learning outcomes: 7,8
	4. Work with 8 bit microcontroller for control of simple external devices and components, zh , Learning outcomes: 1,4 Swork with 8 bit microcontroller for control of complex external devices and component. Learning outcomes: 1,4
	5. Work with 8 bit incrocontroller with A/D conversion 2b Learning outcomes: 1.3.4
	7. work with 8 bit microcontroller (mix of previous exercises). 2h. Learning outcomes:1.2.3.4
	8.work with 8 bit microcontroller (mix of previous exercises), 2h, Learning outcomes:1,2,3,4
	9.work with character-based and graphical interfaces, 2h, Learning outcomes:1,2,3,4
	10.work with software for documenting program., 2h, Learning outcomes:1,2,3,4,7,8
	11.work with 32 bit microcontroller - introduction, 2h, Learning outcomes:1,2,3,4,5,6
	12. work with 32 bit microcontroller - advanced, 2h, Learning outcomes:1,2,3,4,5,6
	13. Work on student project, 2n, Learning outcomes: $1, 2, 3, 4, 5, 6, 7, 8$
	15.no class, 2h
Course content	1.no class (work from home), 2h
seminars	2.no class (work from home), 2h
	3. no class (work from home), 2h
	4.110 class (work from home), 2h
	5.no class (work from home). 2h
	7.no class (work from home), 2h
	8.no class (work from home), 2h
	9.no class (work from home), 2h
	10.no class (work from home), 2h
	11.no class (work from home), 2h
	12 no class (work from home), 2h
	13. In class (work from home), 2h
	15.no class (work from home), 2h
Course content	1.no class (work from home), 2h
constructures	2.no class (work from home), 2h
	3. no class (work from home), 2h
	4. II o class (work from home) 2h
	6.no class (work from home). 2h
	7.no class (work from home), 2h, Learning outcomes:1,2,3,4,5,6,7,8
	8.no class (work from home), 2h, Learning outcomes:1,2,3,4,5,6,7,8
	9.no class (work from home), 2h, Learning outcomes:1,2,3,4,5,6,7,8
	10.no class (work from home), 2h, Learning outcomes:1,2,3,4,5,6,7,8
	11.no class (work from home), 2h, Learning outcomes:1,2,3,4,5,6,7,8
	12 no class (work from nome), 2n, Learning outcomes:1,2,3,4,3,6,7,8
	13 no class (work from home) 2h Learning outcomes: 1,2,3,4,5,6,7,8
	15.no class (work from home), 2h, Learning outcomes:1,2,3,4,5,6,7,8
Required materials	Basic: classroom, blackboard, chalk
	Special purpose laboratory
	Special pulpose computer laboratory Whitehoard with markers
	Overhead projector
	Maquette
	Special equipment
	Construction program is the realization of the project tasks. The project is selected independently with the approval of
	teachers from the list of proposed projects. It implies work at home with consultation during the semester. It is possible
	to continue the project even after examination as preparation of the final paper. Only students who have chosen the construction task can choose the final theore in this course. It is prescribed to work in a task of market of the
	construction task can choose the final dieses in this courses in its possible to work in a team of more memories. After
	(coints awarded by the team leader within given quota). Students who work construction program are not required to
	attend the lab. exercises, except for the consultation and the use of development boards and measurement equipment.
Exam literature	BUDIN, LEO: Mikroračunala i mikroupravljači. Element, Zagreb, ISBN 953-6098-69-5, 2001
Students obligations	While individually doing design exercise, students are faced with real problems in carrying out the project.
	Demonstration versions of development tool and simulators or the open code tools are used. It is possible to test the
	program on a real board using available licensing software tools or open source code during the laboratory exercises or
Knowlodgo	Consultations.
Knowledge	Quizz (materm, mai term) 50% of the inal mark
semester	
Knowledge	Written exam
evaluation after	Oral exam
semester	
Student activities:	Aktivnost ECTS
	(Viniten exam) I
	(Constantly tested knowledge) 2

	(Practical work) 1		
Remark	This course can be used for final thesis theme		
Prerequisites:	Students cannot enroll in this course unless they have passed Digitalni sklopovi E Students cannot enroll in this course unless they have passed Programiranje		
Proposal made by	mr. sc. Dražen Ćika, pred. and Stipe Predanić		

Code WEB/ISVU	22857/22266	ECTS	4.0	Academic year	2018/2019
Name	Engineering Mechanic	:s			
Status	3rd semester - Electri	cal power engineering (F	edovni elektrotehnika) -	obligatory course3rd se	mester - Control and
	computer engineering	j in automation (Redovni	elektrotehnika) - obligat	tory course	
Teaching mode	Lectures + exercises work at home	(auditory + laboratory +	seminar + metodology	+ construction)	30+30 (30+0+0+0) 60
Teachers	Lectures:1. Karmen M Lectures: Vesna Alić-k Auditory exercises: Ka	iott Bingula dipl.ing.stroj Kostešić dipl.ing.stroj. armen Mott Bingula dipl.i	ina.stroi.		
Course objectives	Students will broaden in electrical engineeri	previously obtained kno ng.	wledge in the module of	Physics and be qualified	to apply the knowledge
Learning outcomes:	1.ability to calculate s	strength and deformation	of mechanical construc	tions. Level:6	
	2.ability to construct e 3.ability to analyze str 4.ability to calculate t 5.ability to draw kiner	electromotive force. Leve ress and strain in the giv he elements of electric c matic diagrams of electri	el:6,7 'en constructions. Level:6 c drives and simple mec	5 hanical circuits. Level:6	
Methods of carrying out lectures	Ex cathedra teaching Case studies Simulations				
Methods of carrying out auditory exercises	Group problem solving Traditional literature a Data mining and know Discussion, brainstorr Interactive problem so Auditory: Solving simp understanding and ac	g analysis vledge discovery on the ning olving pler problems which illus pler problems which illus	Web trate the topics covered nowledge. Students are	by the lectures, in order active and solve the prol	to increase blems on the blackboard.
Course content	1.Rigid body mechani	cs: Active forces and rea	ctions., 2h, Learning out	comes:1	
	3.Reduction of forces, dimensions, 2h, Learn 4.Components of inter 5.1st test, 2h, Learnin 6.Mechanics of deform 7.Stress and strain of 2h, Learning outcome 8.Torsion stress and s outcomes:1,3 9.Combined load: ben 10.2nd test, 2h, Learni 11.Rigid body dynami dynamics., 2h, Learni 12.Force impulse, wor Learning outcomes:1, 13.Kinetic energy of a	to a given point. Statical ing outcomes:1 rnal forces: axial force, t ig outcomes:1 nable bodies: Definition of axially loaded rod. Cento is:1 itrain; design for strength ding and torsion of trans- ning outcomes:1,3 ics: translation and rotati ng outcomes:1,5 rk and energy (potential, 5 a system; mechanical en-	offent of force and more ransverse force, bending of stress and strain; Hool er of gravity, static mom h. Bending stress and str smission shafts., 2h, Lear ion of rigid body. Planar i kinetic), power. Center ergy conservation law., 2	reces, Statical equilibrium reces, Statical equilibrium reces, Statical equilibrium rent of area, 2h, Learning of ent of area, axial and po rain; design for strength. rning outcomes:1,3 motion. Introduction to t of mass, rigid body mom the comparison of the strength recession o	he particle and system hent of inertia., 2h,
	elements,engine., 2h, 15.3rd test, 2h, Learn	Learning outcomes:2,4, ing outcomes:1,2,3,4,5	5	ang machine, clutches, t	ransmission
Course content auditory	1.Calculation of the re 2.Application of the co 3.Equilibrium of forces 4.Internal forces comp 5.Calculation of stress 6.Calculation of mome 7.Examples of design 8.Design of shafts., 21 9.Stress calculation in 10.Examples of transl 11.Moments of inertia 12.Kinematic diagram 13.Transmission (belt 14.Conservation of m 15.Work and power in	sultant of coplanar force oplanar forces equilibriur s in three dimensions., 2 conents calculation: a be s and strain of axially loa ent of inertia of composit calculations for torsion I n, Learning outcomes:1 acombined load cases., 2 ational and rotational mo of solid rod, cylinder, ba b. Examples of translation , gear, friction). Transmise echanical energy, inertia n rotational motion Exam	S., 2h, Learning outcome n equation., 2h, Learning h, Learning outcomes:1 am on two supports., 2h ded rods., 2h, Learning ou oads; statically indeterm 2h, Learning outcomes:4 otion., 2h, Learning outcom all., 2h, Learning outcom nal and rotational motior ssion ratio., 2h, Learning l force, friction, efficienc ples in dynamics of elect	es:1 g outcomes:1 h, Learning outcomes:1,3 putcomes:1,3 tcomes:1 inate cases., 2h, Learnin ,5 omes:5 es:5 h, 2h, Learning outcome outcomes:2,4 ry, 2h, Learning outcome tromotive drives., 2h, Learning	ng outcomes:1 s:2,4 es:4,5 arning outcomes:4,5
Required materials	Basic: classroom, blac Whiteboard with mark Overhead projector Portable overhead pro Maquette	:kboard, chalk ‹ers ɔjector			
Exam literature	Basic literature: B. Kunovac, Mehanika Additional literature: O. Muftić, Mehanika,T K.H. Decker, Elementi	i elementi konstrukcija, ehnička knjiga,Zagreb, 1 i strojeva, Tehnička knjig	bilješke s predavanja, 1 .991. Ja,Zagreb, 1987.	997.	

	I. Alfirević, Nauka o čvrstoći I, Tehnička knjiga d.d., Zagreb, 1995. B. Kraut: Strojarski priručnik, 2012.
Students obligations	regular class attendance, minimal number of points in homework or seminar paper
Knowledge evaluation during semester	tests, numerical and theoretical questions; homework assignments
Knowledge evaluation after semester	Writen exam, Oral exam
Remark	This course can not be used for final thesis theme
Prerequisites:	No prerequisites.
Proposal made by	Čedomir Jurčec, lecturer

Name English Language Status 1st semester - Undergraduate professional study in electrical engineering (Redovni elektrotehnika) - elective Teaching mode Lectures + exercises (auditory + laboratory + seminar + metodology + construction) 15+30 (30+ 15 Teachers Lectures:1. Marija Krstinić	e course +0+0+0)
Status 1st semester - Undergraduate professional study in electrical engineering (Redovni elektrotehnika) - elective Teaching mode Lectures + exercises (auditory + laboratory + seminar + metodology + construction) 15+30 (30+ 15 Teachers Lectures:1. Marija Krstinić 15	e course +0+0+0)
Teaching mode Lectures + exercises (auditory + laboratory + seminar + metodology + construction) 15+30 (30+1) Work at home Lectures:1. Marija Krstinić	+0+0+0)
work at home 15 Teachers Lectures:1. Marija Krstinić	
Teachers Lectures: 1. Marija Krstinić	
Lectures:2. Zoran Vulelija	
Auditory exercises. Varia Nistinic Auditory exercises: Zoran Vulelija	
Course objectives students will acquire elementary competence in communication and knowledge of basic professional termination of the student st	ology
necessary for translating easy texts in professional literature; systematize and broaden the knowledge of the	e English
language structures with emphasis on professional language; develop the skill of writing messages and note	es
Learning outcomes: 1.ability to communicate at the standard basic level. Level:6,7	
2.ability to write short personal letters, notes and messages using auxiliary literature (dictionaries and handl	books).
Level:0,7 3 ability to integrate familiar language structures into a new context. Level:6.7	
4.ability to identify and translate basic professional terminology. Level:6	
5.ability to distinguish between established stereotypes and intercultural characteristics. Level:6	
6.ability to integrate professional terminology into short written reports. Level:6,7	
7.ability to establish similarities and differences between the language structures of Croatian and English. Le	evel:6
Mathada of energing Ex esthadra teaching	
out lectures Case studies	
Questions and answers	
Seminar, students presentation and discussion	
Homework presentation	_
Interactive lectures, i.e. continuous participation of students, using drills and exercises from text books, or b	y means of
all over-nead projector.	
methods of carrying Laboratory exercises on laboratory equipment	
exercises Group problem solving	
Discussion, brainstorming	
Grammar and vocabulary drills and exercises in class and in the computer laboratory(on-line learning).	
Course content 1.Present Tenses, Word Order, 2h, Learning outcomes:1	
lectures 2. Past Tenses, 2h, Learning outcomes:7	
3. Sequence of tenses, 2n, Learning outcomes: 1	
5.Zero and 1st conditional. 2h. Learning outcomes:1.2.3.4	
6.The Engineering Profession, 2h, Learning outcomes:1,3,4,6,7	
7. The Bologna Process in the Department of Electrical Engineering, ECST, 2h, Learning outcomes: 1	
8. The Structure of Matter, 2h, Learning outcomes: 4, 6	
9. The Electric Current, 2n, Learning outcomes: 4, 6, 7	
11. The Effects of an Electric Current. 2h. Learning outcomes:6.7	
12.Conductors, Insulators, Semiconductors, 2h, Learning outcomes:4,5,6	
13.Batteries and Capacitors, 2h, Learning outcomes:3,4,5	
14. Your Career as an Electrical Engineer, 2h, Learning outcomes: 1,2,3	
15.what is Energy?, 2h, Learning outcomes:4,5,6	
Course content 1. Present Tenses, Word Order, 2h. Learning outcomes: 1,2,3	
auditory 2.Past Tenses, 2h, Learning outcomes: 1,2,3	
3.Sequence of tenses, 2h, Learning outcomes:1,2,3	
4.Articles, Commands, 2h, Learning outcomes:1,2,3	
5.Zero and 1st conditional, 2h, Learning outcomes:1,2,3	
7 The Bologna Process in the Department of Electrical Engineering, ECTS, 2h, Learning outcomes: 4,5,6,7	
8. The Structure of Matter, 2h, Learning outcomes:4,5,6,7	
9.The Electric Current, 2h, Learning outcomes:4,5,6,7	
10.Electric Circuits, 2h, Learning outcomes:4,5,6,7	
11. The Effects of an Electric Current, 2h, Learning outcomes:4,5,6,7	
13. Conductors, and Lagaritors, Semiconductors, 21, Learning Outcomes.4,3,6,7	
14. Your Career as an Electrical Engineer, 2h, Learning outcomes:4,5,6,7	
15.What is Energy?, 2h, Learning outcomes:4,5,6	
Required materials Basic: classroom, blackboard, chalk	
General purpose computer laboratory Whiteboard with markers	
Overhead projector	
Exam literature Basic literature:	
1. Marija Krznarić : Electricity and Electronics, TVZ 2012.	
Additional literature	
1. Vladimir Muliević: Englesko-hrvatski elektrotebnički riečnik	
2. Štambuk, Pervan, Pilković, Roje: Rječnik elektronike (hrvatsko-engleski i englesko-hrvatski)	
3. Marija Slunjski: Englesko-hrvatski rječnik elektroenergetskog nazivlja	



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Students obligations	none			
Knowledge evaluation during semester	Redovitost pohaa#10#0#100\$Mini-test#2#5#60\$Seminarski rad#1#30#100\$Domazada5#5#100\$Pisana provjera znanja#2#40#55\$Usmena provjera znanja#1#20#60\$			
Knowledge evaluation after semester	written and oral exam			
Student activities:	AktivnostE(Classes attendance)1(Written exam)1	CTS		
Remark	This course can not be used for final thesis theme	This course can not be used for final thesis theme		
Prerequisites:	No prerequisites.			
ISVU equivalents:	22153;46826;85612;			
Proposal made by	senior lecturer, Marija Krznarić, prof. (20.06.2013.)			

Code WEB/ISVU	23389/155633	ECTS	2.0	Academic year	2018/2019		
Name	English Language 2						
Status	3rd semester - Electrical power engineering (Redovni elektrotehnika) - elective course3rd semester - Control and computer engineering in automation (Redovni elektrotehnika) - elective course3rd semester - Communication and computer technology (Redovni elektrotehnika) - elective course						
Teaching mode	Lectures + exercises (a work at home	uditory + laboratory + s	eminar + metodology +	construction)	15+30 (30+0+0+0) 15		
Teachers	Lectures:1. Marija Krsti Lectures:2. Zoran Vulel Auditory exercises: Mar	nić ija rija Krstinić					
Course objectives	studioly exercises. Manya Risultic students will acquire competence in communication and good command of professional terminology in English required for translating more complex professional literature; broaden the knowledge of the English language structures with the emphasis on professional language; develop the skill of writing and integrating professional terminology in reports and presentations.						
Learning outcomes:	 1.ability to integrate professional terminology into seminar papers and presentations. Level:6,7 2.ability to translate a more complex text in professional literature from English into Croatian using a dictionary. Level:6,7 3.ability to formulate and define basic terminology in electrical engineering . Level:6,7 4.ability to analyze similarities and differences in the professional language structures between Croatian and English . Level:6 5.ability to identify the language structures in professional literature. Level:6 6.ability to communicate and discuss professional topics. Level:6,7 						
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion Questions and answers Seminar, students pres Homework presentation Interactive lectures and achivements in electric affinity. During present are given interactivelly means of an over-head	entation and discussion n d students are continuall al engineering and other ations all available elect , i.e. continuous participa projector.	y encouraged for discuss related scientific fields. ronic media are used. Int ation of students, using c	sion and presentation of Particular attention is pa tercultural themes are a drills and exercises from	the new idea and aid to their interests and Iso included. Lectures text books, or by		
Methods of carrying	Laboratory exercises, c	omputer simulations					
out auditory	Group problem solving	•					
exercises	Discussion, brainstormi	ng ny drille and exercises in	class and in the comput	tor laboratory (opling los	rning) colf loorning		
Course content	1 Activo rovicion 2h				inning), sen-ieanning		
lectures	2.Passive, 2h, Learning 3.Defectives, Past Parti 4.Indirect Speech, 2h, 1 5.CRT, 2h, Learning out 6.Robots, 2h, Learning 7.Circuit Breakers, Fuse 8.Power Engineering, 2 9.Energy Crisis, 2h, Lea 10.Machine Translation 11.Process Control Syst 12.Nanotechnology, 2h 13.Optical Fibers, 2h, L 14.Nikola Tesla, 2h, Lea 15.Telecommunications	contcomes:5,6 ciple, professional langu Learning outcomes:2,3,4 tcomes:1,2,3 outcomes:1,2,3,4 es and Switches, 2h, Lea h, Learning outcomes:3, arning outcomes:1,2,4 , 2h, Learning outcomes tem, 2h, Learning outcomes tem, 2h, Learning outcomes:4,5,6 arning outcomes:1,3,6 s, 2h, Learning outcomes	age structures , 2h, Lear ,5,6 rning outcomes:1,2,3,4 4,5 :1,2,6 nes:1,3,6 s:1,3,6	ning outcomes:4,5,6			
Course content auditory	1.Verbal forms in active 2.Active vs Passive, 2h 3.Professional glossary 4.Direct vs Indirect spe 5.Comparison between 6.Robots and Artificial I 7.Circuit Breakers, Fuse 8.Power Engineering ar 9.Energy Crisis and pos 10.Machine Translation 11.Process Control Sysi 12.Nanotechnology in e 13.Optical Fibers vs Co 14.Nikola Tesla and oth 15.(Tele)communicatio	e, 2h, Learning outcomes a, Learning outcomes:1,2 Exercises, 2h, Learning ech exercises, 2h, Learning ech exercises, 2h, Learning exercises, 2h, Learning es and Switches, 2h, Learning es and Switches, 2h, Learning tem, 2h, Learning outcor everyday life, 2h, Learning axial cables, 2h, Learning er outstanding Croatian ns, 2h, Learning outcom	S:1.2,6 ,6 outcomes:1,2,3 ing outcomes:4 h, Learning outcomes:1, g outcomes:1,4,6 rning outcomes:4,5 2h, Learning outcomes:2, ure, 2h, Learning outcom outcomes:3,4,6 nes:5,6 ng outcomes:1,2,3 g outcomes:3,5 Scientists, 2h, Learning es:1,2,5	2,3,4,5,6 ,3,4 nes:1,2,3 outcomes:1,2,6			
Required materials	Basic: classroom, black General purpose compo Whiteboard with marke Overhead projector	board, chalk uter laboratory rrs					
Exam literature	Basic literature: 1. Marija Krznarić : Elec	tricity and Electronics, T	VZ 2012.				

	Additional literature: Vladimir Muljević: Englesko-hrvatski elektrotehnički rječnik 2. Štambuk, Pervan, Pilković, Roje: Rječnik elektronike (hrvatsko-engleski i englesko-hrvatski) 3. Marija Slunjski: Englesko-hrvatski rječnik elektroenergetskog nazivlja Marija Slunjski: Englesko-hrvatski rječnik elektroenergetskog nazivlja
Students obligations	none
Knowledge evaluation during semester	Redovitost pohaa#10#0#100\$Mini-test#2#5#60\$Seminarski rad#1#30#100\$Domazada5#5#100\$Pisana provjera znanja#2#40#55\$Usmena provjera znanja#1#20#60\$
Knowledge evaluation after semester	Pismeni ispit#1#40#55\$Usmeni ispit#50#60#60\$
Remark	This course can not be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22245;85614;
Proposal made by	senior lecturer, Marija Krznarić, prof

Code WEB/ISVU	23390/155634	ECTS	2.0	Academic year	2018/2019			
Name	English Language 3							
Status	4th semester - Electrical power engineering (Redovni elektrotehnika) - elective course4th semester - Control and computer engineering in automation (Redovni elektrotehnika) - elective course4th semester - Communication and computer technology (Redovni elektrotehnika) - elective course4th semester - Communication and							
Teaching mode	Lectures + exercises (a work at home	uditory + laboratory + s	seminar + metodology +	construction)	15+15 (15+0+0+0) 30			
Teachers	Lectures:1. Zoran Vulel	ija			<u> </u>			
	Lectures:2. Marija Krsti Auditory exercises: Mar Auditory exercises: Zor	nić rija Krstinić ran Vulelija						
Course objectives	Competence in commu	nication and general and	h professional terminolog	1)/				
Learning outcomes:	1 ability to communicat	te and discuss. Level:6.7		<u>, , , , , , , , , , , , , , , , , , , </u>				
	2.ability to integrate pr 3.ability to translate. Le 4.ability to formulate a 5.ability to analyze sim 6.ability to identify the	ofessional terminology. evel:6,7 nd define. Level:6,7 ilarities and differences. language structure. Lev	Level:6,7 Level:6 el:6					
Methods of carrying out lectures	Ex cathedra teaching Case studies							
	Demonstration							
	Discussion							
	Seminar, students pres	entation and discussion						
	Homework presentation	1						
Mathada of complex	Cusur mushlam sahing							
out auditory	Traditional literature ar	nalvsis						
exercises	Data mining and knowl	edge discovery on the W	/eb					
	Essay writing							
	Discussion, brainstormi	ng ving						
	Workshop	Vilig						
Course content	1.Job Search, 1h, Learn 2 Resume (CV) 1h Lea	ing outcomes:1,2,4,5						
lectures	3.Resume (CV), 1h, Lea	arning outcomes:1,2,4						
	4.Application and Cove	r Letter, 1h, Learning ou	tcomes:1,2,4,6					
	5.Application and Cove	r Letter, 1h, Learning ou	tcomes:1,2,4,6					
	7.1. Kolokvij, 1h, Learni	ing outcomes:4	0111e5.1,2,3,0					
	8.Job Interview, 1h, Lea	rning outcomes:1,2,3,4,	5					
	9.Letters and E-Mails, 1	h, Learning outcomes:1	,2,4					
	11.Negotiations, 1h, Le	arning outcomes:1,2,6	1,2,4					
	12.Negotiations, 1h, Le	arning outcomes:1,2,6						
	13.Presentation, 1h, Le	arning outcomes:1,2,3,4	-					
	14.Presentation, 1h, Le 15 2 Kolokvii 1h Learr	arning outcomes:1,2,3,4 iing outcomes:4	÷					
	101211(0101(01)), 111, 2001	ing cateonics.						
Course content	1.How to Start a Job Se	arch, 1h, Learning outco	mes:1,2,4,5					
auditory	2.Internet of Things (EU 3.Internet of Things (Co	J and Privacy Rules), 1h,	Learning outcomes:1,2,	4,5				
	4.Wired and Weird (Cyl	org Plants), 1h, Learnin	g outcomes:1,2,4,6					
	5.Wired and Weird (Cyt	oorg Plants), 1h, Learnin	g outcomes:1,2,4,6					
	6.Microbes for Greener	Electronics, 1h, Learning	g outcomes:1,2,3					
	8. Job Interview, 1h, Lea	irning outcomes:1,2,4,5,	6					
	9.Hardware Emulation,	1h, Learning outcomes:	2,4,6					
	10.Hardware Emulation	n, 1h, Learning outcomes	5:2,4,6					
	12.Electric Trains and V	Vind Energy, 1h, Learning Outo	a outcomes:1.2.3.5					
	13.ITER Project, 1h, Lea	arning outcomes:1,2,4,6	5 , , , , , , ,					
	14.ITER Project, 1h, Lea	arning outcomes:1,2,4,6						
	15.2.KOIOKVIJ, 111, LEAT	ing outcomes.4						
Required materials	Basic: classroom, black	board, chalk						
	General purpose compo	uter laboratory						
	Whiteboard with marke	ers						
Exam literature	Basic literature:							
	1. Marija Krznarić : Elec	tricity and Electronics, T	VZ 2012.					
	Additional literature:	esko-hrvatski elektroteh	nički riečnik					
	2. Štambuk, Pervan. Pil	ković, Roje: Riečnik elek	tronike (hrvatsko-engles	ki i englesko-hrvatski)				
•				/	1			


	3. Marija Slunjski: Englesko-hrvatski rječnik elektroenergetskog nazivlja Marija Slunjski: Englesko-hrvatski rječnik elektroenergetskog nazivlja
Students obligations	Attendance 80%
Knowledge evaluation during semester	Redovitost pohaa#10#0#100\$Mini-test#2#5#60\$Seminarski rad#1#30#100\$Domazada5#5#100\$Pisana provjera znanja#2#40#55\$Usmena provjera znanja#1#20#60\$
Knowledge evaluation after semester	Written and Oral Exam
Remark	This course can not be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22254;85618;
Proposal made by	lecturer, Marija Krstinić, prof.

Code WEB/ISVU	23493/156009	ECTS	8.0	Academic year	2018/2019		
Name	Final Thesis						
Status	6th semester - Electrica	I power engineering (Re	dovni elektrotehnika) - e	elective course6th seme	ster - Control and		
	computer engineering i	n automation (Redovni e	elektrotehnika) - elective	course6th semester - C	ommunication and		
	computer technology (F	Redovní elektrotehnika) -	elective course				
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) $15+0$ (0+0+0+0)						
Topehore	Work at nome [223						
reachers	Lectures: Troimisiav No	ovak may. my. mi. et cor M	nin. techn.				
	Lectures: Marija Krstinio	-9 					
	Lectures:mr.sc. Milivoj I	Puzak v. pred					
Course objectives	students will know how	to apply the acquired kr	nowledge when solving e	ngineering problems			
Learning outcomes:	1.ability to identify the	problem and developme	nt line of the field. Level	:6			
	2.ability to analyze the	existing achievements in	n the particular field. Lev	rel:6			
	3.ability to analyze the	problem and developme	ent line of the field into it	s components. Level:6			
	5 ability to work out a pro	posal, i.e. a solution to the r	rie problem. Level:0,7				
	6.ability to make conclu	ision about the achieven	nents and possibilities fo	r generalization of the t	nesis. Level:6.7		
	7.ability to present the	results of the thesis. Lev	el:6,7				
Involvement of	5.1.EE Razumjeti princi	o rada električnih rotacij	skih strojeva, transforma	atora, dalekovoda i sklop	nih aparata: 30h in		
learning outcomes	240h						
of the course in	6.5.KIRT IZabrati transfo	ormatore, nadzemne voc	love i sklopne aparate za	a prijenos i distribuciju e	ektriche energije: 30h		
Methods of carrying	Case studies						
out lectures	Simulations						
	Modelling						
	Discussion						
	Seminar, students pres	entation and discussion					
-							
Course content	1.An engineering proble	em The use of profession	al language and form in	the presentation of wor	k. Standards, 3h		
lectures	2.Structuring the thesis	: Introduction, theoretica	al discussion, practical re	esuits, conclusion, abstra	ICT, 3N		
	4. planning of the thesis	s, relevant literature rese	Parch., 3h	nes and formulas integra	3001., 511		
	5. Preparation of presentation materials and the public presentation of results. 3h						
	6.Work coordinated with final thesis menthor, 2h						
	7.Work coordinated with final thesis menthor, 2h						
	8.Work coordinated with final thesis menthor, 2h						
	9.Work coordinated with final thesis menthor, 2h						
	11.Work coordinated wi	ith final thesis menthor.	2h				
	12.Work coordinated wi	th final thesis menthor,	2h				
	13.Work coordinated wi	th final thesis menthor,	2h				
	14.Work coordinated wi	ith final thesis menthor,	2h				
	15.Work coordinated wi	th final thesis menthor,	2h				
Required materials	Basic: classroom, black	hoard chalk					
Required materials	General purpose compl	iter laboratory					
	Special purpose compu	ter laboratory					
	Overhead projector						
	Tools						
	Operating supplies						
Evam literature	Proma Zadatku i uputar	na montora					
	Puzak: Završni rad - inž	enierski zadatak -web Fl	0				
	Ćika: Završni rad - prod	uktivna uporaba računa	la; web ELO				
	Krznarić: Završni rad - p	pravopis, rječnik: web EL	0				
Students obligations	A final thesis paper in a	ccordance to the guideli	nes given in the "Final th	nesis instructions"			
Knowledge	Regular attendance 109	%					
evaluation during	Finished thesis 90%						
semester	Desules etter des et 200	N/					
Knowledge	Regular attendance 109	/o					
semester							
Remark	This course can not be	used for final thesis then	ne				
Prereguisites:	No prerequisites						
ISVU equivalents:	83430:						
Proposal made by	Ivan Luio, MSc. Lecture	r					
speca. made by							

Code WEB/ISVU	23963/184795	ECTS	9.0	Academic year	2018/2019		
Name	Fundamentals of Electr	rical Engineering					
Status	1st semester - Undergraduate professional study in electrical engineering (Redovni elektrotehnika) - obligatory course						
Teaching mode	Lectures + exercises (a	auditory + laboratory + s	seminar + metodology +	- construction)	45+60 (45+15+0+0)		
-	work at home				165		
Teachers	Lectures:2. Davor Sterc Lectures:2. mr.sc. Veselko Tomljenović viši predavač Lectures: Vladimir Šimović Auditory exercises: Mato Brizar Auditory exercises: Robert Herčeki Auditory exercises: Želimir Ivanović Auditory exercises:mr.sc. Zoran Kovačević predavač						
	Auditory exercises: Davor Šterc Auditory exercises: Davor Šterc Laboratory exercises: Trpimir Alajbeg Laboratory exercises: Mato Brizar Laboratory exercises: Tomislav Đuran , dipl. ing. Laboratory exercises: Želimir Ivanović Laboratory exercises: Aleksandar Kiričenko Laboratory exercises:mr.sc. Zoran Kovačević predavač Laboratory exercises: Siniša Lacković struč.spec.ing.el. Laboratory exercises:pred. Ivan Lujo , dipl.ing.						
	Laboratory exercises: Laboratory exercises: Laboratory exercises: N	nr.sc. Krunoslav Martinčić /ladimir Šimović Petar Tomlianović	ć				
Course objectives	Eastratory exercises. P						
Learning outcomes:	1 Level:6 2.ability to formulate, v solution depending on 3.ability to set and solv source . Level:6,7 4.ability to ability to int diagrams using phasor 5.ability to use instante characteristic example 6.ability to use basic th principle, i.e. the super and apply the most sui 7.ability to understand	write and solve Kirchoff's the voltage-current relat ve equation of charging a troduce and apply phaso 's, impedance/admittance enous, average, active, r s and applications. Level beorems and methods for rposition principle, Theve table method for a partic and use the basic princi	a law equations, understation for a particular brand and discharging of capac r method for solving alter e. Level:6,7 eactive, apparent and co l:6 r solving electric network enin and Norton theorem cular problem . Level:6 ples of three-phase network	Ind and explain the exist ch. Level:6,7 itors and inductor by rea rnating electric circuits, omplex power and the po ks: node and mesh analy and the theorem of may yorks . Level:6	ence and uniqueness of I voltage or current calculating and drawing ower factor in rses, the addition kimum power; to choose		
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion Questions and answers	5					
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstormi	ing					
Methods of carrying out laboratory exercises	Laboratory exercises of Group problem solving Discussion, brainstormi	n laboratory equipment ing					
Course content lectures	 , 3h, Learning outcor 	mes:1,2 mes:1,2,6 mes:2,6 mes:2,6 mes:1,2,6 mes:1,2,3 mes:1,3 mes:1,3 omes:1,2,3 omes:1,2,3 omes:1,2,3,6 omes:1,2,3,6 omes:1,3					
Course content auditory	 , 3h, Learning outcor 	mes:1,2 mes:1,2 mes:1,2 mes:1,2 mes:1,2 mes:1,2 mes:1,2					

	8. , 3h, Learning outcomes:1,2,3 9. , 3h, Learning outcomes:1,2,4 10. , 3h, Learning outcomes:1,2,4 11. , 3h, Learning outcomes:1,2,4 12. , 3h, Learning outcomes:4,5,6
	13. , 3h, Learning outcomes:1,2,4 14. , 3h, Learning outcomes:1,2,4,5,6 15. , 3h, Learning outcomes:1,4
Course content laboratory	 1. 2. 3. 4. 5. 6. , 3h, Learning outcomes:1 7. , Learning outcomes:1,4,5 8. , 3h, Learning outcomes:1,2,4,5 9. 10. , 3h, Learning outcomes:2,4 11. 12. , 3h, Learning outcomes:2,4 13. , Learning outcomes:7 14. , 3h, Learning outcomes:2,4 15.
Required materials	Basic: classroom, blackboard, chalk Special purpose laboratory Whiteboard with markers Overhead projector Portable overhead projector Video equipment
Exam literature	Preporučena literatura: udžbenik: V. Pinter (1994) Osnove elektrotehnike, ISBN zbirka zadataka: istosmjerni električni krugovi -> E. Šehović, M. Tkalić, I. Felja (1989) Osnove elektrotehnike - zbirka primjera, ISBN izmjenični električni krugovi -> J. Edminster (1963, 2003) Electric circuits ISBN ili V. Tomljenović (2009) Osnove elektrotehnike 2 (zbirka rješenja) ISBN. Alternativna literatura: B. Kuzmanović (2002) Osnove elektrotehnike II ISBN. G. Lukić (2012) Zbirka zadataka iz osnova elektrotehnike ISBN. A. Pavić, I. Felja (1996.) Osnove elektrotehnike 1 (auditorne vježbe) ISBN. I Felja, D. Koračin (1987) Zbirka zadataka i riješenih primjera iz Osnova elektrotehnike, ISBN
Student activities:	Aktivnost ECTS (Classes attendance) 2 (Written exam) 4 (Orcle exam) 3
Remark	This course can be used for final thesis theme
Proroquisitos	
	No prerequisites.
isvu equivalents:	22249;

Code WEB/ISVU	23391/155635	ECTS	2.0	Academic year	2018/2019			
Name	German Language							
Status	1st semester - Undergraduate professional study in electrical engineering (Redovni elektrotehnika) - elective course							
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) 15+30 (30+0+0+0) work at home 15							
Teachers	Lectures:1. Doc. dr. sc. Lidija Tepeš Golubić v. pred. Auditory ovorcicos: Doc. dr. sc. Lidija Topoč Golubić v. pred							
Course objectives	Students will acquire competence in translating professional literature. By systematizing and broadening general							
course objectives	knowledge of the Germ	knowledge of the German language structures and by practicing the language skills, they will achieve the A2 level (in come alguments P1 level) according to the Common Surgraph Surgraph of P56-10-10-10-10-10-10-10-10-10-10-10-10-10-						
Learning outcomes:	ability to communicate at the standard basic level. Level:6.7							
	2.ability to write short p Level:6,7	2.ability to write short personal letters, notes and messages using auxiliary literature (dictionaries and handbooks). Level:6.7						
	3.ability to integrate far	miliar language structure	es into a new context. Le	evel:6,7				
	5. ability to recognize an	of translate basic profes	reotypes and intercultura	al characteristics. Level:6	5			
	6.ability to integrate professional terminology into short written reports. Level:6.7							
	7.ability to analyze simi	ilarities and differences h	between the language st	ructures of Croatian and	German. Level:6			
	F 11 1 1 1							
Methods of carrying	Ex cathedra teaching							
out lectures	Questions and answers							
	Homework presentation	ı						
	The course is intercultu	ral and interdisciplinary.	Students are introduced	d to scientific and technic	cal achievements of the			
Mathada of sounday	people whose language	they study (especially i	n the specialism area).					
methods of carrying	Interactive problem solving	vina						
exercises	The student does variou	us types of exercises in a	auditory recitations, bein	g continuously warned o	of cognitive,			
	metacognitive and socia	al and affective learning	strategies which make i	ndividual learning easier	. The student is trained			
	for using dictionaries (b	ilingual, unilingual) and	other manuals (in a trad	itional form or those me	diated by electronic			
	media), in order to be a	ible to use manuals, prot	ressional literature, docu	mentation and other kno	Wiedge sources in			
	write short summaries a	and use the basic busine	ess correspondence and	to communicate about e	vervdav issues.			
Course content	1.Introductory lecture, 2	2h, Learning outcomes:1			- , ,			
lectures	2.Importance of foreign	i language study, 2h, Lea	arning outcomes:1,3,5					
	3.New media, 2h, Learn	ing outcomes:2,3,4,5		_				
	4.Grammar of the Germ	ian language - Nouns, 21 Basics, 26, Learning ou	n, Learning outcomes:1,.	3				
	6.Electrical Engineering	Basics, 2h, Learning ou	tcomes:3.4.6					
	7.Colloquium 1, 2h, Lea	rning outcomes:1,2,3,4,	5,6,7					
	8.Curriculum Vitae, 2h,	Learning outcomes:2,3,	6,7					
	9.Curriculum Vitae, 2h,	Learning outcomes:2,3,0	6,7					
	11.Electrical Engineerin	a lobs. 2h. Learning out	comes:2.4.7					
	12.Grammar of the Ger	man language - Verbs, 2	h, Learning outcomes:2	,7				
	13.Electrical Engineerin	g Books in German, 2h,	Learning outcomes:2,3,4	4				
	14.Dictionary and vocal	bulary, 2h, Learning out	comes:3,4,/					
	15.Colloquiulli 2, 211, Le	aming outcomes.1,2,3,4	+, J, 0, 7					
Course content	1.Introductory lecture, 2	2h, Learning outcomes:1						
auditory	2.Importance of foreign	language study, 2h, Lea	arning outcomes:1,3,5					
	3.New media, 2h, Learn	ing outcomes:2,3,4,5	h Loorning outcomocil	2				
	5. Electrical Engineering	Basics, 2h, Learning ou	tcomes:3.4.6	2				
	6.Electrical Engineering	Basics, 2h, Learning ou	tcomes:3,4,6					
	7.Colloquium 1, 2h, Lea	rning outcomes:1,2,3,4,	5,6,7					
	8.Curriculum Vitae, 2h,	Learning outcomes:2,3,0	6,7 6 7					
	10 lob interview 2h Le	earning outcomes:2,3,0	0,7					
	11.Job interview, 2h, Le	arning outcomes:1,4						
	12. Electrical Engineerin	ig Jobs, 2h, Learning out	comes:2,4,7					
	13.Grammar of the Ger	man language - Verbs, 2	h, Learning outcomes:2	,7				
	14.Dictionary and vocal 15.Colloquium 2, 2h. Le	arning outcomes:1.2.3.4	1.5.6.7					
	15.0010901011 2, 21, 20		,,,,,,,,					
Required materials	Basic: classroom, black	board, chalk						
	Whiteboard with marke	rs						
	Overhead projector							
	The student does variou	us types of exercises in a	auditory recitations, bein	a continuously warned a	of cognitive.			
	metacognitive and socia	al and affective learning	strategies which make i	ndividual learning easier	. The student is trained			
	for using dictionaries (b	ilingual, unilingual) and	other manuals (in a trad	itional form or those me	diated by electronic			
	media), in order to be a	ible to use manuals, prof	ressional literature, docu	mentation and other kno	wiedge sources in			
	write short summaries a	and use the basic busine	ess correspondence and	to communicate about e	vervdav issues.			
Exam literature	Basic literature:				. ,,			
	1. Izbor tekstova (na str	ranicama TVZa)						

	 Rječnici (J. Kljajić, Njemačko-hrvatski praktični rječnik, Skolska knjiga, Zagreb, 1998.; M. Uroić, A. Hurm, Hrvatsko- njemački rječnik, Školska knjiga, Zagreb, 1994.; V. Muljević: Elektrotehnički rječnik njemačko-hrvatski, Školska knjiga, Zagreb, 1996.; S. i J. Rittgasser, Njemačko-hrvatski računalni rječnik, Školska knjiga, Zagreb, 1996.) Gramatike (I. Medić, Deutsche Grammatik fuer jedermann, Školska knjiga, Zagreb, 2002.; T. Marčetić, Pregled gramatike njemačkog jezika, Školska knjiga, Zagreb, 2000.; Dreyer, Schmitt: Lehr- und Uebungsbuch der deutschen Grammatik, Verlag fuer Deutsch, 2002; Stručni časopisi iz svih područja elektronike i elektrotehnike. 					
Students obligations	Attending classes and participation in the process					
Knowledge evaluation during semester	preliminary exam 1 and 2; pp presentation					
Knowledge evaluation after semester	written and/or oral exam					
Student activities:	Aktivnost ECTS (Written exam) 1 (Report) 1					
Remark	This course can not be used for final thesis theme					
Prerequisites:	No prerequisites.					
ISVU equivalents:	22238;46827;85613;					
Proposal made by	Phd. Lidija Tepeš Golubić, senior lecturer, 18th of May 2016					

Code WEB/ISVU	23392/155636	ECTS	2.0	Academic year	2018/2019
Name	German Language 2				•
Status	3rd semester - Electric	al power engineering (Re	edovni elektrotehnika) - e	elective course3rd seme	ster - Control and
	computer engineering computer technology (in automation (Redovni Redovni elektrotehnika)	elektrotehnika) - elective - elective course	course3rd semester - C	ommunication and
Teaching mode	Lectures + exercises (a work at home	auditory + laboratory + s	seminar + metodology +	construction)	15+30 (30+0+0+0) 15
Teachers	Lectures:1. Doc. dr. sc.	Lidija Tepeš Golubić v. J	pred.		
Course objectives	Ability to successfully t	ranslate professional lite	erature. By systematizing	and broadening genera	I knowledge of the
	German language strue level) according to the	ctures and by practicing Common European Fran	the language skills, they nework of Reference for	will achieve the A2 leve Languages.	l (in some elements B1
Learning outcomes:	1.ability to integrate pr	rofessional terminology i	nto seminar papers and	presentations. Level:6	
	2.ability to translate m	ore complex professiona	I literature from German	into Croatian using a die	ctionary. Level:6,7
	3.ability to formulate a	nd define basic terminol	ogy in electrical enginee	ring . Level:6	Counting and Country
	4. ability to analyze sin	manues and differences	in the professional langu	age structures between	Croatian and German.
	5 ability to identify land	quage structures in profe	essional literature. Level:	6.7	
	6.ability to communica	te and discuss profession	nal topics. Level:6,7	-,-	
Methods of carrying	Ex cathedra teaching				
out lectures	Case studies				
	Questions and answers	5			
	Homework presentatio	n			
	Other	and the station of th	Charles to any interval	l bar a standi f ta an al bardant	
	people whose language	e they study (especially i	in the specialism area).	a to scientific and techni	cal achievements of the
Methods of carrying	Group problem solving				
out auditory	Interactive problem so	lving			
exercises	Other The student does varie	us types of exercises in	auditory regitations hair	a continuously warned	of cognitivo
	metacognitive and soc	ial and affective learning	i strategies which make i	ndividual learnig easier.	The student is trained
	for using dictionaries (bilingual, unilingual) and	other manuals (in a trad	itional form or those me	diated by electronic
	media), in order to be	able to use manuals, pro	fessional literature, docu	mentation and other know	owledge sources in
	German, all related to	the profession they are t	rained for.The student is	trained for using variou	s reading techniques, to
	write short summaries	and use the basic busine	ess correspondence and	to communicate about e	veryday issues.
Course content	1.Wiederholen und Sys	stematisieren, 2h, Learni	ng outcomes:1,3,4	utcomocil 24	
lectures	3 Aktueller Text (Anlas	s)· Physik - Nobelpreis 20	013 1h Learning outcon	1es·1 2	
	4.CERN 1 (Text. Film).	1h. Learning outcomes:1	2	103.1,2	
	5.CERN 2 (Text, Film),	1h, Learning outcomes:1	,2,5		
	6.Widerstand; Kompara	ation, 1h, Learning outco	mes:1,3,4		
	7.Elektronenrn, Passive	ersatz 1, 1h, Learning ou	tcomes:1,3,4		
	8. I ransistoren; Passive	ersatz 2, 1n, Learning out	COMES:1,2,3,4		
	10.Anweisungen: Rech	erchieren; Referate schr	eiben; Referieren, 1h, Le	arning outcomes:6	
	11.Mikroprozessor; Del	klination der substantive	1, 1h, Learning outcome	es:1,3,4	
	12.Eingabe- und Ausga	begeraete; Deklination	der Substantive 2, 1h, Le	arning outcomes:1,3,4	
	13.Eine nette Geste 1,	In, Learning outcomes:	L,Z,3 L 2 3		
	15.Briefe schreiben (M	uster: Geschaeftsbrief, p	rivatbrief), 1h, Learning	outcomes:3,5	
Course content	1.Wiederholen und Sys	tematisieren, verschiede	ene ungen (schriftliche/m	uendliche), 2h, Learning	outcomes:1,2,3
auditory	3 Satzstellung (schriftli	che und muendliche Llet	oungen): Arbeit mit dem	Woerterbuch 2h Learni	na outcomes:1 2 5
	4.Passiv (schriftliche U	ebungen); Arbeit mit der	Vokabelliste, 2h, Learni	ng outcomes:1,2	··· g · · · · · · · · · - , - , -
	5.1. Kolloquium; schrift	liche Uebersetzung; Arb	eit mir der Vokabelliste;	Recherchieren im Intern	et (Aufgaben: Kroaten
	am CERN; Teilchenbes	chleuniger an anderen F	orschungsinstituten), 2h,	Learning outcomes:1,2,	5
	7.1 Kolloquium (Wiede	rholung): Fragestellung:	Arheit mit der VI · Passiv	Arbeit mit der VL, 211, Le Jersatz (schriftliche Hehi	ingen) 2h Learning
	outcomes:1,2,3,4	, ragestenang,			
	8. Fragestellung; Arbei	t mit der VL; Passiversat	z (schriftliche Uebungen)	; Kurzgespraeche: Tage	sablauf, 2h, Learning
	outcomes:1,2,3	- t - 11	(I. 2)	- 1 0 4	
	10 Imperativ (schriftlic	he ungen): gezieltes Lleh	ersetzen (Infinitivarunne	n Passiv Passiversatz)	2h Learning
	outcomes:1,2,3	ine dingeni,, geziences een		,	2.1., 2001111.9
	11.2. Kolloquium (Wied	lerholung); Deklination d	ler Substantive 1 (schrift	liche Uebungen); Arbeit	mit der VL, 2h, Learning
	outcomes:1,2,3,4	atantina D. Kumananya I	m Duana Familianfaian (2.2
	12.Dekilhation der Sub	stantive 2; Kurzgespre: I	in Buero, Familienteier, A	outcomes:1 2 3 4	,2,3
	14.3. Kolloguium; Arbe	it mit dem WB, 2h, Learr	ning outcomes:1,2,3,5	Gaccomes.1,2,3,7	
	15.Arbeit mit dem WB;	Kurzgespraeche: Im Bes	schsreise, 2h, Learning o	utcomes:1,2	
Required materials	Basic: classroom, black	board, chalk			
	Whiteboard with marke	ers			
	Overhead projector				
l	video equipment				



	Operating supplies					
	dictionary					
Exam literature	Izbor tekstova na njemačkom jeziku (repozitorij)					
	Additional literature: 1. Tekstovi dostupni na stranicama Interneta. 2. Rječnici (J. Kljajić, Njemačko-hrvatski praktični rječnik, Školska knjiga, Zagreb, 1998.; M. Uroić, A. Hurm, Hrvatsko- njemački rječnik, Školska knjiga, Zagreb, 1994.; V. Muljević: Elektrotehnički rječnik njemačko-hrvatski, Školska knjiga, Zagreb, 1996.; S. i J. Rittgasser, Njemačko-hrvatski računalni rječnik, Školska knjiga, Zagreb, 1996.). 3. Gramatike (I. Medić, Deutsche Grammatik fuer jedermann, Školska knjiga, Zagreb, 2002.; T. Marčetić, Pregled gramatike njemačkog jezika, Školska knjiga, Zagreb, 2000.; 4. V. Grujoski, Deutsche Fachtexte aus der Elektrotechnik, Sveučilište u Zagrebu, 1993.					
Students obligations	Attendance 80%, homework 100%.					
Knowledge evaluation during semester	Attendance 80% Homwork: 3 - 5 checkups, value 10% Written exam: 5 checkups, value 90%					
Knowledge evaluation after semester	Written exam: 2 checkups, value 40% Oral exam: 2 checkups, value 60%					
Student activities:	Aktivnost ECTS (Constantly tested knowledge) 1 (Activity in class) 1					
Remark	This course can not be used for final thesis theme					
Prerequisites:	No prerequisites.					
ISVU equivalents:	22248;85617;					
Proposal made by	PhD. Lidija Tepeš Golubić, 04. of June 2018					

Code WEB/ISVU	23393/155637	ECTS	2.0	Academic year	2018/2019			
Name	German Language 3							
Status	4th semester - Electrical power engineering (Redovni elektrotehnika) - elective course4th semester - Control and computer engineering in automation (Redovni elektrotehnika) - elective course4th semester - Communication and computer technology (Redovni elektrotehnika) - elective course							
Teaching mode	Lectures + exercises (a work at home	res + exercises (auditory + laboratory + seminar + metodology + construction) 15+15 (15+0+0+ at home 30						
Teachers	Lectures:1. Doc. dr. sc.	Lidija Tepeš Golubić v. j	pred.					
Course objectives								
Remark	This course can not be used for final thesis theme							
Prerequisites:	No prerequisites.	lo prerequisites.						
ISVU equivalents:	22255;85619;							

Code WEB/ISVU	23134/128258	ECTS	5.0	Academic year	2018/2019			
Name	Information, theory ar	nd coding						
Status	4th semester - Communication and computer technology (Redovni elektrotehnika) - obligatory course							
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) 30+45 (15+30+0+0)							
_	work at home	work at home 75						
Teachers	Lectures:1. dr. sc. Mla	iden Sokele predavač						
	Auditory exercises:dr.	sc. Mladen Sokele pred	avač					
	Laboratory exercises:	dr.sc. Krešimir Osman ,	dipl.ing.					
	Laboratory exercises:	dr. sc. Miaden Sokele pr		·				
Course objectives	students will understand the architecture of telecommunication systems, services and basic processes within the systems							
Learning outcomes	1 ability to aplyze the structure and functionality of the communication system. Loval:6							
Learning outcomes.	2.ability to calculate t	he amount of informatic	on emitted by the source (of information . Level:6				
	3.ability to distinguish	i between different mes	sage encryption algorithm	ns. Level:6				
	4.ability to calculate t	4.ability to calculate the information capacity of a communication channel. Level:6						
	5.ability to compare d	lifferent encryption algo	rithms. Level:6,7					
	6.ability to analyze an	id apply complex proced	dures of digital modulation	ns. Level:6				
	7.ability to configure of a bility to configure of	digital data transmitter.	Level:6,7	unication system. Loval	67			
	o.ability to evaluate ti	le quality to cost-effecti		unication system. Level.	0,7			
Involvement of	6.5.KIRT Izabrati trans	sformatore, nadzemne v	odove i sklopne aparate z	za prijenos i distribuciju e	lektrične energije: 10h			
learning outcomes	in 150h				inerteriere errergije. 1011			
of the course in								
study programme:								
Methods of carrying	Ex cathedra teaching							
out lectures	Simulations							
	Modelling							
	Homework presentati	on						
	Oral lecturing support	ed with a modern prese	ntation technology. Theo	retical explanation and e	quations derivation is			
	followed by multimed	ia interactive demonstra	ation. Discussion with stud	dents is frequent too.				
Methods of carrying	Laboratory exercises	on laboratory equipmen	t					
out auditory	Laboratory exercises,	computer simulations						
exercises	Computer simulations	; 						
	Numerical problem so	lving on the blackboard	and in notebooks is supp	orted with a spreadsheet	t MS Excel and MatLab.			
Methods of carrying	Laboratory exercises,	computer simulations						
exercises	Individual work in a P	, Claboratory						
Course content	1.About subject, plan	and conditions. 1h						
lectures	Communication syste	m, definitions and exam	ples, 1h, Learning outcon	nes:1				
	2.Communication and	Information definition,	2h, Learning outcomes:2					
	The entropy of a dis	crete source of informat	tion, 2h, Learning outcom	es:3				
	4.The amount of infor	mation, 2h, Learning ou	tcomes:2	-				
	5.Evenly and unevenly	y coding, Snannon-Fano	, 2n, Learning outcomes:	3				
	7 The binary symmetr	ric channel BSC 2h Lea	rning outcomes.2					
	8.Checking the correc	thess of message transi	mission, 2h, Learning out	comes:3				
	9.Protecting the inform	mation from errors in tra	insmission of messages, 2	2h, Learning outcomes:3				
	10.Analysis of the effe	ectiveness of protection,	2h, Learning outcomes:3	à				
	11.BSC Simulation wit	h Hamming code, enha	ncement exercises, 1h, Le	earning outcomes:4				
	Channel capacity, phy	/sical level, Co., 1h, Lear	rning outcomes:4					
	13 Information coding	and signal modulation	2h Learning outcomes:4					
	14.Digital modulation	s. 2h. Learning outcome	s:6.7					
	15.Transmission into a	a modulation band, 2h, I	Learning outcomes:8					
Course content	1.Probability, 1h, Lear	ning outcomes:2	_					
auditory	2.Applied probability,	Th, Learning outcomes:	2					
	A Applied statistics 1	ab, In, Learning outcom	1es:1					
	5.Statistical analysis o	of signals and messages	. Learning outcomes:1.2					
	6.Random Number Ge	enerators, 2h, Learning o	outcomes:3					
	7.Capacity of BSC, 1h	, Learning outcomes:2						
	8.CRC, 1h, Learning o	utcomes:3						
	9.Hamming and Huffn	nan coding, 1h, Learning	g outcomes:3					
	10. The first colloquiur	n, 2h, Learning outcome	es:1,2,3					
	12 Contemporary cry	ntography with public ar	n, Learning outcomes:5	a outcomes:/				
	13.DMT. 1h. Learning	outcomes:6	iu seciel key, zii, Leamin	g outcomes.4				
	14.Digital modulation	s, 1h, Learning outcome	s:7					
	15.Transfer into a mo	dulation band, 1h, Learr	ning outcomes:8					
	The second colloquiur	n, 1h, Learning outcome	es:4,5,6,7,8					
.								
Course content	1. Introducing mbed p	lattorm, 2h, Learning ou	tcomes:1					
	3.Statistical analysis a	and probability in spread	Isheets, 2h, Learning out	comes:2				
			,,,,,,,					

	 4.Statistical analysis of real signals and messages , 2h, Learning outcomes:2 5.BSC channel simulation, 2h, Learning outcomes:3,4 6.BSC channel simulation, 2h, Learning outcomes:3,4 7.BSC with Hamming code simulation, 2h, Learning outcomes:5 8.BB channel analysis, 2h, Learning outcomes:5 9.Line codes, 2h, Learning outcomes:4 10.Digital modulations, 2h, Learning outcomes:6 11.Digital modulations, 2h, Learning outcomes:6 12.Presentation and analysis of digitally modulated signals, 2h, Learning outcomes:7 13.Demodulation of digitally modulated signals, 2h, Learning outcomes:8 14.Analysis of a digital channel, 2h, Learning outcomes:5,8 15.Exercises presentation, Learning outcomes:1,8
Required materials	Basic: classroom, blackboard, chalk Special purpose laboratory Special purpose computer laboratory Overhead projector Special equipment mbed LPC 1768
Exam literature	Obvezna 1.P. Valožić: Informacija i kodiranje, skripta TVZ, 2012. 2.P. Valožić: Informacija i kodiranje, zbirka riješenih zadataka, TVZ, 2012. 3.P. Valožić: Informacija i kodiranje, laboratorijske vježbe,TVZ, 2012. Dopunska 1.P. Valožić: Informacija i kodiranje, laboratorijske vježbe s uputama, TVZ, 2012. 2.Information Theory and Coding Technique http://g.csie.org/itct/ 3.Željko Pauše: Vjerojatnost, informacija, stohastički procesi, Školska knjiga, Zagreb, 2003. 4.Vjekoslav Sinković, Informacija, simbolika, semantika, Školska knjiga, Zagreb, 1997.
Students obligations	Attendance All the exercises completed Colloquium of the exercises
Knowledge evaluation during semester	Regular attendance 10 percent Colloquium, numerical tasks 40 percent Colloquium, theoretical issues 30 percent Oral examination 20 percent 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 examination 60 percent Oral examination 40 percent $90\ 100 = 5\ (A)$ $80\ 89 = 4\ (B)$ $65\ 79 = 3\ (C)$ $60\ 64 = 2\ (D)$ $50\ 59 = 2\ (E)$ $49\ and less, insufficient$
Student activities:	AktivnostECTS(Classes attendance)1(Written exam)1(Oral exam)1(Practical work)2
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22307;85689;
Proposal made by	PhD Predrag Valožić, prof.

Code WEB/ISVU	23491/156006	ECTS	5.0	Academic year	2018/2019		
Name	Introduction to netwo	rking technologies	5				
Status	3rd semester - Comm	nunication and con	nputer technology (Red	ovni elektrotehnika) - obligator	y course		
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) 30+30 (0+30+0+0) work at home 90						
Teachers	Lectures:1. mr.sc. Dubravko Žigman viši predavač Laboratory exercises: Nikolina Kasunić struč.spec.ing.techn.inf. Laboratory exercises: Tomislav Novak mag. ing. inf. et comm. techn.						
Course objectives	Laboratory exercises	lodgo in the area of	ic.spec.ing.techn.inf.	lioc			
Learning outcomes:	Acquiring basic know	edge in the area o	tion Level:6	lies.			
Learning outcomes:	 1.ability to analyze network communication. Level:6 2.ability to compare the ISO/OSI and TCP/IP network models. Level:6,7 3.ability to relate the ISO/OSI network models to real devices and applications in a network. Level:6,7 4.ability to plan the network address space. Level:6,7 5.ability to calculate the IP address space. Level:6 6.ability to analyze the network traffic. Level:6 7.ability to prepare default network equipment to connect a simple local area network. Level:6,7 8.ability to design a simple local area network. Level:6 9.ability to test the computer network operating. Level:6 10.ability to detect the problem of the interrupted communication in a simple local area network. Level:6 						
out lectures	Case studies Simulations Discussion Questions and answe In person lectures wit are presented in clas	rs h practical experie sroom and are ava	ences and examples pre	esented using modern technolo	gies. Multimedia materials		
Methods of carrying out laboratory exercises	Laboratory exercises Laboratory exercises Group problem solvir Data mining and kno Discussion, brainstor Mind mapping Computer simulation: Interactive problem s Introduction to netwo	on laboratory equ , computer simulat g wledge discovery o ming s olving rk components an	ipment cions on the Web d design. Launching a s	small network, signal measuren	nents and traffic analysis.		
Course content	1.Course introductior	i, 2h			,		
lectures	2.Exlopring the Netw 3.Configuring a Netw 4.Network protocols a 5.Network Acces, 2h, 6.Ethernet, 2h, Learn 7.Network layer, 2h, 8.Transport Layer, 2h 9.IP addressing, 2h, L 10.IP addressing, 2h, 11.Subnetting IP Neth 12.Subnetting IP Neth 13.Application Layer, 14.It is a Network, 2h 15.Course summary,	orks, 2h, Learning ork Operating Syst and communicatio Learning outcomes ing outcomes:1,2, Learning outcomes the communication the communication the communication works, 2h, Learning outcome 2h, Learning outcome 2h, Lea	outcomes:1 tem, 2h, Learning outco n, 2h, Learning outcome es:7,8 3 s:6,7 tes:2,3 :4,5 s:4,5 g outcomes:4,5 g outcomes:4,5 g outcomes:4,5 es:7,8,9,10 omes:1,2,3,4,5,6,7,8,9,1	imes:3,7 es:1,2,3,7 10			
Course content laboratory	1. Introduction to couit 2. Network Communic 3. Basic Networking D 4. Protocols and appli 5. Methods and Techr 6. Ethernet Technolog 7. Observing Network 8. Observing Transpor 9. IPv4 and IPv6 subn 10. IPv4 and IPv6 subn 11. Subnetting of IPv4 12. Advanced subnett 13. Network Services 14. Connecting and co	rse, 2h, Learning o cation Tools resear evice configuratio cations research, 2 cologies of Network ies and Protocols a Layer services, 2h t Layer services, 2h t Layer services, 2 etting, 2h, Learnin netting, 2h, Learning out ing of IPv4, 2h, Lear research, 2h, Lear onfiguring Network pretical exam, 2h,	utcomes:1 ch, 2h, Learning outcom n, 2h, Learning outcomes:2 k, Learning outcomes:2 c Access, 2h, Learning o analasys, 2h, Learning o tearning outcomes:4, g outcomes:4,5 ng outcomes:4,5 comes:4,5 arning outcomes:1,6 ting Devices, 2h, Learning Learning outcomes:1,2,	nes:1 es:7,8 2,3,6 outcomes:4,5 outcomes:1,2,3,6 5 4,5 ng outcomes:4,5,7,8,9,10 .3,4,5,6,7,8,9,10			
Required materials	Basic: classroom, bla Special purpose labor General purpose com Special purpose com Whiteboard with mar Overhead projector Tools Operating supplies	ckboard, chalk ratory puter laboratory outer laboratory kers					

	Special equipment	
	Routers, Switches, Crimping Tool, RJ-45 Connectors, UTP cable	
Exam literature	 I.Interconnecting Cisco Network Devices, Part 1 (ICND1) Foundation Learning Jun 17, 2013, ISBN-10: 1-58714-376-3, ISBN-13: 978-1-58714-376-2, Cisco Pr 2. Cisco CCNA Routing and Switching 200-120 Foundation Learning Guide Lib Oct 7, 2013, ISBN-10: 1-58714-378-X, ISBN-13: 978-1-58714-378-6, Cisco Pre 3. CCENT/CCNA ICND1 100-101 Official Cert Guide Premium Edition eBook an 2013, ISBN-10: 0-13-336788-6, ISBN-13: 978-0-13-336788-1, Cisco Press. 4. CCNA Routing and Switching 200-120 Official Cert Guide Library, May 23, 2 1-58714-387-9, ISBN-13: 978-1-58714-387-8, Cisco Press. 5. CCENT/CCNA ICND1 100-101 Official Cert Guide, by Wendell Odom, Apr 25 978-1-58714-385-4, Cisco Press 4. Internet Core Protocols by O'Reilly. 	g Guide, 4th Edition, by Anthony Sequeira, ess. rary, by Anthony Sequeira and John Tiso, iss. d Practice Test, by Wendell Odom, Mar 26, 2013, by Wendell Odom, ISBN-10: , 2013, ISBN-10: 1-58714-385-2, ISBN-13:
Students obligations	s Minimum of 9 completed laboratory exercises.	
Knowledge evaluation during semester	Attendance, Quick-test, Test, Homework, Practical Exam	
Knowledge evaluation after semester	Written Exam, Oral Exam	
Student activities:	AktivnostECTS(Written exam)1(Activity in class)1(Constantly tested knowledge)3	
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
ISVU equivalents:	26094;63008;	
Proposal made by	Dubravko Zigman	

Code WEB/ISVU	23272/143308	ECTS	1.0	Academic year	2018/2019	
Name	Kinesiology Education I					
Status	1st semester - Undergr	aduate professional stud	y in electrical engineerir	ng (Redovni elektrotehni	ka) - obligatory course	
Teaching mode	Lectures + exercises (a	uditory + laboratory + s	eminar + metodology +	construction)	0+30 (30+0+0+0)	
_	work at home				0	
Teachers	Auditory exercises:1. B	oris Metikoš ,prof.				
Course objectives	students will raise awaı	reness of the importance	of physical education			
Learning outcomes:	1.Demonstrate the prop	per execution of the tech	nical elements of a spec	ific kinesiologic activity.	Level:6	
	2.Demonstrate the prop	per execution of the tech	nical elements of a spec	ific kinesiologic activity.	Level:6	
	3.Explain the basic terr	ns of a specific kinesiolog	jic activity. Level:6	. Level C		
	4.Explain the important	ce of warming-up in a spe	cular kinesiologic activit	y. Level:6		
	6 Express the basic rule	es of a specific kinesiolog	ic activity Level.6	y. Level.0		
	7.Identify auxiliary and	elementary games in the	e learning process of a s	pecific kinesiologic activ	vitv. Level:6	
	8.Describe the technica	al and tactical elements o	f a specific kinesiologic	activity. Level:6		
	9.Give an example of h	ow to organize a compet	ition. Level:6			
	10.Identify and underst	and the necessity of regu	ular exercise for health.	Level:6		
	11.ability to describe of	rganization of students' s	port competitions. Level	1:0		
Methods of carrying	Workshop					
out auditory	workshop					
exercises						
Course content	1.Repeating technical e	elements of a specific king	esiologic activity, 2h, Le	arning outcomes:1		
auditory	2.Repeating technical e	elements of a specific kine	esiologic activity, 2h, Le	arning outcomes:1		
	3.Adopting new elemer	nts of a specific kinesiolog	gic activity, 2h, Learning	outcomes:2		
	4.Adopting new elemer	nts of a specific kinesiolog	gic activity, 2h, Learning	outcomes:2		
	5.Improving the element	nts of a specific kinesiolog	gic activity, 2h, Learning	outcomes:3		
	6.Improving the element	nts of a specific kinesiolog	gic activity, 2n, Learning	outcomes:3	- 4	
	8 Adopting a set of stre	the exercises for a spe	ecific kinesiologic activity	, 211, Learning outcomes	4 ac·5	
	9.Repeating the basic r	ules of a specific kinesiol	ogic activity. 2h. Learnir	ng outcomes:6	.5.5	
	10.Using auxiliary and elementary games in the learning process of a specific kinesiologic activity. 2h. Learning					
	outcomes:7			-		
	11.Adoption of basic te	chnical and tactical elem	ents of a specific kinesic	ologic activity, 2h, Learn	ing outcomes:8	
	12.Adoption of basic te	chnical and tactical elem	ents of a specific kinesic	ologic activity, 2h, Learn	ing outcomes:8	
	13.Competition and Ga	mes, 2h, Learning outcor	nes:9			
	14. Competition and Games, 2h, Learning outcomes:9					
		action of injury prevention	exercises, zn, Leaning	ouccomestio		
Required materials	Methodological: Realize	ed according to the electi	ve programmes for whic	h the students decide a	t the beginning of each	
	semester: football, bas	ketball, swimming, walkir	ng, general physical con	dition. Programmes are	adapted to the level of	
	technical and tactical k	nowledge of a certain gro	oup in the individual pro-	gramme. In addition to t	he contents included in	
	elective programmes, t	he students are obliged t	o climb Sljeme once in e	every semester and to te	est the knowledge of	
	swimming in order to g	et an insight into the nun	nber of non swimmers. A	A course for non swimme	ers is organized. The	
	athletics)		for competitions (roots)	all, basketball, water pol	lo, alchery and	
Exam literature	Basic literature					
	1. I. Belan, Aerobik, Ivo	Balen, Koprivnica, 1988.				
	2. I. Horvat, Pravila nog	jometne igre, Novinsko-iz	davačko propagandno p	oduzeće, Zagreb, 1994.		
	3. I. Tocigl, Taktika igre	u obrani, Novinsko-izdav	/ačko propagandno podι	uzeće, Zagreb, 1989.		
	Additional literature:	l i se daželi sa setelos anim		(in a sint a XI i fall with a b Z a su		
	1. D. Milanovic, Dopuns	ski sadrzaji sportske pripr	eme, Sportska tribina i k	Kinezioloski fakultet Zag	reb, Zagreb, 2002.	
Students obligations	Students are required t	t as through the swimmi	exercises during 30 nour	's per semester, during t	our semesters. First	
	second semester) Seco	and semester students m	ust he present at both le	ectures and exercises S	tudents who are not	
	required to attend beca	ause of active participation	on in sports are however	required to attend all le	ctures, assist in the	
	organization and imple	mentation of lectures, an	d attend a specially dev	ised program if permitte	ed to do so by the sports	
	doctor.					
Knowledge	Regular attendance					
evaluation during						
semester	T he second second second	Thomas I I I I I I	and and a state of the state of the	tanka an 11 11 71	laudan an l	
Knowledge	The exam is not graded	I but the knowledge is ch	ecked at the beginning,	in the preamble, the fol	lowing semester.	
semester						
Student activities	Aktivnost		FCTS			
- wasne detryfticsi	(Classes attendance)		1			
Remark	This course can not be	used for final thesis them	 1e			
Prereguisites:	No prereauisites.					
ISVU equivalents:	22259;83784:					
Proposal made hv	Boris Metikoš, profesor	of kineziology				

Code WEB/ISVU	23273/143309	ECTS	1.0	Academic year	2018/2019
Name	Kinesiology Education I	l			
Status	2nd semester - Undergi	raduate professional stu	dy in electrical enginee	ring (Redovni elektrotehr	nika) - obligatory course
Teaching mode	Lectures + exercises (a work at home	uditory + laboratory + s	eminar + metodology -	+ construction)	0+30 (30+0+0+0) 0
Teachers	Auditory exercises:1. B	oris Metikoš ,prof.			
Course objectives	students will raise awar	reness of the importance	of physical education		
Learning outcomes:	1.Demonstrate the prop 2.Demonstrate the prop 3.Group together the ex 4.Express the basic rule 5.Distinguish the way o 6.Compare different ph 7.Explain the basics of 8.Describe the technica 9.Give an example of h 10.ability to explain bas	per execution of the tech per execution of the tech xercises for each muscle es of a specific kinesiolog of training for specific mo ysical activities and thei the impact of regular ex- al and tactical elements ow to organize a compet- sic relation between phy	nical elements of a spe inical elements of a spe group. Level:6 itor and functional abilit r impact on the anthrop ercise on physical and r of a specific kinesiologic cition. Level:6 sical exercises and gen	cific kinesiologic activity cific kinesiologic activity ties. Level:6 pologic characteristics of mental health. Level:6 c activity. Level:6 eral body voluminosity. I	. Level:6 . Level:6 the body. Level:6 _evel:6
out auditory exercises	workshop				
Course content auditory	1.Repeating technical e 2.Repeating technical e 3.Adopting new elemer 4.Adopting new elemer 5.Adopting a set of exe 6.Adopting a set of exe 7.Establishing the rules 8.Adopting different tra 9.Adopting different tra 10.Implementation of tl 11.Training of injury pro 12.Adoption of basic te 13.Adoption of basic te 14.Competition and Ga	elements of a specific kir elements of a specific kinesiolo hts of a specific kinesiolo rcises for each muscle g rcises for each muscle g of a specific kinesiologi hining methods , 2h, Lean he elements of various s evention exercises , 2h, chnical and tactical elem chnical and tactical elem mes, 2h, Learning outco	esiologic activity, 2h, L esiologic activity, 2h, L gic activity, 2h, Learnin gic activity, 2h, Learnin roup, 2h, Learning outco c activity, 2h, Learning out ning outcomes:5 norting activities, 2h, Lo Learning outcomes:7 nents of a specific kines mes:9 mes:9	earning outcomes:1 earning outcomes:1 g outcomes:2 g outcomes:2 omes:2 omes:3 outcomes:4 earning outcomes:6 iologic activity, 2h, Learr iologic activity, 2h, Learr	ning outcomes:8 ning outcomes:8
Required materials	Methodological: Realize semester: football, basl technical and tactical k elective programmes, t swimming in order to g competitions and techn athletics).	ed according to the elect ketball, swimming, walki nowledge of a certain gr he students are obliged et an insight into the nu ical-tactical preparation	ive programmes for wh ng, general physical co oup in the individual pr to climb Sljeme once in nber of non swimmers. s for competitions (foot	ich the students decide a ndition. Programmes are ogramme. In addition to every semester and to t A course for non swimm ball, basketball, water po	at the beginning of each adapted to the level of the contents included in test the knowledge of ters is organized. The blo, archery and
Exam literature	Basic literature: 1. I. Horvat, Pravila nog 2. I. Tocigl, Taktika igre Additional literature: 1. D. Milanović, Dopuns	jometne igre, Novinsko-i u obrani, Novinsko-izda ski sadržaji sportske prip	zdavačko propagandno vačko propagandno po reme, Sportska tribina i	poduzeće, Zagreb, 1994 Juzeće, Zagreb, 1989. Kineziološki fakultet Zag	l. greb, Zagreb, 2002.
Students obligations	Students are required t semester students mus second semester). Seco required to attend beca organization and implei doctor.	o actively participate in at go through the swimm and semester students n ause of active participation mentation of lectures, an	exercises during 30 hou ing test (non-swimmers nust be present at both on in sports are howeve nd attend a specially de	urs per semester, during have to attend the swin lectures and exercises. S r required to attend all le vised program if permitt	four semesters. First nming school during the Students who are not ectures, assist in the ed to do so by the sports
Knowledge evaluation during semester	Regular attendance				
Knowledge evaluation after semester	The exam is not graded	I but the knowledge is ch	necked at the beginning	, in the preamble, the fo	llowing semester.
Student activities:	Aktivnost		ECTS		
	(Classes attendance)		1		

ISVU equivalents: 22260;83785; Proposal made by Boris Metikoš, profesor of kineziology

No prerequisites.

This course can not be used for final thesis theme

Remark

Prerequisites:

Code WEB/ISVU	23274/143310	ECTS	1.0	Academic year	2018/2019	
Name	Kinesiology Education II	1				
Status	3rd semester - Electrica computer engineering in computer technology (R	Il power engineering (Re n automation (Redovni e Redovni elektrotehnika) -	dovni elektrotehnika) - d elektrotehnika) - obligato - obligatory course	bbligatory course3rd sem bry course3rd semester -	ester - Control and Communication and	
Teaching mode	Lectures + exercises (a work at home	uditory + laboratory + s	eminar + metodology +	construction)	0+30 (30+0+0+0) 0	
Teachers	Auditory exercises:1. Bo	oris Metikoš ,prof.				
Course objectives	students will raise awar	eness of the importance	of physical education			
Learning outcomes:	1.ability to properly per 2.ability to explain the p 3.ability to give an exar 4.ability to group basic 5.ability to inform about 6.ability to create a pers 7.ability to describe how	ability to properly perform technical elements of a particular sport activity. Level:6 2.ability to explain the purpose of performing tactical elements of a particular sport activity. Level:6 3.ability to give an example of organizing students' sport competitions. Level:6 4.ability to group basic kinesiology programs with regard to their influence on human organism. Level:6 5.ability to inform about possibilities of participating in recreational and sport activities in Croatia. Level:6 5.ability to create a personal exercise program for a week/month/year. Level:6 7.ability to describe how to give the first aid in case of sport injury. Level:6				
Methods of carrying out auditory exercises	Workshop					
Course content auditory	1.Improving the technic 2.Improving the technic 3.Establishing the rules 4.Establishing the rules 5.Improving the basic te 6.Improving the basic te 7.Game systems and ta 9.Team leadership, offic 10.Training structure (c 11.Learning and applica free time., 2h, Learning 12.Learning and applica free time., 2h, Learning 13.Adoption of exercise 14.Strength and mobilit 15.Basic characteristics Learning outcomes:6	al elements of a specific al elements of a specific of a specific kinesiologic of a specific kinesiologic echnical and tactical eler echnical and tactical eler ctics of a specific kinesic ciating, organization of c ontent and organization ation of a specific kinesic outcomes:7 ation of a specific kinesic outcomes:7 s for each muscle group y exercises for the preve- of different kinesiologic	kinesiologic activity, 2h kinesiologic activity, 2h cativity, 2h, Learning o cativity, 2h, Learning o ments of a specific kines blogic activity, 2h, Learn onpetitions, 2h, Learnin of a specific kinesiolog ologic activity for the pur blogic activity for the pur blogic activity for the pur for the prevention of oc ention of injuries, First a activities and their impa	n, Learning outcomes:1 n, Learning outcomes:1 nutcomes:2 siologic activity, 2h, Learn isologic activity, 2h, Learn ing outcomes:4 ing outcomes:4 ing outcomes:5 ic activity, 2h, Learning o rpose of independent reg rpose of independent reg cupational injuries, 2h, L id, 2h, Learning outcome act on anthropological ch	ning outcomes:3 ning outcomes:3 outcomes:6 ular exercise during ular exercise during earning outcomes:6 is:5 naracteristics, 2h,	
Required materials	Methodological: Realize semester: football, bask technical and tactical kr elective programmes, th swimming in order to ge competitions and techn athletics).	d according to the electi actball, swimming, walkin nowledge of a certain gru- he students are obliged et an insight into the nur ical-tactical preparations	ive programmes for which ng, general physical con oup in the individual pro to climb Sljeme once in mber of non swimmers. s for competitions (footb	th the students decide at dition.Programmes are a gramme. In addition to t every semester and to te A course for non swimme all, basketball, waterpole	thebeginning of each dapted to the level of he contents included in est the knowledge of ers is organized. The o, archery and	
Exam literature	Basic literature: 1. M. Dodik, Tjelesna i z 2. I. Belan, Aerobik, Ivo 3. I. Horvat, Pravila nog 4. I. Tocigl, Taktika igre	dravstvena kultura, Sve Balen, Koprivnica, 1988. ometne igre, Novinsko-iz u obrani, Novinsko-izdav	učilište u Rijeci, Rijeka, 1 zdavačko propagandno j vačko propagandno pod	1992. poduzeće, Zagreb, 1994. uzeće, Zagreb, 1989.		
Students obligations	Students are required to semester students must second semester). Seco required to attend beca organization and impler doctor.	o actively participate in o t go through the swimmi and semester students m use of active participation mentation of lectures, ar	exercises during 30 houring test (non-swimmers nust be present at both I on in sports are however ad attend a specially dev	rs per semester, during f have to attend the swim ectures and exercises. S required to attend all le vised program if permitte	our semesters. First ming school during the tudents who are not ctures, assist in the d to do so by the sports	
Knowledge evaluation during semester	Practical work					
Knowledge evaluation after semester	The exam is not graded	but the knowledge is ch	necked at the beginning,	in the preamble, the fol	lowing semester.	
Student activities:	Aktivnost (Classes attendance)		ECTS 1			
Remark	This course can not be u	used for final thesis then	ne			
Prerequisites:	No prerequisites.					
ISVU equivalents:	22261;83787;					
Proposal made by	Boris Metikoš, profesor	of kineziology				

Code WEB/ISVU	23275/143311	ECTS	1.0	Academic year	2018/2019
Name	Kinesiology Education I	V			
Status	4th semester - Electrica computer engineering i computer technology (F	al power engineering (Re n automation (Redovni e Redovni elektrotehnika) -	dovni elektrotehnika) - c lektrotehnika) - obligato obligatory course	obligatory course4th sem ory course4th semester -	ester - Control and Communication and
Teaching mode	Lectures + exercises (a work at home	uditory + laboratory + s	eminar + metodology +	construction)	0+30 (30+0+0+0) 0
Teachers	Auditory exercises:1. Bo	oris Metikoš ,prof.			
Course objectives	students will raise awar	eness of the importance	of physical education		
Learning outcomes:	1.Apply the rules of a sp 2.Demonstrate the tech 3.Demonstrate the prop 4.Choose the proper kir 5.Design and present a 6.Envision the organiza 7.Conduct a kinesiologi 8.Demonstrate strength 9.Interpret the benefits 10.ability to point out th system. Level:6	pecific kinesiologic activi nnical and tactical eleme per execution of the tech nesiologic operators for li- personal exercise progra- tion of student sports co c program with regard to n and mobility exercises of kinesiologic activities ne importance of physica	ty. Level:6 nts of a specific kinesiol- nical elements of a part earning and improving a am for the week / month mpetitions and teamwor its impact on the body. for the purposes of injur for the purpose of raisir at activity in prevention a	ogic activity. Level:6 icular kinesiologic activit a specific sporting activit n / year. Level:6 rk training. Level:6 . Level:6 y prevention . Level:6 ng the level of skills and against occupational dise	y. Level:6 y. Level:6 qualities. Level:6 eases of locomotive
Methods of carrying out auditory exercises	Workshop				
Course content auditory	1.Adopting and improvi 2.Adopting and improvi 3.Improving the technic 5.Establishing the rules 6.Establishing the rules 7.Analysis and methods 8.Application of a speci Learning outcomes:5 9.Application of a speci Learning outcomes:5 10.Team leadership, off 11.Training structure (c 13.Selection of exercise 14.Basic characteristics Learning outcomes:9 15.Basic characteristics Learning outcomes:9	ng the technical element ng the technical element cal and tactical elements cal and tactical elements of a specific kinesiologic of a specific kinesiologic of teaching a specific kinesiologic fic kinesiologic activity for fic kinesiologic activity for ficiating, organization of content and organization ontent and organization of each muscle group of different kinesiologic s of different kinesiologic	ts of a chosen kinesiolog ts of a chosen kinesiolog of a specific kinesiologi of a specific kinesiologi activity, 2h, Learning o activity, 2h, Learning o nesiologic activity, 2h, L or the purpose of indepe or the purpose of indepe competitions, 2h, Learni of a specific kinesiolog for the prevention of oc activities and their impa- activities and their impa-	gic activity, 2h, Learning gic activity, 2h, Learning o c activity, 2h, Learning o c activity, 2h, Learning o utcomes:3 utcomes:3 Learning outcomes:4 endent regular exercise d ing outcomes:6 ic activity, 2h, Learning o ic activity, 2h, Learning o cupational injuries, 2h, L act on anthropological ch	outcomes:1 outcomes:2 utcomes:2 utcomes:2 uring free time., 2h, uring free time., 2h, outcomes:7 outcomes:7 earning outcomes:8 naracteristics, 2h, maracteristics, 2h,
Required materials	Methodological: Realize semester: football, bask technical and tactical ki elective programmes, t swimming in order to g competitions and techn athletics).	ed according to the electi ketball, swimming, walkin nowledge of a certain gr he students are obliged et an insight into the nur ical-tactical preparations	ve programmes for which ng, general physical con pup in theindividual prog to climb Sljeme once in (mber of non swimmers.) to competitions (footb	th the students decide at dition. Programmes are a gramme. In addition to th every semester and to the A course for non swimme all, basketball, waterpole	t the beginning of each adapted to the level of ne contents included in est the knowledge of ers is organized. The o, archery and
Exam literature	Basic literature: 1. M. Dodik, Tjelesna i z 2. I. Belan, Aerobik, Ivo 3. I. Horvat, Pravila nog 4. I. Tocigl, Taktika igre	dravstvena kultura, Sve Balen, Koprivnica, 1988 ometne igre, Novinsko-iz u obrani, Novinsko-izdav	učilište u Rijeci, Rijeka, 1 zdavačko propagandno p vačko propagandno pod	1992. poduzeće, Zagreb, 1994. uzeće, Zagreb, 1989.	
Students obligations	Students are required to semester students mus second semester). Seccond required to attend beca organization and impler doctor.	o actively participate in t go through the swimmi and semester students m use of active participation mentation of lectures, an	exercises during 30 hour ng test (non-swimmers lust be present at both I on in sports are however Id attend a specially dev	rs per semester, during f have to attend the swim ectures and exercises. S r required to attend all le rised program if permitte	our semesters. First ming school during the tudents who are not ctures, assist in the ed to do so by the sports
Knowledge evaluation during semester	Regular attendance				
Knowledge evaluation after semester	The exam is not graded	l but the knowledge is ch	ecked at the beginning,	in the preamble, the fol	lowing semester.
Student activities:	Aktivnost		ECTS		
Domorik	(Classes attendance)	used for final the start	1		
Remark Prerequisites:	No prerequisitor	used for final thesis then	le		
ISVII equivalenter	22262-83788-				
Pronosal made by	Boris Metikoč profesor	of kineziology			
Proposal made by	DUTIS METIKOS, Profesor	ui kineziology			

Code WEB/ISVU	23480/155990	ECTS	4.0	Academic year	2018/2019
Name	LabView graphic progra	amming			
Status	5th semester - Electrica computer engineering i computer technology (F	al power engineering (Re n automation (Redovni e Redovni elektrotehnika)	dovni elektrotehnika) - e elektrotehnika) - elective - elective course	elective course5th semes e course3rd semester - Co	ster - Control and ommunication and
Teaching mode	Lectures + exercises (a work at home	uditory + laboratory + s	eminar + metodology +	- construction)	30+30 (6+24+0+0) 60
Teachers	Lectures:1. pred. Ivan L Lectures:2. Tomislav No Auditory exercises:pred Auditory exercises: Tom Laboratory exercises:pr Laboratory exercises: T	ujo , dipl.ing. ovak mag. ing. inf. et cor I. Ivan Lujo , dipl.ing. nislav Novak mag. ing. ir red. Ivan Lujo , dipl.ing. omislav Novak mag. ing	nm. techn. ıf. et comm. techn. . inf. et comm. techn.		
Course objectives	students will be familian	r with basic graphic prog	ramming and the exam	ples of the LabView prog	ramming tool
Learning outcomes:	1.to recognize the diffe 2.ability to create virtua 3.ability to integrate a o Level:6,7 4.ability to design a sof 5.ability to recognize a 6.connecting the compo	rence between the graph al measuring instrument computer and LabView s tware application for me possibility for using com uter with other "outside"	nical and textual (comm whose functions are per oftware package into a r asurements using graph puter as a measuring in units (electronics, mech	and line) programing app rformed by using a comp measurement process ar nical programming langu strument. Level:6 nanics,). Level:6,7	proach. Level:6 nuter . Level:6,7 nd data display. age. Level:6
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Demonstration Simulations Modelling Discussion Questions and answers				
Methods of carrying out auditory exercises	Laboratory exercises or Group problem solving Discussion, brainstormi Computer simulations Interactive problem solv Workshop	n laboratory equipment ng ving			
Methods of carrying out laboratory exercises	Laboratory exercises or Laboratory exercises, c Group problem solving Discussion, brainstormi Computer simulations Workshop Other	n laboratory equipment omputer simulations ng			
Course content lectures	1.Introduction to LabVie 2.Basics of LabView env 3.Elements of control fl 4.Elements of control fl 5.Fields and other comp 6.Fields and other comp 7.Graphical presentatio 8.Graphical presentatio 9.Creating text and files 10.Measurement and si 11.Digital and analog ir 12.Digital and analog ir 13.Measuring instrument 14. Advanced LabView 15.Communication with	ew environment, 2h, Lea vironment, 2h, Learning ow of the LabView progr ow of the LabView progr olex data types, 2h, Lea olex data types, 2h, Lea no f data, 2h, Learning o en of data, 2h, Learning o s, 2h, Learning outcome ignal generating, 2h, Lea oputs and outputs, 2h, Lea oputs and outputs, 2h, Lea oputs and outputs, 2h, Lea not control, 2h, Learning of structures and functions of other software and har	rning outcomes:1 outcomes:1 am execution, 2h, Learn am execution, 2h, Learn rning outcomes:3,4 rning outcomes:3,4 sutcomes:3,4 s:1,3 rning outcomes:1,3 earning outcomes:2,3,4, boutcomes:2,4,5,6 , 2h, Learning outcome dware equipment, 2h, Learning	ing outcomes:1,3 ing outcomes:1,3 6 6 s:2,4,5,6 earning outcomes:4,5,6	
Course content auditory	1.No class, 2h 2.No class, 2h 3.Solving more difficult 4.No class, 2h 5.No class, 2h 6.No class, 2h 7.Solving more difficult 8.No class, 2h 9.No class, 2h 10.No class, 2h 11.No class, 2h 12.Solving more difficul 13.No class, 2h 14.No class, 2h	laboratory exercise assi laboratory exercise assi lt laboratory exercise ass	gnments, 2h gnments, 2h signments, 2h		

	15.No class, 2h
Course content	1.Test
laboratory	2.Test
-	3.Introduction and basic elements of LabView environment, variable types, 2h, Learning outcomes:1,3
	4.LabVIEW execution control elements, 2h, Learning outcomes:1,3,4
	5.Complex operations in LabVIEW, random number generation, 2h, Learning outcomes:1,3,4
	6.Test, 2h
	7.Text and textual manipulation (string operations), 2h, Learning outcomes:2,5,6
	8.Complex data types, arrays, 2h, Learning outcomes:2,5,6
	9.Clusters and State machine, 2h, Learning outcomes:2,5,6
	10.Test, 2h
	11.Data acquisition, 2h, Learning outcomes:2,3,5
	12.7 segment display and acquired data manipulation, 2h, Learning outcomes:3,5,6
	13.The data storage, 2n, Learning outcomes:3,5,6
Required materials	Basic: classroom, blackboard, chalk
	Special purpose computer laboratory
	Whiteboard with markers
	Overhead projector
	Operating supplies
	Special equipment
Exam literature	J. Travis, J. Kring - LabVIEW for Everyone: Graphical Programming Made Easy and Fun, III izdanje, Prentice Hall, 2006
	National instruments web stranice: http://www.ni.com/academic/students/learniabview/
Students obligations	50% of totally possible points covering lab attendance and knowledge checks
Knowledge	Three knowledge checks during the semester 75%
evaluation during	Lab attendance (beside tests) 25%
semester	
	lotal of 50% needed for a passing grade
Knowledge	Written test - 50% needed for a passing grade
evaluation after	Oral examination - 50% needed for a passing grade
semester	
Kemark	I his course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	93491;
Proposal made by	Ivan Lujo, Msc. Lecturer

Code WEB/ISVU	22867/22296	ECTS	4.0	Academic year	2018/2019
Name	Lighting and Installation	ns			
Status	5th semester - Electrica	al power engineering (Re	edovni elektrotehnika) - o	obligatory course	
Teaching mode	Lectures + exercises (a work at home	auditory + laboratory +	seminar + metodology +	construction)	30+15 (0+15+0+0) 75
Teachers	Lectures:1. dr.sc. Davo Laboratory exercises:d	r Petranović dipl.ing.el. r.sc. Davor Petranović d	ipl.ing.el.		
Course objectives	Students should be cap documentation.	able to solve problems	in the field of electrical ir	nstallations and lighting a	and produce project
Learning outcomes:	1.ability to analyze req 2.ability to identify the 3.ability to identify the 4.ability to examine the 5.ability to classify the 6.ability to classify the 7.analyze the type and 8.knowledge check. Lev	uirements for lighting. L required type of lighting existence of such lighting preliminary view of ligh sources of light applied n accepted solution. Lev the elements of the inst vel:6	evel:6 g . Level:6 ng in a similar space. Lev nting after installment. L in project. Level:6 el:6 tallation. Level:6	rel:6 evel:6	
Involvement of learning outcomes of the course in study programme:	5.1.EE Razumjeti princi 120h	p rada električnih rotaci	jskih strojeva, transforma	atora, dalekovoda i sklop	nih aparata: 15h in
Methods of carrying out lectures	Ex cathedra teaching Discussion Questions and answers Drawings, tables and d photographs, design, p to achieve their active	iagrams are used to eas roject and test documer participation. It is neces	e understanding. The sp Itation. All exposed mate sary to have blackboard	ecific examples are also rials are analyzed and d and LCD projector.	shown through iscussed with students
Methods of carrying out laboratory exercises	Laboratory exercises, c Computer simulations	omputer simulations			
Course content lectures	1.Low-voltage networks 2.Low-voltage networks 3.Low- and medium-vol 2h, Learning outcomes 4.Low- and medium-vol 2h, Learning outcomes 5.Conductor and load c 6.Conductor and load c 7.Low-voltage installati 8.Control and commun 9.Lighting basics. Light 10.Sources and lumina 11.Indoor and outdoor 12.Utility method, poin 13.Reflecting surface ir 14.Standardization., 2h 15.Computer program	s and indoor and outdoo s and indoor and outdoo tage power distribution 7 ontrol and protection, 2 ontrol and protection, 2 ontrol and protection, 0 on equipment selection ication devices installati ing sources: constructio ries characteristics., 2h, lighting design., 2h, Lea t method and glare limit filuence and characteris , Learning outcomes:1 applications in low-volta	r installations., 2h, Learr r installations., 2h, Learr construction types, requ construction types, requ th, Learning outcomes:6 2h, Learning outcomes:6 and design., 2h, Learnin ons., 2h, Learning outco n, colour, accessories, us Learning outcomes:2 arning outcomes:5 ing method., 2h, Learnin tics., 2h, Learning outco ge installations and light	ing outcomes:7 ing outcomes:7 uirements, conductors, c uirements, conductors, c g outcomes:7 mes:7 se and duration., 2h, Lea g outcomes:5 mes:4 ing., 2h, Learning outcor	ables and accessories. , ables and accessories., rning outcomes:1 mes:5
Course content laboratory	1.Indoor lighting desigr 2.Indoor lighting desigr 3.Indoor lighting desigr 4.Outdoor lighting desi 6.Outdoor lighting desi 6.Outdoor lighting desi 7.colloquium, 2h, Learr 8.no teaching 9.Installation calculatio 10.Installation calculati 11.Installation calculati 12.no teaching 13.no teaching 14.colloquium, 1h, Lear 15.no teaching	 h., 2h, Learning outcome h., 1h, Learning outcome gn., 2h, Learning outcome gn., 1h, Learning outcor gn., 1h, Learning outcor gn., 1h, Learning outcor ing outcomes:8 n, 2h, Learning outcome on, 1h, Learning outcome 	es:1 es:2 es:5 nes:1 nes:2 nes:5 es:7 nes:7 nes:7		
Required materials	General purpose comp Whiteboard with marke Overhead projector	uter laboratory ers			
Exam literature	Basic literature: 1. Tehnički priručnik, Ku 2. RELUX On-line manu 3. Ecodial On-line manu Dodatna: 1. Električne instalacije	ončar Zagreb al Jal u zgradama - Zbirka el.	teh. propisa i pravila		
Students obligations	written professional pa	per in accordance with t	he contents and layout o	lefined by Regulations of	n Final Thesis



Knowledge evaluation during semester	Pisana provjera znanja#2#80#50	Usmena provjera znanja#1#20#50\$	
Knowledge evaluation after semester	Paper test#1#80#50\$verbal exam	n#1#20#50\$	
Student activities:	Aktivnost (Written exam) (Oral exam)	ECTS 3 1	
Remark	This course can be used for final thesis theme		
Prerequisites:	No prerequisites.		
Proposal made by	MSEE Davor Petranović, senior lect	urer	

Study programme f	for academic year	2018/2019
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Code WEB/ISVU	22869/22301	ECTS	4.0	Academic year	2018/2019
Name	Linear and Nonlinear N	etworks			
Status	3rd semester - Commu	nication and computer te	echnology (Redovni elek	trotehnika) - elective co	urse
Teaching mode	Lectures + exercises (a work at home	uditory + laboratory + s	eminar + metodology +	construction)	30+15 (15+0+0+0) 75
Teachers	Lectures:1. Željko Stoja Auditory exercises: Želj	inović iko Stojanović			-
Course objectives	Students will acquire k	nowledge in the field of e	electrical circuit analysis		
Learning outcomes	1 ability to classify more	tels of electrical compon	ents Level 6 7		
	2.ability to predict basi 3.ability to analyze sim 4.ability to analyze sim 5.ability to compare the	c properties of electrical ple electrical circuits in a ple electrical circuits in a e methods of analysis. Le	circuits. Level:6,7 time interval. Level:6 frequency interval. Lev evel:6,7	el:6	
Methods of carrying out lectures	Ex cathedra teaching Case studies Modelling Discussion				
	Questions and answers Seminar, students pres Homework presentation	entation and discussion า			
Methods of carrying out auditory exercises	Traditional literature ar Discussion, brainstormi Mind mapping	nalysis ng			
Course content lectures Course content auditory	1.Introduction, 2h, Lear 2.One-port resistors, 2H 3.One-port resistors, 1H One-port reactive elem 4.One-port reactive elem 5.Multi-port resistors, 2 6.Commutation laws, 2 7.First-order circuits 9.Second-order circuits 9.Second order circuits 10.Second order circuit Basic properties of Lap 11.Basic properties of Lap 11.Basic properties of Lap 12.Circuit analysis usin 13.Network functions, 2 14.Reciprocity Theoren 15.Two-ports, 2h, Lear 1.Introduction, 1h, Lear 2.One-port resistors, 1H	ning outcomes:1,2,3 h, Learning outcomes:1,2 h, Learning outcomes:1,2 h, Learning outcomes:1,2 ents, 1h, Learning outco ments, 2h, Learning outco ments, 2h, Learning outcomes:1, h, Learning outcomes:1,2 - free response, 2h, Lea - complete response, 2h, Lea - complete response, 2h, Lea Lace transforms, 1h, Learl Laplace transforms, 2h, L g Laplace transforms, 2h, L g Laplace transforms, 2h, L g Laplace transforms, 2h, L g Laplace transforms, 2h, L ming outcomes:1,2,4,5 ming outcomes:1,2,3 h, Learning outcomes:1,2 h, Learning outcomes:1,2	2,3 ,3 mes:1,2,3 2,3 2,3 2,3 2,3 ,3 rning outcomes:1,2,3 h, Learning outcomes:1,2 h, Learning outcomes:1,2 h, Learning outcomes:1,2 earning outcomes:4,5 tearning outcomes:4,5 tearning outcomes:4,5 tearning outcomes:4,5 tearning outcomes:1,2 2,4,5 5:1,2,4,5	2,3 ,2,3 ,4,5	
	4.One-port reactive ele 5.One-port reactive ele 6.Multi-port resistors, 1 7.Commutation laws, 1 8.First order circuits, 11 9.Second order circuits 10.Second order circuits 11.Basic properties of L 12.Laplace Transforma 13.Network functions, 1 14.Reciprocity Theoren 15.Two-port elements,	ments, 1h, Learning outc ments, 1h, Learning outc h, Learning outcomes:1, h, Learning outcomes:1, n, Learning outcomes:1, - free response, 1h, Lea s - forced response, 1h, .aplace transformation, 1 tion Circuit Analysis, 1h, Lh, Learning outcomes:1 h, 1h, Learning outcomes:1	:omes:1,2,3 :omes:1,2,3 2,3 2,3 :ning outcomes:1,2,3 Learning outcomes:1,2,3 .h, Learning outcomes:4 Learning outcomes:1,2, :2,4,5 ::1,2,4,5 .,2,4,5	3 ,5 4,5	
Required materials	Basic: classroom, black Whiteboard with marke Maquette	board, chalk rs			
Exam literature	Basic literature: 1. Flegar, Teorija mreža Additional literature: 1. Chua, Desoer, Kuh, L 2. Nilsson, Riedel, Elect 3. Flegar, Teorija mreža 4. Flegar, Teorija mreža 5. Željko Stojanović, Lir http://nastava.tvz.hr/zs	a-Bilješke s predavanja, s inear and Nonlinear Circ iric circuits, Reading, Ma a-Zbirka zadataka, Sveuč alspitna pitanja, ETF Osij nearne i nelinearne mrež tojanovic/predmeti/linem	weučilište u Osijeku, Os uits, Mc. Graw Hill Comp ssachusetts, Addison-We ilište u Osijeku, Osijek, i ilšte, Osijek, 2001, Interna eDodatni zadaci i pitanja v/linem.htm	ijek, 2001 p. 1987 esley Publ. Comp. 1996 1996 skripta a,	
Students obligations	There are 10 small exa	ms during the semester.	Minimum condition is 2	0% overall.	
Knowledge	There are 10 small exa	ms during the semester.			

evaluation during semester	Grades: - 0 - 20% #8594; the conditions for taking exams are not accomplished for the whole year - 20 - 50% #8594; 1 , not passed - 50 - 64% #8594; 2 , passed - 64 - 80% #8594; 3 , passed - 80 - 90% #8594; 4 , passed - 90 - 100% #8594; 5 , passed Another option is to pass seminary or consultations.
Knowledge evaluation after semester	The exam consists of 20 questions divided into two groups, both of 10 questions from announced list of questions (see additional literature number 4). Group A consists of questions from number 1 to 43, and 56 to 96. Group B consists of questions from number 199 to 231, 277 to 282 and 293 to 301. There are 120 minutes for solving the exam. Value of each question is 1 point. The condition for passing the written exam is at least 50\$ correct answers from each group of question. Passing grades - 10 do 13 points #8594; 2 - 13 do 16 points #8594; 3 - 16 do 18 points #8594; 5 There is oral exam after written exam.
Student activities:	Aktivnost ECTS (Constantly tested knowledge) 4
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
Proposal made by	Željko Stojanović

Code WEB/ISVU	23492/156008	ECTS	5.0	Academic year	2018/2019	
Name	Lines and Antennas					
Status	4th semester - Commu	nication and computer te	echnology (Redovni elekt	rotehnika) - obligatory (course	
Teaching mode	Lectures + exercises (a work at home	auditory + laboratory + s	eminar + metodology +	construction)	30+30 (15+15+0+0) 90	
Teachers	Lectures:1. dr.sc Sonja	Zentner Pilinsky prof.v.š				
	Auditory exercises:dr.sc	Lectures:Prof.gr.sc. Slavica Cosovic Bajic Auditory exercises:dr.sc. Sonia Zentner Pilinsky prof.y.š				
	Laboratory exercises: A	aboratory exercises: Antonio Krajinović mag.ing.inf. et comm.techn				
	Laboratory exercises: S	iniša Lacković struč.spec r se Sonia Zontnor Pilinsk	c.ing.el.			
Course objectives	students will acquire k	nowledge of types of tran	smission lines used in m	odern communication s	vstems and of special	
course objectives	features of high-freque	ncy signal transmission			ystems and or special	
Learning outcomes:	1.ability to design basic types of transmission lines (coaxial cable, microstrip line, rectangular waveguide) . Level:6					
	2.ability to calculate st 3 ability to calculate th	ub matching at microway e input impedance corre	/e frequencies. Level:6 lated to load impendence	e transmission line lend	th and matching	
	elements. Level:6				in and matching	
	4.ability to analyze diff	erent causes of external	losses in radio (wireless)	communication system	1. Level:6	
	5.ability to distinguish frequency band). Level	between various antenna :6.7	as and their parameters (gain efficiency coefficie	int, polarization,	
	6.ability to identify SM	and MM fibers and variou	us optical cables. Level:6			
	7.ability to calculate po	ower budget in wireless c	ommunication system co	onsisting of transmitter	with antenna and	
	8.ability to predict a po	ssibility of establishing a	wireless communicatior	system with available	components. Level:6	
	, , ,	, ,		,	•	
Methods of carrying	Ex cathedra teaching					
out lectures	Discussion					
	Questions and answers					
	The subject matter is to active part in class Tea	aught by using a number	of particular examples.	Students are constantly	motivated to take an	
Methods of carrying	Group problem solving	ching equipment. board,	overnead projector and	LCD projector.		
out auditory exercises	Students solve practica	Il examples.				
Methods of carrying out laboratory exercises	Laboratory exercises, c Students solve practica	omputer simulations Il examples on computer	s. Lab excersises prepar	atin are obligatory home	ework.	
Course content	1.Introduction - definiti	on of communication sys	tem, coax cable and trai	nsmission line, lumped a	and distributred	
lectures	parameters , 2h, Learn 2 Coax cables and mici	ing outcomes:1,3	a outcomes:1.3			
	3.Definition of lossless	tramsmission line param	eters - characteristic imp	pedance, SWR, reflection	n coefficient , 2h,	
	Learning outcomes:1,3				in a Dhallan min a	
	4. Smith chart - definiti outcomes:1.2.3	on, impedance and admi	Ittance characterization a	along the transmission i	ine , 2n, Learning	
	5.Stub matching in Sm	ith chart , 2h, Learning o	utcomes:1,2,3			
	6.Stub matching in Sm 7 Fibers and ontical cal	ith chart , 2h, Learning o ples - SM and MM fiber in	utcomes:1,2,3 umber of modes basic f	iber and cable characte	ristics (2h Learning	
	outcomes:6				istics (, 21, Ecuring	
	8.Rectangular wavegui	de definition, TE and TM	modes, singlemode tran	smission frequency, wa	veguide excitation , 2h,	
	9.Rectangular wavegui	de definition, TE and TM	modes, singlemode tran	smission frequency, wa	veguide excitation , 2h,	
	Learning outcomes:1				J	
	10.Capacity and induct	ivity in rectangualr wave	guide, waveguide filters	, waveguide resonator,	dispersion in	
	11.Antennas - definitio	ns and antenna paramet	ers , 2h, Learning outcon	nes:4,8		
	12.Elementary dipole a	nd elementary surface, o	dipoles and monopoles ,	2h, Learning outcomes:	4	
	13.Linear antenna arra 14.Linear antenna arra	y - array factor, array ca v - arrav factor, arrav ca	lculations, 2n, Learning c	outcomes:7		
	15.Different antennas a	and antenna arrays - refl	ectors, Yagi-Uda, horns,	wideband antennas , 2h	, Learning outcomes:5,8	
Course content	1.coax characteristic in	npedance calculations ar	nd coax dimensioning; di	mensioning of microstri	p lines, 1h, Learning	
auditory	outcomes:1					
	2.calculations of imped	ance and admitance alor ance and admitance alor	ng transmission line (with ng transmission line (with	n Smith chart), 1h, Lear n Smith chart), 1h, Lear	ning outcomes:3 ning outcomes:3	
	4.stub matching, 1h, Le	earning outcomes:2			ing outcomesis	
	5.stub matching, 1h, Le	earning outcomes:2	h Learning outcomes.			
	7.matching with lambd	a quarter transformer, 1 a quarter transformer, 1	h, Learning outcomes:2			
	8.NA and number of m	odes calculations in fiber	, SM condition, 1h, Learn	ing outcomes:6		
	9.waveguide modes ca	lculations, single mode of	peration conditions, loss	es per length, 1h, Learr	ing outcomes:1,3	
	11.Friis equation, 1h, L	earning outcomes:4,5		ses per lengui, III, Ledi	ming outcomes.1,3	
	12.Friis equation, 1h, L	earning outcomes:4,5				
	13.Antenna array calcu	llations, array diagram, f	eeder impedance, lambd	a/4 transformer in feed	er lines , 1h, Learning	
	14.Antenna array calcu	llations, array diagram, f	eeder impedance, lambd	a/4 transformer in feed	er lines , 1h, Learning	
	outcomes:7,8	-			-	



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	15.Antenna array calculations, array diagram, feeder impedance, lambda/4 transformer in feeder lines , 1h, Learning outcomes:7,8
Course content laboratory	 1.no lab exercises 2.no lab exercises 3.no lab exercises 4.Characteristic impedance of various transmission lines, 2h, Learning outcomes:1,3 5.Measurements of transmission line losses, 2h, Learning outcomes:2 6.SWR measurements, 2h, Learning outcomes:2 7.no lab exercises 8.no lab exercises 9.Stub matching, 1h, Learning outcomes:2 10.Folded dipole and monopole impedance, log-periodic antenna, 2h, Learning outcomes:3,4 11.Long wire antenna patters, 2h, Learning outcomes:5,8 12.no lab exercises 13.Measurements of free space losses and antenna pattern, 2h, Learning outcomes:1,4,5 14.Measurements of directional coupler characteristics, 2h, Learning outcomes:1,4,5
Required materials	Basic: classroom, blackboard, chalk General purpose computer laboratory Whiteboard with markers Overhead projector
Exam literature	Basic literature: 1. E. Zentner, Antene i radiosustavi ,Graphis, Zagreb, 2001 Additional literature:
Students obligations	regular class attendance
Knowledge evaluation during semester	Redovitost pohaa#5#10#50\$Mini-test#2#30#40\$Kolokvij, numeri zadaci#3#30#50\$Kolokvij, teorijska pitanja#3#15#50\$Prakti rad#6#15#50\$
Knowledge evaluation after semester	written exam and after copletion of min. 50% oral exam
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	28962;
Proposal made by	professor Slavica Čosović-Bajić, Ph.D.; professor Sonja Zentner Pilinsky,Ph.D.

Code WEB/ISVU	23088/85714	ECTS	5.0	Academic year	2018/2019
Name	Maintenance				
Status	6th semester - Control	and computer engineeri	ng in automation (Redov	ni elektrotehnika) - oblig	atory course
Teaching mode	Lectures + exercises (a	auditory + laboratory + s	seminar + metodology +	construction)	45+45 (45+0+0+0)
	work at home				60
Teachers	Lectures:1. mr.sc. Bran	imir Preprotić dipl. inž. s	stroj.		
	Auditory exercises: Dar	KO MITROVIĆ Sc. Branimir Proprotić dir	al inž stroi		
Course objectives	Gain competences for r	plant or service mainten	ance management		
Learning outcomes:	1 Risks Level 6	signe of service mainten			
	2.Time based acitivity	olan. Level:6,7			
	3.Maintenance strategy	/ . Level:6,7			
	4.Reliability, Availability	y, Overall Equipment Efe	ectiveness. Level:6		
	5.Maintenance manage	ement. Levelto,/			
Methods of carrying	Ex cathedra teaching				
out lectures	Guest lecturer				
	Case studies				
	Discussion				
	Seminar, students pres	entation and discussion			
	Homework presentation	n			
	Company visit				
Methods of carrying	Group problem solving	alveic			
exercises	Data mining and knowl	edge discovery on the V	/eb		
	Discussion, brainstorm	ing			
	Workshop				
Course content	1 Maintanan an Intuaduu		interes concerts Ch		
lectures	2. Types of maintenance	e. 6h. Learning outcome	s:5	Learning outcomes:3,5	
	3.Defining of maintena	nce key performance inc	dicators, 6h, Learning out	comes:1,4	
	4.No Lessons				
	5.No Lessons	ononco organizational m	adala 26 Laarning auto	amacı.E	
	7. Service workshop or	inization, 6h. Learning o	utcomes:1.3.5	omes:5	
	8.Legal requirements in	n maintenance, 6h	4200110012,0,0		
	9.No lessons				
	10.No lessons				
	12.Test-second part. 3	n. Learning outcomes:2			
	13.Project managemen	t-theory, 6h, Learning o	utcomes:2		
	14.Project managemen	t-theory, 3h, Learning o	utcomes:2		
	15.Nema nastave				
Course content	1.No lessons				
auditory	2.No lessons				
	3.No lessons				
	4.Calculation of mainte	nance Key performance	indicators, 6h, Learning	outcomes:4	
	6.Test ofacquired know	ledge, 3h			
	7.No lessons	5			
	8.No lessons				
	9.Case Study: Organiza	ition of automatization n	naintenance Thermo pow	er plant and specific rec	juirements , 6n,
	10.Case Study: Organiz	ation of service network	on entire area of Croatia	a, tools and SW impleme	ented , 6h, Learning
	outcomes:1,2,3				
	11.Visit to plant with be	est in class maintenance	organization, 3h, Learni	ng outcomes:3,4,5	
	12.Test-Second part. 3	h	Solis leatheu, Sil, Leathi	ig outcomes.1,2,3,4,3	
	13.No Lessons				
	14.Project managemen	t Excercise, 3h, Learning	g outcomes:2		
	15.Test-third part, 3h Student prezentations	3h Learning outcomes	1 2 3 / 5		
	Student prezentations,	Sh, Leanning outcomes.	1,2,3,4,3		
Required materials	Basic: classroom, black	board, chalk			
	Whiteboard with marke	ers			
	Overhead projector				
Evam literature	Materijali objavljeni na	intranetu			
Students obligations	Attendance of lectures	maneta			
Knowledge	3 tests				
evaluation during					
semester					
Knowledge	Exams-writen and oral				
evaluation after					



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semester			
Student activities:	Aktivnost	ECTS	
	(Classes attendance)	1	
	(Written exam)	3	
	(Oral exam)	1	
Remark	This course can be used for final thesis t	heme	
Prerequisites:	No prerequisites.		
ISVU equivalents:	32776;		
Proposal made by	mr.sc. Branimir Preprotić dipl. inž. stroj.,		

Study programme	for academic	year 2018/2019
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Code WEB/ISVU	23481/155991	ECTS	2.0	Academic year	2018/2019
Name	Mathematical Tools in	Electrical Engineering			-
Status	2nd semester - Underg	araduate professional stu	dy in electrical engineer	ina (Redovni elektrotehr	nika) - obligatory course
Teaching mode	Lectures + exercises (auditory + laboratory + s	seminar + metodology +	- construction)	0+30(30+0+0+0)
,	work at home			,	30
Teachers	Auditory exercises:1. L	uka Marohnić			
	Auditory exercises:2. r	nr.sc. Bojan Kovačić , viš	i predavač		
	Auditory exercises:3. I	vica Vuković			
	Auditory exercises:4. c	lr. sc. Anđa Valent viši pr	edavač		
	Auditory exercises:Pro	f.dr.sc. Slavica Čosović B	ajić		
	Auditory exercises:dr.s	sc. Mandi Orlić Bachler v.	pred		
	Auditory exercises: Go	ran Sirovatka			<u>.</u>
Course objectives	Students will acquire b	basic knowledge and skill	s working with properly o	chosen mathematical so	rtware.
Learning outcomes:	1.input mathematical	expression. Level:6	7		
	2.combine possible pro	blem solutions. Level:6,	/		
	A write simple comput	er programs Level.67			
	5. solve (non)algebraic	equations. Level:6			
	6.solve ordinary differe	ential equations. Level:6			
Methods of carrying	Laboratory exercises,	computer simulations			
out auditory	Computer simulations				
exercises	a laptop				
Course content	1.Introduction. Scientif	fic notation., 2h, Learning	outcomes:2		
auditory	2.Computing values of	elementary math function	ons., 2h, Learning outcor	mes:2	
	3.Matrix input and gen	erating. Basic matrix ope	erations., 2h, Learning ou	utcomes:2	
	4.Changing matrix eler	ments. Calculating matrix	k determinant and invers	se matrix., 2h, Learning	outcomes:2
	5.Anonymous function	s and applications. Displa	aying function graphs., 2	n, Learning outcomes:4	2015
	7.1 preliminary exam	2h Learning outcomes	2 / 5	s., zii, Learning outcome	-5.0
	8.Symbolic expression	s., 2h. Learning outcomes	s:2		
	9.Computing limits and	d differentials., 2h, Learn	ing outcomes:2		
	10.Computing integral	s., 2h, Learning outcome	s:1		
	11.Numeric series. , 2h	n, Learning outcomes:3,6	1		
	12.Function series. Tay	ylor and Fourier series., 2	h, Learning outcomes:3,	,6	
	13.Laplace transform.	Solving ordinary differen	tial equations.,, 2h, Lear	ning outcomes:3	
	14.Overview of free ma	athematical software., 2	, Learning outcomes:2,5	0	
	15.2. preliminary exam	n., 2n, Learning outcome	5:1,2,3,3,0		
Required materials	Basic: classroom, blac	khoard chalk			
Required materials	General nurnose comp	uter laboratory			
	Whiteboard with mark	ers			
	Overhead projector				
	a laptop				
Exam literature	Obavezna:				
	1. Autorizirani radni m	aterijal za auditorne vjež	be		
	B. Kovačić: Matemat	tički alati u elektrotehnic	i, elektronički udžbenik,	Tehničko veleučilište u Z	'agrebu, Zagreb, 2013.
	Additional literature				
	Additional literature:				
	1 MATLAB Documenta	tion-Version B0216a Th	e MathWorks Inc Natic	k 2016	
	2. M. Vrdoliak: Uvod u	MATLAB. (http://titan.fsb	hr/myrdolia/matlab)	K, 2010.	
	3. R. L. Spencer, M. Wa	are: Introduction to MATL	AB, Brigham Young Univ	ersity, 2011.	
	4. Getting started with	MATLAB , The Math Wor	ks, 2016.		
Students obligations	Performed all laborato	ry exercises.			
Knowledge	1. preliminary exam:				
evaluation during					
semester	eliminatory;				
	pass: 50% od total poi	nts;			
	2. preliminary exam:				
	aliminatary				
	eliminatory;	ato.			
	pass: 50% of total poir	its;			
	Final mark [.]				
	50% - 62% od total po	ints at both preliminary e	exams = sufficient (2)		
	63% - 74% od total po	ints at both preliminary e	exams = good (3)		
	75% - 89% od total po	ints at both preliminary e	xams = very good (4)		
	90% - 100% od total p	oints at both preliminary	exams = excellent (5)		
Knowledge	Practical exams				
evaluation after	L .				
semester	4 exam terms;	ntc			
	pass: 50% ou total pol	11.5.			
1	1				

	Ocjene: see final marks formed as the result of both preliminary exams.			
Student activities:	Aktivnost ECTS (Constantly tested knowledge) 2			
Remark	This course can be used for final thesis theme			
Prerequisites:	No prerequisites.			
ISVU equivalents:	85622;			
Proposal made by	Bojan Kovačić, M.Sc., senior lecturer, Luka Marohnić, B.Sc., lecturer (31.5.2018.)			

Code WEB/ISVU	23482/155992	ECTS	7.0	Academic year	2018/2019
Name	Mathematics I			•	
Status	1st semester - Underg	graduate profess	ional study in electrical e	ngineering (Redovni elektrotel	nnika) - obligatory course
Teaching mode	Lectures + exercises	(auditory + labo	ratory + seminar + meto	dology + construction)	45+45 (45+0+0+0)
	work at home				120
Teachers	Lectures:1. mr.sc. Boj	an Kovačić , viši	predavač		
	Lectures:2. Luka Marc	ohnić đa Malantusiži nas	ala a X		
	Lectures: 3. dr. sc. And	vić	edavac		
	Auditory exercises:mi	r.sc. Boian Kovač	ić . viši predavač		
	Auditory exercises: Lu	ika Marohnić			
	Auditory exercises:dr	. sc. Anđa Valent	viši predavač		
	Auditory exercises: lv	ica Vuković			
Course objectives	Students will understa	and the teaching	material and develop the	e skill required for solving the	relevant problems.
Learning outcomes:	1.ability to analyze th	e real function or	f a real variable. Level:6		
	2.ability to calculate s	sum, difference, j	product and quotient of c	omplex numbers written in so	me of three standard
	Bability to calculate dot, cross and scalar triple products of three vectors and give an interpretation of the obtained				
	results. Level:6				
	4.ability to calculate of	derivations of the	e real function of a real va	ariable . Level:6	
	5.calculate the limit o	f a sequence of r	real numbers and the limit	it of a real function of a real va	riable. Level:6
	6.ability to plot the gr	aph of the real re	eal function of a real variant	able . Level:6	in Longh C
	7.calculate sum, diffe	rence and produ-	ct of two real matrices, a	nd inverse of regular real matr	IX. Level:6
Methods of carrying	Ex cathedra teaching				
out lectures	Case studies				
	Modelling				
	Discussion				
	Questions and answe	rs			
	Uther The course material is	hoing procente	d in the classroom with d	stailed explanations and com	monts
Methods of carrying	Computer simulations	s being presenter			nents.
out auditory	Other	•			
exercises	The problems are being	ng solved on the	blackboard with detailed	explanations.	
Course content	1.Introduction to the	module. Basic pri	inciples of mathematic lo	gics. Mathematical induction,	3h
lectures	2.Complex numbers.	Euler formula., 3	h, Learning outcomes:2	-	
	3.Basic concept of ma	atrix algebra., 2h	, Learning outcomes:7		
	Determinants of orde	r at most 3., 1h,	Learning outcomes:7		
	4.Basic concept of ver	ctor algebra, 2h,	Learning outcomes:3	Learning outcomes:3	
	5.Concept of real fund	tions with one re	eal variable. Function nat	ural domain. Bijective function	and its inverse 3h.
	Learning outcomes:1				
	6.Polynomials. Polyno	mial roots. Basic	theorem of algebra., 3h,	Learning outcomes:1,6	
	7.Polynomial long div	ision. Rational fu	nctions. Zeros and poles	of rational function. Partial fra	ction decomposition of
	Rational function., 3h,	Learning outcom	nes:1,0 f a sequence of real num	hers Number e Limit of a real	function of a real variable
	Some basic limits 3h	. Learning outco	mes:5	bers. Number e. Limit of a real	function of a real variable.
	9.Continuous function	. Local and globa	al components of continu	ous function., 2h, Learning out	comes:1,5
	10.Derivation of a rea	l function of a re	al variable. Derivation ru	les. Getting some elementary	derivations of real
	functions., 3h, Learnii	ng outcomes:4	· · · · · · · · · · · · · · · · · · ·		
	11.Some derivation te	echniques., 3h, L differential calc	earning outcomes:4	and Cauchy theorem) 3	Learning outcomes:1.4
	13 Local and global e	xtrema of a real	function I Hospital-Berno	ulli rule Asymptotes 3h Lea	rning outcomes 1 4 5
	14.Derivative of order	2. Intervals of c	oncavity and convexity. I	nflection points. Examining a r	eal function of a real
	variable., 3h, Learning	g outcomes:1,4,6	5		
	15.Higher order deriv	atives. Concept o	of differentials., 3h, Learn	ing outcomes:1,4	
C	1 Decisionalizations of a				
course content	2 Forms of complex n	umbers. De Moiv	ics., 3n re formulas Euler formul	a 3h Learning outcomes:2	
auditor y	3.The basic concepts	of matrix algebra	a., 3h, Learning outcomes	s:3	
	4.The basic concepts	of vector algebra	a., 3h, Learning outcomes	5:3,7	
	5.Real functions of a i	real variable - ge	neral notion and domain.	Algebraic operations with fun	ctions. Inverse of a
	bijective function., 3h	, Learning outco	mes:1,7		
	7 Harmonic function	al functions. Dec	two barmonic functions	3h Learning outcomes:1.7	i, Learning outcomes:7
	8.1. preliminary exam	n. 2h. Learning ou	utcomes:1.2.3.7	Sh, Learning outcomes.1,7	
	Hyperbolic functions.,	1h, Learning ou	tcomes:1,7		
	9.Limit of a sequence	of real numbers	. Limit of a real variable f	unction., 3h, Learning outcom	es:5
	10.Derivation of real f	function with one	real variable. Derivation	rules., 3h, Learning outcomes	.:4
	11.The chain rule. De	rivation of implic	ite defined function. Deri	vation of parametric defined fi	unction., 3h, Learning
	12 Tangent and norm	al of plain curve	l Hospital-Bernoulli rule	3h Learning outcomes 1 4	
	13.Intervals of monot	onicity of real fur	nction. Finding the extrem	na of a real function. Mathema	itical modelling of simple
	optimization tasks., 3	h, Learning outco	omes:1,4,6		
	14.Intervals of concav	ity and convexit	y. Inflection points. Exam	ining a real function., 3h, Lear	ning outcomes:1,4,6
	15.Examining a real f	unction., 1h, Lea	rning outcomes:1,4,5,6		
	 preliminary exam., 	ZII, Learning out	.comes:1,4,5,6		

Required materials	Basic: classroom, blackboard, chalk					
	Whiteboard with markers					
	Overhead projector					
	not necessary					
Exam literature	Obavezna:					
	1. I. Vuković: Matematika 1: udžbenik za stručni studij elektrotehnike. Redak, 2015.					
	2. Autorizirani radni materilal za predavanja i vježbe.					
	3. B. Kovačić, L. Marohnić, T. Strmečki: Repetitorij matematike za studente elektrotehnike, priručnik, Tehničko					
	veleučilište u Zagrebu, 2016.					
	4. A. Aglić Aljinović et.al.: Matematika 1, Element, Zagreb, 2014.					
	5. S. Suljagić: Matematika 1, interna skripta, Tehničko veleučilište u Zagrebu, Zagreb, 2003.					
	Dodatna:					
	1. B. Apsen: Repetitorij elementarne matematike, Tehnička knjiga, Zagreb, 1994.					
	2. B. Apsen: Repetitorij više matematike 1, Golden-marketing - Tehnička knjiga, Zagreb, 2003.					
	3. 1. Bradić et.al.: Matematika za tehnološke fakultete, Element Zagreb, 2006.					
	4. I. Brnetic: Matematicka analiza 1, zadaci s pismenin ispita, Element, Zagreb, 2005.					
	5. B.P. Demidovic, Zadači i riješeni primjeri iz više matematike, Danjar, Zagreb, 1995.					
Charles the states of the states	0. v.r. Milliolski. Zbilka zauataka iz vise matemateke, remincka knjiga, Zagreb, 1972.					
Students obligations	/V% of class attendance of the total class number.					
Mar a seal a share	In case of less class attendance, valid excuse and submitted obligatory assignments are required.					
Knowledge	lotal 2 preliminary exams (numerical tasks).					
evaluation during						
semester	1. preliminary exam: eliminatory, pass: 50% of total points at the exam;					
	2. preliminary exam: eliminatory, pass: 50% of total points at the exam.					
	Final mark:					
	50% - 62% of total points at both preliminary exams = sufficient(2)					
	53% - 74% of total points at both preliminary example a 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); no obligation of oral exam.					
Knowledge	Written exam:					
evaluation after						
semester	4 examining terms:					
	pass: 50% od total points;					
	Written exam mark:					
	see final mark formed as the result of both preliminary exams;					
	Oral exam:					
	obligatory condition: passed written exam:					
	Dange of y condition passed white encoding					
	pass. contect answers at 50% of questions,					
	Oral exam mark:					
	maximum 1 mark better than mark of written exam.					
Student activities:	Aktivnost ECTS					
	(Written exam) 5					
	(Oral exam) 2					
Remark	This course can be used for final thesis theme					
Prerequisites:	No prerequisites.					
ISVU equivalents:	22240;					
Proposal made by	Bojan Kovačić, M.Sc., senior lecturer, Luka Marohnić, B.Sc., lecturer (31.5.2018.)					

Code WEB/ISVU	23957/184786	ECTS	8.0	Academic year	2018/2019	
Name	Mathematics II			•		
Status	2nd semester - Underg	raduate professional s	tudy in electrical engineer	ing (Redovni elektrotehn	ika) - obligatory course	
Teaching mode	Lectures + exercises (a	uditory + laboratory +	+ seminar + metodology +	- construction)	45+60 (60+0+0+0)	
	work at home				135	
Teachers	Lectures:1. Luka Maroh	nić	- ¥			
	Lectures:2. mr.sc. Boja Lectures:3. lvica Vukov	n Kovacić , visi predav ić	ac			
	Lectures:4. dr. sc. Anda	Valent viši predavač				
	Auditory exercises:mr.s	sc. Bojan Kovačić , viši	predavač			
	Auditory exercises: Luk	a Marohnić				
	Auditory exercises:dr.	Auditory exercises:dr. sc. Anđa Valent viši predavač				
Course objectives	Students will understar	d vukuvic	al and douglan the skill re-	auirad for colving the pro	bloms independently	
Learning outcomes	1 ability to integrate so	me elementary real fu			blems independently.	
Learning outcomes.	2.ability to examine convergence of number series and functions series using some basic convergence and divergence					
	tests. Level:6					
	3.ability to calculate th	e area of plane shape	and the arc length of plan	e curve and the volume	of solid of revolution	
	using integral calculus.	Level:6	a Taylor corias I ayoli 6.7			
	5. ability to expand the	value function defined	d on the segment into Fou	rier series., Level:6.7		
	6.classify and solve sor	ne basic ordinary diffe	rential equations of order	1. Level:6,7		
	7.ability to classiffy and	solve the first order l	inear (non)homogeneous (differential equation nam	nely, of the second order	
	with constant coefficier	nts. Level:6,7		, and a survey of the number of survey	unting Laural C	
	8.ability to make a simi	lanty/dimerence betwe	een the methods of solving	g ordinary differential eq	uations. Level:6	
Methods of carrying	Ex cathedra teaching					
out lectures	Case studies					
	Discussion					
	Questions and answers					
	The course material is l	peing presented in the	classroom with detailed e	explanations and comme	nts	
Methods of carrying	Computer simulations					
out auditory	Other					
exercises	The problems are being	solved on the blackb	oard with detailed explana	itions		
Course content	1.Primitive function. Sta	andard antiderivative	and indefinite integral., 2h	, Learning outcomes:1		
lectures	Some basic methods to	r indefinite integral ca for indefinite integral	culation: integration by in	substitution and partial	ig outcomes:1	
	Learning outcomes:1	for indefinite integral	calculation. Integration by	substitution and partial	integration, on,	
	3.Riemann sum for a gi	ven function. Definite	integral. Newton-Leibniz f	ormula., 3h, Learning ou	tcomes:1	
	4. Some basic application of definite integral: calculation of an area of a plane shape, a volume of a solid of revolution					
	and a length of a plane curve., 3n, Learning outcomes:3 5.Improper integrals3h. Learning outcomes:1					
	6.Number series. Basic	number series conver	.1 gence criteria 3h. Learnii	na outcomes:2		
	7.Function series. Powe	er series. Expanding so	me elementary function in	nto Taylor and MacLaurir	ı series., 3h, Learning	
	outcomes:2,4					
	8. I rigonometric polyno	mial. Trigonometric se	ries. Fourier series., 3h, Le	earning outcomes:2,5		
	10.Ordinary differential	equations of order 1.	Linear ordinary differentia	I equations of order 1., 3	h, Learning outcomes:6	
	11.Ordinary differential	equations of order 2.	Linear ordinary differentia	I equations of order 2 wi	th constant	
	coefficients., 3h, Learni	ng outcomes:7				
	12.Laplace transformat	ion (definition, charac	teristics, examples). Findir	ng Laplace transforms of	some elementary	
	13.Solving Cauchy prot	lems with linear ordin	ary differential equations	of order 2 with constant	coefficients using the	
	Laplace transforms., 3h	, Learning outcomes:8	3		5	
	14.Some examples of a	pplication of ordinary	differential equations of o	rder 1, 3h, Learning outc	omes:6	
	15.Some examples of a	ipplication of ordinary	differential equations of o	rder 2., 3n, Learning out	comes:7	
Course content	1.Primitive function. Sta	andard antiderivative	and indefinite integral. Inte	egration by integral table		
auditory	outcomes:1				, , J	
	Some basic methods fo	r indefinite integral ca	Iculation: integration by s	ubstitution and partial in	tegration., 2h, Learning	
	Outcomes:1 2 Integration of rationa	functions 2h Learni	na outcomes:1			
	Integration of irrational	functions., 2h, Learni	ng outcomes:1			
	3.Integration of trigono	metric functions., 2h,	Learning outcomes:1			
	Integration of hyperbol	c functions., 2h, Learr	ing outcomes:1			
	4.Definite integral. New Calculating definite inte	ton-Leibniz formula.,	Ih, Learning outcomes:1	Learning outcomes:1		
	5.Application of definite	e integral on the calcul	ating of an area of a plane	e shape., 4h, Learning ou	itcomes:3	
	6.Application of definite	e integral on the calcu	ating a volume of a solid of	of revolution., 2h, Learnin	ng outcomes:3	
	Application of definite i	ntegral on the calculat	ing a length of a plane cu	rve., 2h, Learning outcor	nes:3	
	1.1. preliminary exam.,	2h, Learning outcome	es:1,3			
	8.Improper integrals., 2	h. Learning outcomes	:1			
	Numerical series. Conv	ergent geometric serie	es., 1h, Learning outcomes	::2		
	Criteria of convergence	of numerical series.,	2h, Learning outcomes:2			
	9. Convergence criteria	or numerical series., 2	n, Learning outcomes:2			

	Finding Taylor and MacLaurin series of elementary functions, 2h, Learning outcomes:4
	10.Expanding certain periodic functions into Fourier series., 2h, Learning outcomes:5
	Fourier series of even and odd functions., 2h, Learning outcomes:5
	11.2. preliminary exam, 2n, Learning outcomes:1,2,4,5
	Homogeneous ordinary differential equations of order 1. h. Learning outcomes:6
	12.(Non)Homogeneous linear ordinary differential equations of order 1., 20. Learning outcomes:6
	Homogeneous linear ordinary differential equations of order 2 with constant coefficients., 2h, Learning outcomes:7
	13.Non-homogeneous linear ordinary differential equations of order 2 with constant coefficients., 2h, Learning
	outcomes:7
	The variation of contants method., $2h$, Learning outcomes: 7,8 14 Solving Couchy problems with linear ordinary differential equations of order 2 with constant coefficients using the
	Lanace transforms. An Learning outcomes 7.8
	15.Examples of applications of the ordinary differential equations of order 1 and 2., 2h, Learning outcomes:6,7,8
	3. preliminary exam, 2h, Learning outcomes:6,7,8
Required materials	Basic: classroom, blackboard, chalk
	Winiteboard with markers
	a lanton
Exam literature	Obavezna:
	1. l. Vuković: Matematika 2: udžbenik za stručni studij elektrotehnike, Redak, 2016.
	1. Autorizirani radni materijal za predavanja i auditorne vježbe
	2. B. Kovačić, L. Marohnić, T. Strmečki: Repetitorij matematike za studente elektrotehnike, priručnik, Tehničko
	veleučilište u Zagrebu, 2016.
	3. A. Aglič Aljinović elitali: Matematika 2, Element, zagreb, 2010. A. S. Sulicadé: Matematika 2, interna skripta Topničko volgučiličko u Zagrobu, Zagrob, 2003.
	4. 3. Juljayić. Matematika 2, interna skripta, rennicko veledcinste u zagrebu, zagreb, zoos.
	Dodatna:
	1 D. Annen, Denstiterii elementeren metersetile. Teksiile leijes. Zenste 1004
	1. B. Apsen: Repetitori viča matematika I. Goldan markating Tabnička knjiga, Zagreb, 1994.
	2. b. Apsen, Repetitorij više matematike 1, Golden matematike Daniar, Zagreb 1995.
	4. V.P. Minorski: Zbirka zadataka iz više matematike, Tehnička knjiga, Zagreb, 1972.
Students obligations	70% of class attendance of the total class number.
	In case of less class attendance, valid excuse and submitted obligatory assignments are requested.
Knowledge	Total 3 preliminary exams (numerical tasks).
evaluation during	1 preliminant event eliminatory page $E0%$ of total points at the event
semester	1. preliminary exam: eliminatory, pass: 50% of total points at the exam
	3. preliminary exam: eliminatory, pass: 50% of total points at the exam.
	Final mark:
	F_{0} (c) (c) total points at both preliminary evans - sufficient(2)
	50% - 52% of total points at both preliminary exams = someten(2)
	75% - 87% of total points at both preliminary exams = very good(4)
	88% - 100% of total points at both preliminary exams = excellent (5); no obligation of oral exam.
Knowledge	Written exam:
evaluation after	
semester	4 examining terms;
	Written exam mark:
	see final mark formed as the result of both preliminary exams;
	Oral exam:
	obligatory condition: passed written exam;
	pass: correct answers at 50% of questions;
	Oral ovam mark:
	maximum 1 mark better than mark of written exam.
Student activities:	Aktivnost ECTS
	(Constantly tested knowledge) 6
	(Oral exam) 2
Remark	I his course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22240;100995; Deien Keus Xić M Cell center leuke Mercheić D Cell Letterer (21.5.2010.)
rroposal made by	וסטומו הטימכוכ, או.סכ., Senior iecturer, בעגם אופרטוחוכ, B.SC., ופכנערפר (גב.ס.2018.)

Code WEB/ISVU	23662/169757	ECTS	5.0	Academic year	2018/2019				
Name	Mobile Radiocommu	nication							
Status	5th semester - Com	nunication and co	mputer technology (Reda	vni elektrotehnika) - elective c	ourse				
Teaching mode	ectures + exercises (auditory + laboratory + seminar + metodology + construction) $30+30(15+15+0+0)$								
, ,	work at home 90								
Teachers	Lectures:1. dr.sc Sonja Zentner Pilinsky prof.v.š.								
	Auditory exercises: 9	Auditory exercises: Siniša Lacković struč.spec.ing.el.							
	Auditory exercises:dr.sc Sonja Zentner Pilinsky prof.v.š.								
	Laboratory exercises: Siniša Lacković struč.spec.ing.el.								
Course objectives	students will be qualified to recognize and solve engineering problems related to mobile radio communications								
Learning outcomes:	1.ability to identify 2G, 3G, 4G network components as well as TETRA networks components. Level:6 2.ability to analyze specific features of air interfaces of public and functional mobile networks. Level:6 3.ability to calculate coverage area based on the loss calculations. Level:6								
	A ability to calculate the network efficiency. Level:6								
	5.ability to distinguish between 2G, 3G, 4G, Wi-Fi and Bluetooth air interface operation. Level:6								
	ô.test and analyse coverage parameters for specific 3G and/or 4G network area. Level:6								
Methods of carrying	Ex cathedra teaching	g							
out lectures	Guest lecturer								
	Discussion								
	Rucstions and answers The subject matter is presented by using drawings, tables and diagrams to make the material easier to understand. The								
	eacher tests the students continuously. Beside the blackboard it is necessary to have an LCD projector.								
Methods of carrying	Group problem solving								
out auditory	The problems of eac	The problems of each topic are solved on the blackboard with the participation of the students.							
exercises									
Methods of carrying	Laboratory exercises	s on laboratory equ	uipment Line e e une e e te unité Ner						
out laboratory	analysis of these and	d other measurem	ents in programs Nemo (no Handy A tool and the rest of	Tab exercises are				
Course content	1 Introduction free	space loss and pov	ver budget calculations	2h Learning outcomes:2					
lectures	2.Wi-Fi and Bluetoot	h Tehnologies - ba	sic architecture and char	acteristics, 2h, Learning outco	nes:1,2,6				
	3.basic GSM archited	cture, Geografical	area coverage model, 2h	, Learning outcomes:1,2,3					
	4.Multiple Access, G	SM packages and	time slots, 2h, Learning o	utcomes:2,5					
	5.Physical and logica	al channels in GSM	, Speech transmission in	GSM - voice coding, channel co	oding, interleaving and bit				
	6 GMSK modulation	Traffic manageme	ent and the efficiency coe	officient of the whole mobile ne	twork 2h Learning				
	outcomes:2,4	fruite multugerite	the und the emelency coe	inclent of the whole mobile he	cwork, 2n, Leaning				
	7.Micro location field	l structure, Dopple	r shift, coherence freque	ncy band, Rayleigh distributior	, 2h, Learning				
	outcomes:2								
	8.mprovement of re-	ceiving signal qual	ity using diversity techni	ques, intermodulations, freque	ncy hopping, 2h, Learning				
	9 GPBS and EDGE sv	outcomes:2,6							
	10.Basics of TETRA	2h. Learning outc	omes:1.2						
	11.UMTS system arc	hitecture, encodin	g and scrambling, 2h, Le	arning outcomes:1,2,5					
	12.UMTS - power co	ntrol, soft and soft	er handover, system cap	acity and coverage, 2h, Learnir	ig outcomes:1,2,5				
	13.HSDPA/HSUPA sy	stem, 2h, Learning) outcomes:1,2,5	systems 2h Learning outcom	0001.2.5				
	15.0FDMA and MIM) in LTE systems. 2	2h. Learning outcomes:2.	5	65.1,2,5				
		-,,	, ,						
Course content	1.antenna directivity	and gain, free sp	ace losses, 2h, Learning d	outcomes:2,3					
auditory	2.tramsmitter and receiver power, electric field strength and voltage at receivers side, 2h, Learning out								
	outcomes 2.3	eceiver power, elec	the new strength and vo	itage at receivers side, ARFCN	, Zh, Learning				
	4.C/I carrier to interf	erence signal ratio	at receivers side, 2h, Le	arning outcomes:3					
	5.First semiexam, 2I	n, Learning outcom	nes:2,3	-					
	6.C/I ratio, signal att	enuation due to va	arious EM wave signal po	larizations, 2h, Learning outcor	nes:3				
	7.C/I ratio with direc	t and one reflected	t ray, 2n, Learning outcoi	mes:2,3					
	9.traffic and system	efficiency calculat	ions. 2h. Learning outcor	nes:3.4					
	10.Second semiexar	n, 2h, Learning ou	tcomes:2,3,4						
	11.system efficiency	calculations, num	ber of MS in sector/cell/c	luster, MS density over specific	area, 2h, Learning				
	outcomes:3,4		lation Daviaiah diatuihuti	an of reactived strend Develop	funning of the				
	12.space diversity e	nnancement calcu	lation, Rayleigh distributi	on of received signal, Doppler	rrequency, zn, Learning				
	13.BER, allowed erro	ors and packet loss	es, 2h, Learning outcom	es:2					
	14.BER calculations	in TETRA system,	2h, Learning outcomes:2,	.3					
	15.Third semiexam,	2h, Learning outco	omes:2,3,4,6						
Course contont	1 Nomo HAndy A sh	aractoristics and m	assurament pessibilities	script construction 1h Loorn	ing outcomes: 1.2.5.6				
laboratory	2.introduction to New	mo Outdoor analys	is possibilities and data t	ransfer to Excel. 1h. Learning (outcomes:1,2,5,0				
	3.introduction to Ne	3. Sintroduction to Nemo Outdoor analysis possibilities and data transfer to Excel, 11, Learning outcomes: 1,2,3,0							
	4.introduction to Nemo Outdoor analysis possibilities and data transfer to Excel, 1h, Learning outcomes:1,2,5,6								
	5.3G signal coverage measurements, 1h, Learning outcomes:1,2,5,6 6.4G signal coverage measurements, 1h, Learning outcomes:1,2,5,6 7.3G measurements analysis, 1h, Learning outcomes:1,2,5,6 8.3G measurements analysis, 1h, Learning outcomes:1,2,5,6								
	9.4G measurements	analysis, 1h, Lear	ning outcomes:1,2,5,6						
•	•								

	 10.4G measurements analysis, 1h, Learning outcomes:1,2,5,6 11.measurements of end-user satisfaction with network performance, 1h, Learning outcomes:1,2,5,6 12.Nemo Outdoor analysis of end-user satisfaction with network performance measurements , 1h, Learning outcomes:1,2,5,6 13.Nemo Outdoor analysis of end-user satisfaction with network performance measurements , 1h, Learning outcomes:1,2,5,6 14.Excel analysis of end-user satisfaction with network performance measurements , 1h, Learning outcomes:1,2,5,6 15.Excel analysis of end-user satisfaction with network performance measurements , 1h, Learning outcomes:1,2,5,6
Required materials	Basic: classroom, blackboard, chalk Whiteboard with markers Overhead projector
Exam literature	Basic literature: 1. E. Zentner, Antene i radiosustavi,Graphis, Zagreb, 2001. 2. E. Zentner, S. Zentner, Radiomreže, poglavlje u knjizi Inženjerski priručnik IP Additional literature: 1. Elektrotehnika Elektronika, komunikacije i električni strojevi, školska knjiga, Zagreb, 2002, str. 865 916 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#5#10#50\$Mini-test#2#30#50\$Kolokvij, numeri zadaci#3#45#50\$Kolokvij, teorijska pitanja#3#15#50\$
Knowledge evaluation after semester	written exam (5 numerical exercises) and if passes (more then 50% correct) oral exam (3 theoretical questions)
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22313;155995;
Proposal made by	Professor Sonja Zentner Pilinsky, Ph.D.

Code WEB/ISVU	22861/22282	ECTS	5.0	Academic year	2018/2019			
Name	Numerical Mathematics	5	•	·				
Status	4th semester - Commu	nication and compute	er technology (Re	dovni elektrotehnika) - obligatory	course			
Teaching mode	Lectures + exercises (a	uditory + laboratory	+ seminar + met	odology + construction)	30+30 (30+0+0+0)			
	work at home				90			
Teachers	Lectures:1. dr. sc. Anđa	Valent viši predavač						
	Lectures:2. Ivica Vukov	lĆ ve Anđe Velentviči n	rodovoč					
	Auditory exercises: ur. s	a Vuković	reuavac					
Course objectives	Students should learn s	come basic methods (of numerical math	ematics necessary for solving end	ineering problems using			
	computers.			icinates necessary for solving en	jineering problems using			
Learning outcomes:	1.ability to analyze numerical errors made in calculating polynomial approximations. Level: 6							
-	2.ability to calculate different interpolation polynomials (Newton'sand Lagrange's polynomial) intended for calculating							
	approximations of emp	irical data set . Level	:6					
	3.ability to calculate an integral using different methods for numeric integration (trapezoidal and Simpson's rule).							
	4 ability to solve initial	value (Cauchy) probl	em using differen	t methods for numerical solution (ordinary differential			
	equations (Euler's method, modified Euler's method) and estimate the value and order. Level:6							
	5.ability to solve non-linear equation using different iterative methods for numerical solution of non-linear equations							
	(Newton's method, the interval halving method), and estimate the value and order of the error. Level:6							
	6.ability to solve a syst	em of linear equation	is using Gauss me	ethod. Level:6				
	Established and the solution of							
Methods of carrying	Ex cathedra teaching							
out lectures	Simulations							
	Modelling							
	Discussion							
	Questions and answers							
	Uther The course material is l	baing procented in th	a classroom with	detailed explanations and comme	onte			
Methods of carrying	Laboratory exercises	omputer simulations		detailed explanations and comme	1103.			
out auditory	Group problem solving							
exercises	Computer simulations							
	Other							
	The problems are being	solved on the black	board with detaile	ed explanations.				
Course content	1.Basic principles of eri	for analysis theory., 2	h, Learning outco	mes:1				
lectures	3. Numerical solving of	the systems of linear	equations. Gauss	eliminations, Gauss-Iordan algori	thm., 2h. Learning			
	outcomes:6				, 2, 2001g			
	4.Iteration method, Ga	uss-Seidel method., 2	h, Learning outco	imes:5				
	5.Numerical solving of	nonlinear equations.	Newton method.	Regula falsi method., 2h, Learning	outcomes:5			
	6.Standard iteration me	ethod. , 2h, Learning	outcomes:5					
	8.1 agrange interpolatio	on., 2h. Learning outc	omes:2					
	9.Newton interpolation	., 2h, Learning outcor	nes:2					
	10.Least squares meth	od., 2h, Learning out	comes:2					
	11.Numerical differenti	ation., 2h, Learning o	outcomes:4					
	12.Numerical integratio	on. Trapezoidal rule. E	rror analysis., 2h	, Learning outcomes:3				
	14.Numerical solution of	of ordinary differentia	l equations. Fuler	method., 2h. Learning outcomes:	4			
	15.Modified Euler meth	od. Runge-Kutta met	hod, 2h, Learning	outcomes:4				
		-	_					
Course content	1.Basics of theory of er	rors., 2h, Learning ou	itcomes:1					
auditory	2. Calculation of approx	kimate values of som	e elementary fun	ctions., 2h, Learning outcomes:1				
	3.Numerical solving sys	stems of linear equations	ions. Gauss eiimir	iations. Gauss-Jordan algorithm., 2 Imes:5	in, Learning outcomes:6			
	5.Numerical solving of	nonlinear equations.	Newton method.	Regula falsi method., 2h, Learning	outcomes:5			
	6.Standard iteration me	ethod., 2h, Learning c	outcomes:5	5				
	7.First preliminary exar	n., 2h, Learning outc	omes:1,5,6					
	8.Lagrange interpolatio	n., 2h, Learning outc	omes:2					
	9.Newton Interpolation	d 2h Learning outco	a., 2n, Learning o mes [.] 2	utcomes:2				
	11.Numerical differenti	ation., 2h, Learning outer	outcomes:4					
	12.Numerical integration	on., 2h, Learning outc	omes:3					
	13.Numerical integration	on. Numerical solution	n of ordinary diffe	rential equations. Euler method., 2	2h, Learning outcomes:3			
	14.Modified Euler, 2h, l	earning outcomes:3						
	15.Second preliminary	exam., 2n, Learning (outcomes:2,3,4					
Required materials	Basic: classroom, black	board, chalk						
	General purpose comp	uter laboratory						
	Whiteboard with marke	ers						
	Overhead projector							
	Special equipment	toachors						
Evam literatura	a apropior each of the							
	1. Josipa Pina Milišić, Aı	na Žgaljić Keko: Uvod	u numeričku ma	tematiku za inženjere, Element, Za	agreb, 2013.			
	2. Boris Čulina, Dragana Čulina: Elementarna numerička matematika uz pomoć MS Excela, Veleučilište Velika Gorica,							
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	Velika Gorica, 2010.							
	3. Autorizirani radni materijai za predavanja i vjezbe							
	Additional literature:							
	1. I. Ivanšić: Numerička matematika, Element, Zagreb 1998.							
	2. V. Benić: Primijenjena i numerička matematika, Veleučilište u Splitu, Split, 2003.							
	3. N. Ujević: Uvod u numeričku matematiku, Fakultet prirodoslovno-matematičkih znanosti i odgojnih područja							
	Sveučilišta u Splitu, Split, 2004.							
	 N.I. Danilina, N.S. Dubrovskaya: Computational Mathematics, Mir Publishers, Moscow 1988. 							
	5. F. Scheid, Numerical Analysis, McGraw-Hill, 1989. 6. B. Schuski, Numerička matamatika. Odla za matamatiku Svoučiličta u Osijaku. Osijak, 2004.							
	o. R. Schovski. Numericka matematika, Gujel za matematiku Sveucilista u Osijeku, Osijek, 2004.							
Students obligations	70% of class attendance of the total class number.							
Knowledge	Total 2 preliminary exams (numerical tasks).							
evaluation during								
semester	1. preliminary exam: eliminatory, pass: 50% of total points at the exam;							
	2. preliminary exam: eliminatory, pass: 50% of total points at the exam.							
	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).							
	Oral exam:							
	pass: correct answers at 60% of total number of questions;							
	Final mark is not more than 1 mark better than mark of written exam.							
	Instead of 2. preliminary exam and oral exam, seminar paper could be written in condition of 90% of total points got on 1. preliminary exam.							
Knowledge	Written exam:							
evaluation after								
semester	4 examining terms;							
	Written exam mark:							
	see final mark formed as the result of both preliminary exams;							
	Urai exam:							
	pass: correct answers at 60% of total number of questions:							
	Final mark is not more than 1 mark better than mark of written exam.							
Student activities:	Aktivnost ECTS							
	(Constantly tested knowledge) 4							
	(Oral exam) 1							
Remark	This course can be used for final thesis theme							
Prerequisites:	Students cannot pass this course unless they have passed Matematika II							
Proposal made by	Bojan Kovačić, M.Sc., senior lecturer; Luka Marohnić, B.Sc., lecturer							

Code WEB/ISVU	23103/104555	ECTS	5.0	Academic year	2018/2019			
Name	Object-oriented progra	mming	•					
Status	5th semester - Commu	nication and computer te	chnology (Redovni elekt	trotehnika) - elective cou	urse			
Teaching mode	Lectures + exercises (a	auditory + laboratory + s	eminar + metodology +	construction)	30+45 (0+30+0+15)			
	work at home		57	,	75			
Teachers	Lectures:1. Tomislav N	ovak mag. ing. inf. et cor	nm. techn.					
	Laboratory exercises: T	Fomislav Novak mag. ing	. inf. et comm. techn.					
	Construction exercises	: Tomislav Novak mag. in	ig. inf. et comm. techn.					
Course objectives	Introduction to basics o	of the object oriented pro	gramming, applications,	structure and design of	the source code, and			
-	pasic design patterns.							
Learning outcomes:	1.integrate object and	classes into composite p	rogram solutions. Level:	5,7				
	2.construct classes to s	solve given programming	problems. Level:6,7					
	A design of object origin	and procedural) and ob	ngeet onented programm	ing languages. Level:0,7				
	5 analysis of object orig	ented software systems.	level:6					
Methods of carrying	Ex cathedra teaching							
out lectures	Case studies							
	Demonstration							
	Simulations							
	Discussion	a is followed by interactiv	a domonstration of com	nutor cimulated example	ac Fraguent discussion			
	with students regarding	a examples and theory		puter simulated example	es. Frequent discussion			
Methods of carrying	l aboratory exercises o	n laboratory equipment						
out laboratory	Laboratory exercises of	computer simulations						
exercises	Computer simulations							
	Workshop							
	Writing programming s	olutions. There are 15 we	orkplaces in the lab and	the work is individual.				
How construction	Group problem solving							
exercises are held	Computer simulations							
	Interactive problem sol	lving						
	worksnop							
Course content	1 Introduction to Jova c	biact arianted programm	ing language 2h Learn	ing outcomosi2 2				
lectures	2 Operators branching	loops and switch case s	tructure 2h Learning o	utcomes 2 3				
	3.Methods. 2h. Learnin	a outcomes:1.2.3.4	cractare, 211, Leanning o					
	4.Objects and reference	es, 2h, Learning outcome	es:1,3,4					
	5.Arrays and ArrayList	collection, 2h, Learning c	outcomes:1,3,4					
	6.String manipulation,	2h, Learning outcomes:1	,3,4					
	7.Classes and encapsul	lation 1, 2h, Learning out	comes:1,2,3,4,5					
	8.Classes and encapsul	lation 2, 2h, Learning out	comes:1,2,3,4,5					
	10 Inheritance and poly	morphism 1, 211, Leanning	1000000000000000000000000000000000000					
	11.Constructors and ab	ostract classes. 2h. Learn	ing outcomes:1.2.4.5					
	12.Nested classes, 2h,	Learning outcomes:1,2,4	,5					
	13.Interfaces and enun	nerations, 2h, Learning o	utcomes:1,2,4,5					
	14.Data streams, 2h, L	earning outcomes:1						
	15.Common design pat	tterns, 2h, Learning outco	omes:4,5					
6	1 N							
Course content	1.No excercises							
laboratory	3 No excercises							
	4.Methods, branching.	loops and switch case st	ructure. 3h. Learning out	comes:1.2.3.4				
	5.Holiday		jj					
	6.Objects and reference	es, 3h, Learning outcome	es:1,3,4,5					
	7.Arrays and ArrayList	collection, 3h, Learning c	outcomes:1,3,4					
	8.String manipulation,	3h, Learning outcomes:1	,3,4					
	9.First test, 3h, Learnin	ig outcomes:1,2,3,4,5	comoci1 2 2 4 5					
	11 Inheritance and poly	unation, 511, Learning out	1,2,3,4,3					
	12.No excercises	ymorphism, sn, Leannig	J UULCOITIES. 1, 2, 3, 4, 5					
	13.Constructors, abstra	act and nested classes, 3	h, Learning outcomes:1,	2,4,5				
	14.Interfaces, enumera	ations, Data streams and	design patterns, 3h, Lea	rning outcomes:1,2,4,5				
	15.Second test, 3h, Lea	arning outcomes:1,2,3,4,	5					
Course content	1.No classes							
constructures	2.No classes							
	5.No classes							
	6.No classes							
	7.No classes							
	8.No classes							
	9.No classes							
	10.Giving construction	tasks to students, 3h, Le	arning outcomes:1,2,3,4	.,5				
	11.NO Classes	opening outcomest 2.2	1 5					
I	12.consultations, 3h, Le	earning outcomes:1,2,3,4	L,+					

	13.consultations, 3h, Learning outcomes:1,2,3,4,5 14.consultations, 3h, Learning outcomes:1,2,3,4,5 15.consultations, 3h, Learning outcomes:1,2,3,4,5
Required materials	Basic: classroom, blackboard, chalk General purpose computer laboratory Whiteboard with markers Overhead projector
Exam literature	Obavezna: 1. Cay S. Horstmann, Gary Cornell: Core Java - Volume I - Fundamentals 2. Interni materijali za vježbe i predavanja, autori Milan Draganić, Marijan Matić i Tomislav Novak. Dodatna: 1. Kathy Sierra, Bert Bates: SCJP Study Guide 2. Bruce Eckel: Thinking in Java
Students obligations	- attendance on 70% predavanja - attendance on all lab exercises - enough points from exit quiz on lab exercises - program (construction) task done with passing grade
Knowledge evaluation during semester	8 short answer tests on laboratory exercises - each test 5 points Sum1: 40 points (min 20 for signature) 2 preliminary exams - each of 30 points Sum2: 60 points (min 30 for grade 2) SUM: 100 points =90=5
Knowledge evaluation after semester	Exam is written on computer. Maximum of 100 points, with grade distribution: =90=5
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
Proposal made by	Tomislav Novak i Stipe Predanić 17.12.2013; based on Dražen Ćika, MScEE, lecturer, 8.5.2013

Code WEB/ISVU	23485/155996	ECTS	5.0	Academic year	2018/2019			
Name	Optical communications							
Status	6th semester - Commu	nication and computer te	echnology (Redovni elekt	trotehnika) - obligatory (course			
Teaching mode	Lectures + exercises (a work at home	auditory + laboratory + s	eminar + metodology +	construction)	30+30 (15+15+0+0) 90			
Teachers	Lectures:1. dr.sc Sonja Zentner Pilinsky prof.v.š. Auditory exercises:dr.sc Sonja Zentner Pilinsky prof.v.š. Laboratory exercises: Siniša Lacković struč.spec.ing.el. Laboratory exercises:dr.sc Sonja Zentner Pilinsky prof.v.š.							
Course objectives	students will acquire knowledge of basic components of optical communication systems and their links; be introduced to specific features of fiber optic information transmission and basic characteristics of all-optical network devices, be familiar with basic measuring equipment and its application.							
Learning outcomes:	2.ability to identify suitable components to establish an optical link. Level:6 2.ability to calculate optical link based on power and rise time calculations. Level:6 3.ability to test an optical link using OTDR. Level:6 4.ability to plan optical link (choose fiber and active equipment). Level:6 5.inspect optical connectors and solve problem of invalid connector. Level:6							
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Discussion Questions and answers Other Lectures are presented at the blackboard with an additional help of PowerPoint presentations with various graphs and examples built into them (LCD projector needed). Presentations of new technologies and products given by experts							
Methods of carrying out auditory exercises	Group problem solving Student are encourage	d to solve various numer	ical examples and tasks	by them self				
Methods of carrying out laboratory exercises	Laboratory exercises of Laboratory exercises, c Lab exercises will be pa and result analysis alor	n laboratory equipment computer simulations artially on computers and ne.	d partially on measureme	ent equipment, students	s do allmeasurements			
Course content lectures	 I.Introduction to optical communications - fibers and optical cables, fibers capacity and possibilities of optical network transmission, definition of LASER and coherent EM wave radiation, 3h, Learning outcomes:1 Optical sources lasers and laser diodes (LD), basic operating modes, characteristics and examples , 3h, Learning outcomes:1 Optical sources lasers and laser diodes (LD), basic operating modes, characteristics and examples , 3h, Learning outcomes:1 Optical sources lasers and laser diodes (LD), basic operating modes, characteristics and examples , 3h, Learning outcomes:1 Semiconductor photodetectors PIN and APD, introduction to fiber - SM and MM fibers, 3h, Learning outcomes:1 Fiber standards (SM, MM,POF, PCF), attenuation, dispersion (chromatic), loss, nonlinear effects (SPM, XPM, FWM, SBS, SRS) , 3h, Learning outcomes:1 Fiber standards (SM, MM,POF, PCF), attenuation, dispersion (chromatic), loss, nonlinear effects (SPM, XPM, FWM, SBS, SRS) , 3h, Learning outcomes:1 Fiber standards (SM, MM,POF, PCF), attenuation, dispersion (chromatic), loss, nonlinear effects (SPM, XPM, FWM, SBS, SRS) , 3h, Learning outcomes:1 Planar dielectrical waveguide basic principles, propagation modes. Integrated optical circuits operating modes and examples , 3h, Learning outcomes:1 ODTDR, fiber cables, 3h, Learning outcomes:1,3 Optical cables - standards, ducts, DTH channels, connectors and adapters , 3h, Learning outcomes:1,4 Receiver sensitivity, receiver noise, receiver circuits , 3h, Learning outcomes:1,4 Receiver sensitivity, receiver noise, receiver circuits , 3h, Learning outcomes:1,4 Optical link power calculation with and without EDFA, rise-time , 3h, Learning outcomes:1,4 Auxon network devices, introduction to FTX technologies, 3h, Learning outcomes:1,4 HwDM network devices, introduction to FTX technologies, 3h,							
Course content auditory	 1.no numerical exercises 2.LASERs, 1h, Learning outcomes:1 3.LED, 1h, Learning outcomes:1 4.optical detectors, 1h, Learning outcomes:1 5.First semiexam, 2h, Learning outcomes:1 6.no numerical exercises 7.fibers - NA, acceptance angle, number of modes, SM condition, 1h, Learning outcomes:1 8.fiber - dispersion and losses, 1h, Learning outcomes:1 9.slab waveguides, 1h, Learning outcomes:1,2,3 11.no numerical exercises 12.OTDR, receiver S/N calculations, 1h, Learning outcomes:2,3 13.receiver S/N calculations, designing the optical link power budget with and without EDFA, rise-time , 1h, Learning outcomes:3,4 14.Designing the optical link power budget with and without EDFA, rise-time , 1h, Learning outcomes:3,4 15.Third semiexam, 2h, Learning outcomes:1,2,3,4 							
Course content laboratory	1.no lab exercises 2.no lab exercises 3.Basic HeNe laser para 4.Connectorizing, 2h, L 5.WWDM, 1h, Learning	ameters and difraction g earning outcomes:1 outcomes:1	ratting, 2h, Learning out	comes:1				

	6.no lab exercises 7.PON link OTDR measurements, 2h, Learning outcomes:4 8.OTDR measurements, 2h, Learning outcomes:3 9.Computer analysis of OTDR measurements, 2h, Learning outcomes:3
	10.A digital link, 2n, Learning outcomes:2
	13 Marchanding losses 2h Learning outcomes: 1.2.3
	14. no la exercises
	15.no lab exercises
Required materials	Basic: classroom, blackboard, chalk
	Special purpose laboratory
	Whiteboard with markers
	Overhead projector
	Special equipment
	Lab exercises will be partially on computers and partially on measurement equipment, students do allmeasurements
	and result analysis alone.
Exam literature	Basic literature:
	Billeske's predavanja C. P. Agroup Eliber Ontic Communication Systems, 2rd ed. John Wiley Sans Inc. 2002
	G.P.Agrawai.riber Optic Communication Systems, sid ed, john wheysons ind 2002
	A Gizard et all - Guide to WDM Technology and Testing EXEQ 2008
1	A Girard' ETTX PON Technology and Testing, EXEQ 2005 ill novie izdanie
	A.Girard: FTTx PON Technology and Testing, EXFO 2005 ili novije izdanje
Students obligations	A.Girard: FTTx PON Technology and Testing, EXFO 2005 ili novije izdanje finished practical work, regular class attendance and passed mini test
Students obligations Knowledge	A.Girard: FTTx PON Technology and Testing, EXFO 2005 ili novije izdanje finished practical work, regular class attendance and passed mini test Redovitost pohaa#5#10#50\$Mini-test#2#30#40\$Kolokvij, numeri zadaci#3#30#50\$Kolokvij, teorijska
Students obligations Knowledge evaluation during	A.Girard: FTTx PON Technology and Testing, EXFO 2005 ili novije izdanje finished practical work, regular class attendance and passed mini test Redovitost pohaa#5#10#50\$Mini-test#2#30#40\$Kolokvij, numeri zadaci#3#30#50\$Kolokvij, teorijska pitanja#3#15#50\$Prakti rad#30#15#50\$
Students obligations Knowledge evaluation during semester	A.Girard: FTTx PON Technology and Testing, EXFO 2005 ili novije izdanje finished practical work, regular class attendance and passed mini test Redovitost pohaa#5#10#50\$Mini-test#2#30#40\$Kolokvij, numeri zadaci#3#30#50\$Kolokvij, teorijska pitanja#3#15#50\$Prakti rad#30#15#50\$
Students obligations Knowledge evaluation during semester Knowledge	A.Girard: FTTx PON Technology and Testing, EXEO 2005 finished practical work, regular class attendance and passed mini test Redovitost pohaa#5#10#50\$Mini-test#2#30#40\$Kolokvij, numeri zadaci#3#30#50\$Kolokvij, teorijska pitanja#3#15#50\$Prakti rad#30#15#50\$ written exam, upon copletion of more then 50% oral exam
Students obligations Knowledge evaluation during semester Knowledge evaluation after	A.Girard: FTTx PON Technology and Testing, EXFO 2005 ili novije izdanje finished practical work, regular class attendance and passed mini test Redovitost pohaa#5#10#50\$Mini-test#2#30#40\$Kolokvij, numeri zadaci#3#30#50\$Kolokvij, teorijska pitanja#3#15#50\$Prakti rad#30#15#50\$ written exam, upon copletion of more then 50% oral exam
Students obligations Knowledge evaluation during semester Knowledge evaluation after semester	A.Girard: FTTx PON Technology and Testing, EXFO 2005 ili novije izdanje finished practical work, regular class attendance and passed mini test Redovitost pohaa#5#10#50\$Mini-test#2#30#40\$Kolokvij, numeri zadaci#3#30#50\$Kolokvij, teorijska pitanja#3#15#50\$Prakti rad#30#15#50\$ written exam, upon copletion of more then 50% oral exam
Students obligations Knowledge evaluation during semester Knowledge evaluation after semester Remark	A.Girard: FTTx PON Technology and Testing, EXFO 2005 ili novije izdanje finished practical work, regular class attendance and passed mini test Redovitost pohaa#5#10#50\$Mini-test#2#30#40\$Kolokvij, numeri zadaci#3#30#50\$Kolokvij, teorijska pitanja#3#15#50\$Prakti rad#30#15#50\$ written exam, upon copletion of more then 50% oral exam This course can be used for final thesis theme
Students obligations Knowledge evaluation during semester Knowledge evaluation after semester Remark Prerequisites:	A.Girard: FTTx PON Technology and Testing, EXFO 2005 ili novije izdanje finished practical work, regular class attendance and passed mini test Redovitost pohaa#5#10#50\$Mini-test#2#30#40\$Kolokvij, numeri zadaci#3#30#50\$Kolokvij, teorijska pitanja#3#15#50\$Prakti rad#30#15#50\$ written exam, upon copletion of more then 50% oral exam This course can be used for final thesis theme No prerequisites.
Students obligations Knowledge evaluation during semester Knowledge evaluation after semester Remark Prerequisites: ISVU equivalents:	A.Girard: FTTx PON Technology and Testing, EXFO 2005 finished practical work, regular class attendance and passed mini test Redovitost pohaa#5#10#50\$Mini-test#2#30#40\$Kolokvij, numeri zadaci#3#30#50\$Kolokvij, teorijska pitanja#3#15#50\$Prakti rad#30#15#50\$ written exam, upon copletion of more then 50% oral exam This course can be used for final thesis theme No prerequisites. 22308;

Code WEB/ISVU	23965/184797	ECTS	4.0	Academic year	2018/2019		
Name	Personal computers in	electrical engineering					
Status	1st semester - Undergr	raduate professional stud	ly in electrical engineerir	ng (Redovni elektrotehni	ka) - obligatory course		
Teaching mode	Lectures + exercises (a	auditory + laboratory + s	seminar + metodology +	construction)	15+30 (0+30+0+0)		
-	work at home				75		
Teachers	Lectures:1. Trpimir Alaj	jbeg Salvala nradava š					
	Lectures: dr. sc. Miaden	i Sokele predavac					
	Laboratory exercises: F	Robert Herčeki					
	Laboratory exercises: A	Andrea Jurman					
	Laboratory exercises: I	va Lemac					
Course objectives	Obtaining comprehensi	ion of IT technology, terr	ninology and basic struc	ture and architecture of	personal computers.		
	Understand the data fo	ormats. Become familiar	with particular software	specific for electronic de	sign automation (EDA).		
	peverop the ability of task/algorithm solving via pseudo code.						
Learning outcomes:	1. ability to identify hardware and software components which make a personal computer. Level:6 2 ability to estimate which peripheral units can be optimally used for particular applications. Level:6 7						
	3.create task solving algorithm. Level:6,7						
	4.draw a flowchart diagram. Level:6						
	5.ability to propose a s	ofware application which	n is used in various engin	eering applications. Lev	el:6,7		
	6.develop the ability to) use the EDA program pa	ackage; draw electrical s	chemes, use component	: library and measuring		
	instruments. Simulation	n of electrical and electro	onics circuit operation. Le	evel:6,7			
Methods of carrying	Ex cathedra teaching						
out lectures	Case studies						
	Demonstration						
	Simulations						
	Discussion						
	Questions and answers	; aro available to student	s on the relevant web na	acc and in the LMS Mid	torm oxame will be hold		
	during laboratory exerc	cises as separate compu	ter tests via LMS.	iges and in the LMS. Mid			
Methods of carrving	Laboratory exercises, c	computer simulations					
out laboratory	Group problem solving	··· •					
exercises	Computer simulations						
	Each student works ind	lividually, practice the w	ork on a computer using	written instructions rela	ting to the specific		
Course content	exercise and with the r	reip of the teacher. Midte	erm exams for each exer	cise will be neid via LMS	mination LMC		
lectures	introduction 2h Lear	ning outcomes 1 2 3 4 5	6	ing, assessment and exa			
	2.Types and history of	computers, IT terminolog	gy, application for variou	s engineering purposes.	, 2h, Learning		
	outcomes:1,2,5			5 51 1			
	3.Basic structure of a c	computer, computer arch	itecture., 2h, Learning o	utcomes:1,2,6			
	4.Computer programs a	and application., 2h, Lea	rning outcomes:1,2,3,5				
	6.Programming, pseud	arning outcomes:1,2,3,4	arning outcomes:1.2.3.4	5			
	7.Input and output circ	uits and devices. Electro	nic design automation so	oftware (EDA)., 2h, Learr	ing outcomes:1,2,5,6		
	8.Electronic design aut	omation software., 1h, L	earning outcomes:5,6		-		
	9.no classes						
	10.no classes						
	12.no classes						
	13.no classes						
	14.no classes						
	15.no classes						
Course contout	1						
laboratory	2 no classes						
laboratory	3.Introduction: exercise	e plan, organization, ass	essment and examination	n. LMS introduction. TVZ	online services. Basics		
	of work with an operati	ing system - GUI and con	nmand line interface., 3h	, Learning outcomes:1,2	-		
	4.Work with text proce	ssing programs., 3h, Lea	rning outcomes:1,2,5				
	5.No classes due to hol	liday (1.11) oot programs - 3h. Loarni	na outcomos:1 2 5				
	7. Quizzes-practical wor	rk in word processing an	d spreadsheet programs.	Pseudocode algorithms	and flowcharts 3h.		
	Learning outcomes:1,2	2,3,4,5	a opreadorieet programo				
	8.Pseudocode algorithr	ms and flowcharts. 1st m	idterm exam., 3h, Learn	ing outcomes:1,2,3,4,5			
	9.Quiz-practical work in	n drawing flowchart and	its purpose. EDA interfac	e, components library.,	3h, Learning		
	OUTCOMES: 1, 2, 3, 4, 5, 6	truments in EDA 2nd mi	dterm exam 3h Learnir	a outcomes 1 2 3 4 5 6			
	11.Ouiz-practical work	in EDA. DC circuits in ED	A., 3h. Learning outcom	es:5.6			
	12.no classes		·,,	,-			
	13.AC circuits in EDA.,	3h, Learning outcomes:5	5,6				
	14.EDA-overall practici	ng. Quiz-practical work in	n EDA., 3h, Learning out	comes:5,6			
	15.00 Classes						
Required materials	Basic: classroom, black	vboard, chalk					
	General purpose comp	uter laboratory					
	Overhead projector						
	1						

Exam literature	Osnovna: 1. Pisani materijali s predavanja i laboratorijskih vježbi, dostupni u LMS Mooodle. 2. Baez-Lopez, D.; Guerrero-Castro, F.; CIRCUIT ANALYSIS WITH MULTISIM, Morgan Claypool Publishers, 2011, San					
	Rafael, California, USA					
	 Nacionalni portal za učenje na daljinu Nikola Tesla https://tesla.carnet.hr algoritmi, dijagrami toka 					
	Dodatna:					
	4. Grundler, D.; Kako radi računalo, Pro-mil, Varaždin 2004.					
	5. Bulić, B.; Proračunske tablice, SRCE, Zagreb, 2016.					
Students obligations	- attendance on all laboratory exercises (one absence is allowed)					
	- achieving at least 46% of total points from laboratory exercises quizzes					
Knowledge	2 x midterm exam, 50% total points for passing grade.					
evaluation during	5 x quizzes - practical work/skill in software, each 3 points, achieving at least 46% of total points from laboratory					
semester	exercises quizzes is student obligation.					
Knowledge	-Written part of the exam test via LMS.					
evaluation after	-Verbal part of the exam: conversation with the teacher					
semester						
Student activities:	Aktivnost ECTS					
	(Classes attendance) 1					
	(Practical work) 2					
	(Oral exam) 1					
Remark	This course can be used for final thesis theme					
Prerequisites:	No prerequisites.					
ISVU equivalents:	22242;					
Proposal made by	Trpimir Alajbeg, Master of Electrical Engineering					

Code WEB/ISVU	23961/184793	ECTS	6.0	Academic year	2018/2019			
Name	Physics							
Status	1st semester - Undergr	aduate professional stud	dy in electrical engineerir	ig (Redovni elektrotehni	ka) - obligatory course			
Teaching mode	Lectures + exercises (a	uditory + laboratory +	seminar + metodology +	construction)	45+30 (30+0+0+0)			
	work at home				105			
Teachers	Lectures:1. prof.vis.šk.	lvica Levanat						
	Lectures:2. Alemka Kna	app						
	Auditory exercises: Val	entino jadrisko mka Knann						
	Auditory exercises: Are	na Radatović						
	Auditory exercises: Dia	na Šaponja-Milutinović o	lipl.ing.fizike, pred.					
Course objectives	Students will understar	nd physical phenomena	and quantities used in the	e study of electrical eng	ineering described			
	within a broader contex	kt of the basic laws of ph	nysics. (The topics studied	d in details in the other o	compulsory core			
	modules are not includ	ed.)						
Learning outcomes:	a ability to calculate simple rectilinear and circular motions and projectile motion. Level:6							
	3 ability to calculate tra	3.ability to calculate translational acceleration of a body acted upon by forces and simpler examples of angular						
	acceleration. Level:6							
	4.ability to correlate wo	ork of forces with change	es in kinetic and potentia	l energy of a body. Leve	1:6,7			
	5.ability to analyze sim	ple motions in gravitation	onal field (satellites). Leve	el:6				
	6.ability to distinguish I	petween classical mecha	anical description and spe	cial relativity . Level:6				
	8.ability to relate Bohr	s model of atom with gu	alitative description of el	.o ectronic shells and banc	ls. Level:6.7			
	9.ability to calculate sir	mpler examples of emiss	sion/absorption of photon	s and photoelectric effe	ct . Level:6			
	10.ability to relate the	knowledge of the nucleu	is structure to radioactive	e decay. Level:6,7				
Methods of carrying	Ex cathedra teaching							
out lectures	Case studies							
	Discussion							
	Questions and answers	i						
	Other							
	Oral presentation, inclu	Iding communication wil	h students; their active p	participation is stimulate	d during formulation			
	demonstrations and by	i iaws. Physical phenom	ena and laws are illustrations a	ed by familiar examples and their derivations are	fully outlined on the			
	blackboard, illustrated	by sketches and diagram	ns as appropriate.		Tany bacined on the			
Methods of carrying	Group problem solving	,						
out auditory	Discussion, brainstorm	ing						
exercises	Interactive problem sol	ving						
	Other Solving simpler probler	ns in the tenics covered	by the lectures in order	to increace understandi	ng of physical quantities			
	poiving simpler problems in the topics covered by the lectures, in order to increase understanding of physical quantities and their interrelations. Calculations include numerical values which appear in technical applications. Teacher explains							
	and illustrates the proc	edure, students solve th	e problems on the black	board and in their noteb	ooks.			
Course content	1.Physical quantities ar	nd units., 2h, Learning o	utcomes:1,2					
lectures	Polynomial derivative.,	1h, Learning outcomes:	1,2					
	2.Polynomial integratio	n, definite integral., 1h,	Learning outcomes:1,2					
	3. Motion along curve a	nd circle 3h. Learning outco	outcomes:1.2					
	4.Newton axioms, mon	nentum., 3h, Learning ou	itcomes:3					
	5.Work, power and ene	rgy., 3h, Learning outco	mes:4					
	6.Rigid body rotation.,	3h, Learning outcomes:	2,3					
	8 Relativity of motion	inertial forces 2h Learning ou	comes:5					
	The absolute and great	est speed c., 1h, Learnin	ng outcomes:6					
	9.Einstein special theor	y of relativity., 3h, Lear	ning outcomes:6					
	10.Harmonic oscillation	is., 3h, Learning outcom	es:7					
	11. Wave optics, photo	electric effect., 3n, Lear ave properties of particle	ning outcomes:8,9	ac·8.0				
	13.Electron shells 1h.	Learning outcomes:8	es., 51, Learning outcome	23.0,5				
	Semiconductors., 2h, L	earning outcomes:8						
	14.Elementary particle	s, nuclear structure., 2h,	Learning outcomes:10					
	Unstable nuclei., 1h, Le	earning outcomes:10	rning outcomes:10					
	15.Radioactive decay,	nuclear energy., 511, Lea	ining outcomes.10					
Course content	1.Rectilinear motion., 2	h, Learning outcomes:1						
auditory	2.Rectilinear motion., 2	h, Learning outcomes:1						
	3.Projectile motion., 2h	, Learning outcomes:1,2						
	4.Circular motion., 2h,	Learning outcomes:1,2						
	5.Newton axioms., 2n, 6 Newton axioms 2h	Learning outcomes:3						
	7.Work and power. ene	rgy., 2h, Learning outco	mes:4					
	8.Collisions., 2h, Learni	ng outcomes:4						
	9.1. partial exam, 2h, L	earning outcomes:1,2,3	,4					
	10.Rigid body rotation.	, 2h, Learning outcomes	:2,3					
	11.Motion in gravitation	nai field., 2h, Learning o	utcomes:5 tcomes:6					
	13.Bohr model of atom	., 2h, Learning outcome	5:8					
l		,, <u></u> ,						

	14.Photoelectric effect., 1h, Learning outcomes:9 Radioactivity., 1h, Learning outcomes:10 15.2. partial exam, 2h, Learning outcomes:5,6,7,8,9,10					
Required materials	Basic: classroom, blackboard, chalk Whiteboard with markers Overhead projector					
Exam literature	Basic literature: 1. Levanat, I., Fizika za TVZ: Kinematika i dinamika, TVZ, Zagreb, 2010; 2. Knapp, A., Zbirka riješenih zadataka iz fizike, TVZ, Zagreb, 2013 Additional literature: 1. Young and Freedman, University Physics, Addison Wesley, San Francisco, 2007; 2. Kulišić P. Mehanika i toplina, Školska knjiga, Zagreb, 2005					
Students obligations	none					
Knowledge evaluation during semester	Two partial exams, each with numerical problems and theoretical questions. Minimum to pass each partial exam: theory 40%, problems 50%. For attending lectures up to 10% of theory maximum added.					
Knowledge evaluation after semester	Full exam, with numerical problems and theoretical questions. Minimum to pass: 40% problems and 40% theory.					
Student activities:	AktivnostECTS(Written exam)3(Oral exam)3					
Remark	This course can not be used for final thesis theme					
Prerequisites:	No prerequisites.					
ISVU equivalents:	22239;					
Proposal made by	lvica Levanat, prof.v.šk, 14. 01. 2014					

Code WEB/ISVU	22860/22280	ECTS	5.0	Academic year	2018/2019		
Name	Power Electronics						
Status	4th semester - Electrica	al power engineering (Re	edovni elektrotehnika)) - obligatory course4th se	mester - Control and		
	computer engineering i	in automation (Redovni	elektrotehnika) - elect	ive course			
leaching mode	Lectures + exercises (a work at home	iuditory + laboratory +	seminar + metodolog	y + construction)	30+30 (30+0+0+0) 90		
Teachers	Lectures:2. Željko Stoja	anović			•		
	Auditory exercises: Nev	/en Cobanov					
Course objectives	students will acquire kr	nowledge in nower elect	ronics				
Learning outcomes:	1.ability to classify elec	trical components acco	rding to their conversi	on properties . Level:6.7			
, , , , , , , , , , , , , , , , , , ,	2.ability to distinguish b	between particular type	s of converters. Level:	6			
	3.ability to analyze bas	ic DC converter circuits.	Level:6				
	5.ability to analyze bas	fluence of rectifier on m	iains. Level:6				
	6.ability to analyze bas	6.ability to analyze basic inverter circuits. Level:6					
Methods of carrying	Ex cathedra teaching						
out lectures	Case studies						
	Demonstration						
	Discussion						
	All topics are explained	and illustrated by mea	ns of characteristic ex	amples.			
Methods of carrying	Group problem solving						
out auditory	Discussion, brainstormi	ing					
exercises	Solving problems and d	discussion of results. Vis	it to the power electro	nic factory "Kon"			
Course content	1.Power converters. Ba	sic properties of power	converters , 2h, Learn	ing outcomes:1			
lectures	2.Concept of a power co	onversion device. Const	itutive devices and to	pology of power converter	s, 2h, Learning		
	3.Power semiconductor	r devices. 2h. Learning c	outcomes:1.3.4.5				
	4.Development of unco	ontrolled switches, unilat	eral current switches,	unilateral voltage switche	es, bilateral switches, 2h,		
	Learning outcomes:1,3,	,4,5					
	6.One-guadrant direct a	and indirect dc converte	ers., 2h. Learning outc	omes:1.2.3			
	7.Isolated DC converter	rs, 2h, Learning outcom	es:1,2,3	5			
	8.Four-quadrant DC cor	nverters, 2h, Learning o	utcomes:1,2,3				
	9.Rectifiers. Uncontrolle 10.Uncontrolled rectifie	ed rectifiers, 2n, Learnin ers, Single phase bridge	rectifier with RL load.	2h. Learning outcomes:1	2.4		
	11.Uncontrolled rectifie	ers. Single phase bridge	rectifier with RL and F	C load., 2h, Learning outc	omes:1,2,4		
	12.Uncontrolled rectifie	ers. Three phase rectifier	r with RL load., 2h, Lea	arning outcomes:1,2,4			
	13.Influence of rectifier	's on AC network and its e-stiff inverters 2h Tear	suppresion , 2h, Lear ming outcomes:1 2 5	ning outcomes:1,2,4			
	15.Reduction of input c	urrent harmonic, 2h, Le	arning outcomes:1,2,5	5			
Course content	1. Visit to the power ele	ctronics factory . 2h. Le	arning outcomes:2				
auditory	2.Repetition: commutat	tion laws, average and e	effective value, 2h, Lea	arning outcomes:3,4,5			
	3.Power converters. Ba	sic properties of power	converters , 2h, Learn	ing outcomes:1	hilataral awitahan 2h		
	Learning outcomes:1.3	.4.5	eral current switches,	unilateral voltage switche	s, Dildlerdi Switches, 211,		
	5.DC converters, 2h, Le	arning outcomes:1,2,3					
	6.One-quadrant direct of	dc converters. , 2h, Lear	ning outcomes:1,2,3	amaci 1 2 2			
	8.Isolated DC converter	rs, 2h, Learning outcom	es:1,2,3	JIIIe5.1,2,5			
	9. Four-quadrant DC co	nverters, 2h, Learning c	outcomes:1,2,3				
	10.Isolated DC converte	ers, 2h, Learning outcon	nes:1,2,4 nes:1 2 4				
	12.Uncontrolled rectifie	ers , 2h, Learning outcor	nes:1,2,4				
	13.Influence of rectifier	s on AC network and its	suppresion , 2h, Lear	ning outcomes:1,2,4			
	14.Autonomous voltage	e-stiff inverters, 2n, Lear e-stiff inverters, 2h, Lear	rning outcomes:1,2,5				
Required materials	Basic: classroom, black	board, chalk					
	whiteboard with marke	!rs					
Exam literature	Basic literature:						
	1. I. Flegar, Elektronički	i energetski pretvarači,	Kigen, Zagreb, 2010				
	Additional literature: 1. K. Thorborg, Power e	ectronics. Prentice Hall	New York, 1988				
	2. R. W. Erickson, D. Ma	aksimovic, Fundamental	s of power electronics	, Springer, 2001			
	3. I. Flegar, Sklopovi en	iergetske elektronike, G	raphis, Zagreb, 1996				
Students obligations	Minimum of 25% of tota	al points achieved on at	tendance and partial (exams.			
Knowledge	Attendance-maximum	10% of points on partial	exams.				
evaluation during	Two partial exams.	hout 00%) and these (-	20%				
semester	ivumencal problems (at	Jour 60%) and theory (a	100UL 20%).				

	Grades: - 0 - 50% #8594; 1 , not passed - 50 - 64% #8594; 2 , passed - 64 - 80% #8594; 3 , passed - 80 - 90% #8594; 4 , passed - 90 - 100% #8594; 5 , passed					
Knowledge evaluation after semester	Written exam and oral exam. Minimum of 50% on written exam is requred for oral exam. Optional seminar work.					
Student activities:	Aktivnost (Constantly tested knowledge) (Classes attendance)	ECTS 4 1				
Remark	This course can be used for final thesis theme					
Prerequisites:	No prerequisites.					
Proposal made by	Željko Stojanović					

Code WEB/ISVU	22862/22284	ECTS	6.0	Academic year	2018/2019		
Name	Power Plants Construc	tion					
Status	5th semester - Electric	al power engineering (Redovni elektrotehnika	a) - elective course5th ser	nester - Control and		
	computer engineering	in automation (Redovn	ii elektrotehnika) - eleo	ctive course			
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) 45+45 (0+45+0+0) work at home 90						
Teachers	Lectures:1. mr.sc. Dav Lectures: Tomislav Špo Laboratory exercises:r Laboratory exercises: Laboratory exercises:	or Gadže oljarić d. i. e., v. pred. nr.sc. Davor Gadže Mario Ličanin Tomislav Špoljarić d. i.	e., v. pred.				
Course objectives	students will acquire k	nowledge required for	the electric power plar	nt design and constructior]		
Learning outcomes:	1.ability to analyze the energy requirements of simple facilities. Level:6 2.ability to calculate the elements of overload protection of simple facilities. Level:6 3.ability to calculate the elements of protection against indirect contact of simple facilities. Level:6 4.ability to calculate cooling of the simple facility equipment. Level:6 5.ability to draw a simple scheme applying the power plant design software. Level:6						
Methods of carrying out lectures	Ex cathedra teaching Discussion Questions and answer:	s					
Methods of carrying out laboratory exercises	Laboratory exercises o Other CAD supported docum	on laboratory equipmen ientation	t				
Course content lectures	1.Electric power plant 2.Laws, regulations an 3.Stages of plant consi 4.Technical documenta 5.Energy requirements 6.Plant safety procedu 7.Protection against vo 8.Protection against vo 9.Grounding and poter 10.Protection against s 11.Mechanical protect 12.EX equipment desig 13.Cooling., 3h, Learni 14.Commissioning, 3h 15.Maintenance., 3h, I	- energy flow and inform d standards in design (truction: design, installi ation for each stage., 3 s, power supply and qui re for staff and equipm oltage shock. TN, 3h, Le oltage shock. TT, 3h, Le ntial equalizing., 3h, Le short circuits and overk ion IP code , 3h, Learning gn., 3h, Learning outcom ing outcomes:4 , Learning outcomes:5 Learning outcomes:5	mation., 3h, Learning of IEC, ISO, and HRN)., 3 ment, commissioning i h, Learning outcomes: ality., 3h, Learning outc ent., 3h, Learning outc earning outcomes:2,5 arning outcomes:2,5 bad., 3h, Learning outco ng outcomes:2,3 mes:2,3	outcomes:1,5 h, Learning outcomes:1,5 and maintenance, 3h, Lea :2,3,5 :comes:1,5 comes:2,3,5	rning outcomes:1,5		
Course content laboratory	1.no classes, 2h 2.no classes, 2h 3.no classes, 2h 4.no classes, 2h 5.no classes, 2h 6.Organizing project du 7.Organizing project du 8.components, 4h, Lea 9.installation site, 4h, 10.marking, 4h, Learni 11.symbols, 4h, Learni 12.wires, 4h, Learning 13.cables, 4h, Learning 14.equipment layout, 15.generating reports,	ocumentation, 4h, Lear ocumentation, 4h, Lear arning outcomes:5 Learning outcomes:5 ing outcomes:5 outcomes:5 g outcomes:5 g outcomes:5 4h, Learning outcomes , 2h, Learning outcomes	ning outcomes:1,2,3,4 ning outcomes:1,2,3,4 :5 s:5	1,5 1,5			
Required materials	Special equipment CAD electrical softwar	e, EPLAN					
Exam literature	Basic literature: 1. Electrical installation 2. Westermannov elek Additional literature: 1. Tehnički priručnik; k 2. E Plan upute za kori	n guide According to IE trotehnički priručnik; Šl Končar elektroindustrija ištenje	C Standards 2010; Scł kolska knjiga, Zagreb dd Zagreb, 1991.	nneider Electric SAS, Rueil 1991.	-Malmaison Cedex, France.		
Students obligations	passed preliminary ex	ams in exercises					
Knowledge evaluation during semester	Presence 10 Kolokvij 40 Seminar 50						
Knowledge evaluation after semester	Written 50 Oral 50						
Student activities:	Aktivnost		ECTS				
Remark	(Constantly tested kno	owledge)	6				
nelliai K	This course can be use		5				



Zagreb University of Applied Sciences

Prerequisites:	No prerequisites.
Proposal made by	Mr. sc. Davor Gadže, viši predavač

Code WEB/ISVU	23066/83431	ECTS	6.0	Academic year	2018/2019			
Name	Practical work	•	•	•	•			
Status	6th semester - Electrical power engineering (Redovni elektrotehnika) - elective course6th semester - Control and computer engineering in automation (Redovni elektrotehnika) - elective course6th semester - Communication and computer technology (Redovni elektrotehnika) - elective course							
Teaching mode	Lectures + exercises work at home	(auditory + labo	oratory + seminar + meto	dology + construction)	0+90 (90+0+0+0) 90			
Teachers	Auditory exercises:1.	Tomislav Špolja	rić d. i. e., v. pred.		-			
Course objectives	Students will obtain t	heir first working	g experience in the work e	nvironment as a preparation	for their future profession			
Learning outcomes:	 ability to relate theoretical knowledge acquired through education to specific tasks and skills required during practical work. Level:6,7 ability to distinguish between ideal theoretical models and real practical examples at work. Level:6 ability to compare their own level of competence with the level of competence required by employer. Level:6,7 ability to assess demand for their own qualification at the labour market. Level:6,7 ability to conclude if they want to be in the same profession in future. Level:6,7 							
Methods of carrying	Data mining and kno	wledge discover	y on the Web					
out auditory	Essay writing							
exercises	Other Practical work in an e	electrical enginee	erina environment					
Course content	1.Following the instru	uctions of the pre	actice menthor, 12h					
auditory	2.Following the instru	uctions of the pre	actice menthor, 12h					
,	3.Following the instru	uctions of the pra	actice menthor, 12h					
	4.Following the instru	uctions of the pra	actice menthor, 12h					
	5.Following the instru	uctions of the pra	actice menthor, 12h					
	6.Following the instru	uctions of the pra	actice menthor, 12h					
	7.Following the instru	uctions of the pro	actice menthor, 12h					
	8.Following the instru 9 Following the instru	uctions of the pra	actice menthor, 12h					
	10 Following the inst	ructions of the n	ractice menthor, 12h					
	11.Following the inst	ructions of the p	ractice menthor, 12h					
	12.Following the inst	ructions of the p	ractice menthor, 12h					
	13.Following the inst	ructions of the p	ractice menthor, 12h					
	14.Following the inst	ructions of the p	ractice menthor, 12h					
	15.Following the inst	ructions of the p	ractice menthor, 12h					
<u> </u>			· · ·					
Required materials	Practical work in an e	electrical enginee	ering environment					
Exam literature	Osnovna: Obavezno je poznava instituciji u kojoj se p Additional literature: 1.Zakon o zaštiti na r	anje zaštite na ra raksa provodi radu Republike H	du sa specifičnim zahtijev Irvatske	ima koji su u primjeni na radr	iom mjestu, ostalo ovisi o			
Students obligations	Regular practice atte	ndance and a sig	aned confirmation of the c	ompleted assignments				
Knowledge	Practice journal 100%	6						
evaluation during semester		•						
Knowledge evaluation after semester	Practice journal 100%	6						
Student activities:	Aktivnost (Practical work)		EC ⁻ 6	TS				
Remark	This course can not b	be used for final t	thesis theme					
Prereguisites:	No prerequisites.							
Proposal made by	Ivan Luio, MSc. Lectu	irer						

Code WEB/ISVU	23085/85624	ECTS	3.0	Academic year	2018/2019
Name	Probability and Statisics	S		•	
Status	3rd semester - Electrica computer engineering i computer technology (F	al power engineering (Re n automation (Redovni e Redovni elektrotehnika) -	dovni elektrotehnika) - o elektrotehnika) - obligato - obligatory course	bligatory course3rd sen ry course3rd semester -	ester - Control and Communication and
Teaching mode	Lectures + exercises (a work at home	uditory + laboratory + s	eminar + metodology +	construction)	30+15 (15+0+0+0) 45
Teachers	Lectures:1. Luka Maroh Lectures:2. mr.sc. Bojar Lectures:3. dr. sc. Anđa Auditory exercises:mr.s Auditory exercises: Luk	nić n Kovačić , viši predavač i Valent viši predavač sc. Bojan Kovačić , viši pr a Marohnić	redavač		
	Auditory exercises:dr. s	sc. Anđa Valent viši preda	avač		
Course objectives	Students will be introdu	iced to basic principles o	f probability and basic st	tatistical methods and p	rocedures.
Learning outcomes:	1.calculate basic numer 2.ability to calculate pro 3.ability to combine ele 4.ability to make (diagr Level:6 5.ability to distinguish to Level:6 6.ability to edit nongrou 7.calculate probability o 8.calculate basic statist	rical descriptors of data s obability of elementary e mentary combinatorial t am, graph, map) various between basic discrete a uped statistic sequence o of events in basic measu cic parameters of discrete	sequence (mean, mode, events and the events in echniques in calculatiion descriptiva statistics dia nd continuous probability of empirical statistical da rable subsets of two- and e and continuous random	quartiles, variance, star a discrete probability sp of probabilities. Level:6 agrams (histogram, freq y distribution and adjust ta and make its tabulati d three-dimensional Euc n variables. Level:6	dard deviation). Level:6 ace. Level:6 ,7 uency polygons). them to empirical data. on. Level:6,7 lidean space. Level:6
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion Questions and answers Other The course material is b	peing presented in the cl	assroom with detailed ex	xplanations and comme	nts.
Methods of carrying	Laboratory exercises, c	omputer simulations			
out auditory exercises	Group problem solving Computer simulations Other The problems are being	g solved on the blackboa	rd with detailed explanat	tions.	
lectures	2.One stage amplifiers. 3.One stage amplifiers. 4.One stage amplifiers. 5.One stage amplifiers. 6.Transistor series volta 7.Common source amplifiers. 8.Common drain amplif 9.Multistage amplifiers, 10.Amplitude and phasi 11.Amplitude and phasi 12.Differential amplifier 13.Power amplifiers, 2h 14.Feedback, 2h, Learn 15.Oscillators, 2h, Learn	Common emitter amplif Common emitter amplif Common emitter amplif Common collector amplig age regulator, 2h, Learni lifier, 2h, Learning outcom cier, 2h, Learning outcomes: a frequency response, 21 r, 2h, Learning outcomes: t, Learning outcomes: t, Learning outcomes: ting outcomes: 5 ning outcomes: 2,3,5	ier, 2h, Learning outcom ier, 2h, Learning outcom ier, 2h, Learning outcom ifier, 2h, Learning outcor ng outcomes:4,6 mes:1,2,4,6 5 h, Learning outcomes:5 h, Learning outcomes:5 ::5	es:2 es:2 es:2 nes:2	
Course content auditory	1.Algebra of sets. Basic 2.Basic principles of cor 3.Elementary events. E 4.Classical (discrete) pr 5.Geometrical probabilit 6.Conditional probability 7.Total probability rule. 8.Means. Measures of p 9.Discrete random varia Learning outcomes:7 10.Binomial distribution 11.Poisson distribution. 12.Geometric distribution. 13.Unique continuous o 14.Normal distribution., 15.Central limit theorer	operation with sets. , 1 mbinatorics. Permutatior vents. Algebra of events obability spaces., 1h, Le ty., 1h, Learning outcom y. Independent probabili Bayes rule., 1h, Learnin oosition. Measures of disp ables. Mathematical exp n., 1h, Learning outcome , 1h, Learning outcomes on., 1h, Learning outcomes istribution. Exponential , 1h, Learning outcomes , 1h, Learning outcomes m. De Moivre-Laplace the	n, Learning outcomes:3 ns and combinations. , 1h ., 1h, Learning outcomes arning outcomes:2 les:6 ty. Bernoulli schema., 1h g outcomes:2 persion., 1h, Learning ou ectation and standard de s:5,8 :5,8 les:5,8 distribution., 1h, Learning 5,8 eorem., 1h, Learning outcomes service outcomes service outcomes the service outcomes service outcomes servi	n, Learning outcomes:3 :2 n, Learning outcomes:2 tcomes:1,6,7 eviation of discrete rando g outcomes:5,8 comes:5,8	om variables., 1h,
Required materials	Basic: classroom, black General purpose compu Whiteboard with marke Overhead projector Special equipment a laptop Obayezna:	board, chalk uter laboratory rs			

	1. Autorizirani radni materijal za predavanja i auditorne vježbe 2. B. Čulina, D. Čulina, Elementarna vjerojatnost i statistika uz nomoć MS Excela, Veleučilište Velika Gorica, Velika							
	Gorica. 2011.							
	3. S. Suljagić: Vjerojatnost i statistika, interna skripta, Tehničko veleučilište u Zagrebu, Zagreb, 2005.							
	Additional literature:							
	1. N. Elezović, Diskretna vjerojatnost, Element, 2007. 2. N. Elezović, Slučajne varijable, Element, 2007.							
	[3. Z. Pauše, Riješeni primjeri i zadaci iz vjerojatnosti i statistike, Skolska knjiga, Zagreb, 1989.							
	14. Z. Pauše, Uvod u matematičku statistiku, skolska knjiga, Zagreb, 1993. 15. Ž.Pauše, Vierojatnost, Školska knjiga, Zagreb, 1974.							
Students obligations	70% of class attendance of the total class number.							
	In case of less class attendance, valid excuse and submitted obligatory assignments are required.							
Knowledge	Preliminary exam in the last lecture week;							
evaluation during	eliminatory, pass: 50% of total points at the exam.							
semester	Marks							
	50% - 62% = sufficient (2)							
	63% - 74% = good (3)							
	/5% - 89% = very good (4)							
	90% - 100% = excellent (5);							
	Oral exam:							
	Optional (student choice).							
	Pass: correct answers at 50% of total number of questions;							
	The final mark is not more than 1 mark better than the mark of written exam.							
Knowledge	Written exam (numerical tasks):							
evaluation after								
semester	4 exam terms;							
	Marks:							
	50% - 62% of total points = sufficient (2)							
	63% - 74% of total points = good (3)							
	75% - 89% of total points = very good (4)							
	90% - 100% of total points = excellent (5)							
	Oral exam:							
	Optional (student choice).							
	Pass: correct answers at 50% of total number of guestions;							
	The final mark is not more than 1 mark better than mark of written exam.							
Student activities:	Aktivnost ECTS							
	(Constantly tested knowledge) 2							
D a ma min	(Urai exam) 1							
Remark	I nis course can be used for final thesis theme							
Prerequisites:	no prerequisites.							
ISVU equivalents:	[22251; Delta Kana Xi (M.C., contra batana bata mentati (anata, X (21.5.2010.)							
Proposal made by	Bojan Kovačić, M.Sc., senior lecturer; Luka marohnić, predavač (31.5.2018.)							

Code WEB/ISVU	22854/22256	ECTS	5.0	Academic year	2018/2019
Name	Process Control Com	puters			•
Status	5th semester - Elect computer engineerir	rical power engineering ng in automation (Redo	g (Redovni elektrot ovni elektrotehnika	ehnika) - obligatory course5th s) - obligatory course5th semeste	emester - Control and r - Communication and
Teaching mode	Lectures + exercises	s (auditory + laboratory	y + seminar + met	codology + construction)	30+30 (0+30+0+0)
Teachers	lectures: 1 mr.sc. G	oran Malčić v pred			90
	Laboratory exercises Laboratory exercises Laboratory exercises Laboratory exercises	s: Mario Lučan s: Pavao Maković s:mr.sc. Goran Malčić v s: Ivica Vlašić	.pred.		
Course objectives	students will be intro industry	oduced to specific requ	irements of compu	iter systems implemented in the	process technology and
Learning outcomes:	1.ability to distingui 2.ability to connect i 3.ability to sketch co 4.ability to develop 5.ability to establish	sh between the real-tim the hardware elements introl logic based on gr a control program for si a relation between sof	ne computer syste of asystem with s raphic programmin imple systems . Le tware, computer a	ms and the others . Level:6 oftware. Level:6,7 g language. Level:6 vel:6,7 nd the end hardware elements o	of the system. Level:6,7
Methods of carrying out lectures	Ex cathedra teachin Case studies Demonstration Discussion Questions and answ The lectures are bas	g ers ed on presentations of	particular control	devices and micro-controlling sy	stems.
Methods of carrying out laboratory exercises	Laboratory exercise: Laboratory exercise: Group problem solvi Interactive problem Workshop Exercises are perfor courses for program	s on laboratory equipm s, computer simulations ng solving med on PLC devices co mers to work on the de	ent s nnected to your Po evices.	C. Preparations for the exercise i	n the form of training
Course content lectures	1.Real-time compute 2.Basic functional el 3.Programmable log 4.Types of processe: 5.Connection of the 6.Bit level instructio 7.Direct and indirect 8.Commands and we 9.Commands and we 10.Pulse width modu 11.Operation on dat 12.Operation on dat 13.Commands and p 14.Instructions and u 15.Work with interru	er controlled systems , ements of industrial co ic controller (PLC) as th s and sequential and di process with PLC circui ns and Ladder diagram adressing, optimizing ork with timers, 2h, Lea ork with counters and h lation and pulse contro a - comparison instruct a - mathematical instru cresentation of control changes of program flo ptive subroutines, 2h,	2h, Learning outco ntrol systems, 2h, ne main part of a c istributed control s its and addressing programming, 2h program code, 2h, arning outcomes:1 nigh-speed counter ol device, 2h, Lear ictions and examples uctions and uctions and uctions uctions and uctions uctions uctions and uctions u	omes:1,2,3,4,5 Learning outcomes:1,2,3,4,5 ontrol system, 2h, Learning outcomes: the external devices, 2h, Learning Learning outcomes:1,2,3,4,5 Learning outcomes:1,2,3,4,5 2,3,4,5 's, 2h, Learning outcomes:1,2,3,4,5 (s, 2h, Learning outcomes:1,2,3,5) les, 2h, Learning outcomes:1,2,3,5 les, 2h, Learning outcomes:1,2,3,5 s, 2h, Learning outcomes:1,2,3,4,5 s; 1,2,3,4,5	omes:1,2,3,4,5 1,2,3,4,5 ng outcomes:1,2,3,4,5 4,5
Course content laboratory	1.Basic units of prog 2. Interaction with th 3.Direct and indirect 4.Programming lang 5.Application simula 6.Operating with tim 7.Examples of work 8.Operating counter 9.Control switching 10.Examples of proc 11.Analog modules, 12.Operating with ar 13.Operating with ar 14.Interruptive subr 15.Writing the softw	rammable logic contro ne environment and the addressing, 2h, Learni uage and the application tion on a PC, 2h, Learni rers, 2h, Learning outcom from timers, 2h, Learni s, 2h, Learning outcom equipment, sequential esses combined timers analog value scaling, 2 nalog values, 2h, Learni athematical instruction poutines and operation j are project documenta	Iler (PLC), 2h, Lear e PLC input and ou ing outcomes:1,2,3 on development sc ing outcomes:1,2,3 omes:1,2,3,4,5 ing outcomes:1,2,3 es:1,2,3,4,5 control, 2h, Learni s and counters, 2h, 2h, Learning outcom ing outcomes:1,2, ns, 2h, Learning ou ump start program tion, 2h, Learning	ning outcomes:1,2,3,4,5 tput control , 2h, Learning outco 3,4,5 ftware, 2h, Learning outcomes: 3,4,5 8,4,5 ng outcomes:1,2,3,4,5 Learning outcomes:1,2,3,4,5 mes:1,2,3,4,5 3,4,5 tcomes:1,2,3,4,5 n, 2h, Learning outcomes:1,2,3,4 outcomes:1,2,3,4,5	mes:1,2,3,4,5 L,2,3,4,5
Required materials	Special purpose labo General purpose cor Special purpose con Overhead projector Special equipment PLC computer, switc	pratory nputer laboratory nputer laboratory hing equipment			
Exam literature	Basic literature: G. Malčić, D. Maršić: Zagrebu, Elektroteh Additional literature L.A. Bryan, E.A. Brya	Programirljivi logički k nički odjel, Zagreb, 200 n: Programmable Cont	ontroleri, interna s)9. :rollers -Theory and	kripta za kolegij Procesna račun d Implementation. Second Editio	ala, Tehničko veleučilište u n, An Industrial Text
•				-	

	Company Publication, Atlanta, 1997.					
	John R. Hackworth and Frederick D. Hackworth: Programmable logic controllers: Programing methods and application 2003.					
	H. Jack: Automating manufacturing systems with PLCs, Version 6, 2009. Priručnici za rad					
Students obligations	Mandatory attendance (80% level)					
Knowledge evaluation during semester	Colloquium numerical tasks, Seminar Verbal knowledge testing	Colloquium numerical tasks, Seminar Verbal knowledge testing				
Knowledge evaluation after semester	The written exam Verbal exam Seminar					
Student activities:	Aktivnost EC	TS				
	(Written exam)3(Oral exam)2					
Remark	This course can be used for final thesis theme					
Prerequisites:	No prerequisites.					

Code WEB/ISVU	22859/22270	ECTS	5.0	Academic year	2018/2019
Name	Process Measurements		I		
Status	4th semester - Electrica	al power engineering	(Redovni elektrote	ehnika) - elective course4th sem	ester - Control and
	computer engineering	in automation (Redov	vni elektrotehnika)	 obligatory course 	
Teaching mode	Lectures + exercises (a work at home	auditory + laboratory	+ seminar + meto	odology + construction)	30+30 (15+15+0+0) 90
Teachers	Lectures:1. v.pred. Mat	o Fruk dipl.ing.			
	Auditory exercises:mr.s	sc. Goran Maicic v.pre Mario Lučan	ed.		
	Laboratory exercises:m	ir.sc. Goran Malčić v.	.pred.		
Course objectives	Students will learn the	operating principles (of measuring sense	ors, learn to select measuring se	ensors for automation of
	certain plants and proc	esses			
Learning outcomes:	1.ability to propose me 2.ability to compare me 3.ability to propose app 4.ability to test the me 5.ability to integrate th	asurement of the req easuring sensors who propriate measuring s asuring sensor. Level e measuring sensor i	juired physical values se physical values sensor. Level:6,7 l:6 into the closed looj	Jes in the control system. Level: are based on different function p system. Level:6,7	:6,7 al principles. Level:6,7
		-		-	
Involvement of learning outcomes of the course in study programme:	6.5.KIRT Izabrati transf 150h	ormatore, nadzemne	vodove i sklopne a	aparate za prijenos i distribuciju	električne energije: 5h in
Methods of carrying	Ex cathedra teaching				
out lectures	Case studies				
	The matter is presente	d by using block diag	grams, and explana	ation of basic physical principles	,tables and diagrams
	using illustrative exam	ples.	•		-
Methods of carrying out auditory exercises	Group problem solving Data mining and knowl Auditory: Examples are laboratory examples.	edge discovery on th discussed and solve	ie Web d by students part	icipation on the board for every	topic in connection with
Methods of carrying	Laboratory exercises or	n laboratory equipme	ent		
out laboratory	Group problem solving	anto ara dana an aray	narad madale and	moscurement equipment	
Course content	1 Introduction 2b Log	rning outcomes:1	pared models and	measurement equipment.	
lectures	2.One stage amplifiers. 3.One stage amplifiers. 4.One stage amplifiers. 5.One stage amplifiers. 6.Transistor series volta 7.Common source amp Common drain amplifie 8.Common drain amplifie 8.Common drain amplifie 9.Multistage amplifiers. 10.Amplitude and phas 12.Differential amplifie 13.Power amplifiers, 2h 14.Feedback, 2h, Learr 15.Oscillators, 2h, Lear	Common emitter am Common emitter am Common emitter am Common collector a age regulator, 2h, Lea lifier, 1h, Learning outco fier, 2h, Learning outco fier, 2h, Learning outcon e frequency response r, 2h, Learning outcon , Learning outcomes hing outcomes:4,5 ning outcomes:5	nplifier, 2h, Learnir nplifier, 2h, Learnir nplifier, 2h, Learnir implifier, 2h, Learni arning outcomes:1 utcomes:3 omes:1 comes:2,3 nes:2,3 e, 2h, Learning out e, 2h, Learning out e, 2h, Learning out mes:3,4,5 s:3,4,5	ng outcomes:1,2,3,4 ng outcomes:1,2,3,4 ng outcomes:1,2,3,4 ing outcomes:1,3,4 ,3,4 :comes:2,3 :comes:2,3,4	
auditory	2.Measuring sensor mo 3.Displacement transdu 4.Displacement transdu 5.Force transducers., 1 6.Force transducers., 1 7.Pressure transducers 8.Pressure transducers 9.Flow transducers., 1 11.Level transducers., 1 11.Level transducers., 12.Level transducers., 13.Temperature transd 14.Temperature transd	(, sensor model, integ idel, components., 1h Jacers., 1h, Learning of Jacers., 1h, Learning of h, Learning outcomes h, Learning outcomes , 1h, Learning outcomes h, Learning outcomes 1h, Learning outcome 1h, Learning outcome 1h, Learning outcome lucer., 1h, Learning o Jucer., 1h, Learning o Jucer., 1h, Learning	A comparison of the formation of the for	learning outcomes:1,2 les:1,2	
Course content laboratory	1.Introductory exercise 2.Measuring sensor mo 3.Displacement transdu 4.Displacement transdu 5.Force transducers., 1 6.Force transducers, 1 7.Pressure transducers 8.Pressure transducers 9.Flow transducers., 1h	, sensor model, integ idel, components., 1h ucers., 1h, Learning o ucers., 1h, Learning o h, Learning outcome: h, Learning outcome: ., 1h, Learning outcom ., 1h, Learning outcomes	ral elements., 1h, h, Learning outcom butcomes:1,2,4 butcomes:1,2,4 s:1,2,4 s:1,2,4 mes:1,2,4 mes:1,2,4 mes:1,2,4 ::1,2	Learning outcomes:1,2 ies:1,2	

	10.Flow transducers., 1h, Learning outcomes:1,2 11.Level transducers., 1h, Learning outcomes:1,2 12.Level transducers., 1h, Learning outcomes:1,2 13.Temperature transducer., 1h, Learning outcomes:1,2,4 14.Temperature transducer., 1h, Learning outcomes:1,2,4 15.Light intensity transducer., 1h, Learning outcomes:1,2					
Required materials	Basic: classroom, blackboard, chalk Special purpose laboratory Overhead projector Maquette Laboratory: Measurements are done on prepared models and measurement equipment.					
Exam literature	Basic literature: 1. N.Perić,I.Petrović, Procesna mjerenja, FER Zagreb, skripta, 1999. Additional literature: 1. P. Profos, T. Pfeiffer: Handbuch der Industriellen Messtechnik, Springer Verlag. Deutschland 1994. 2. Međunarodni i državni mjeriteljski propisi i preporuke: HN, EN, ISO, IEC.					
Students obligations	Attend 70 percent of classes and auditory exercises and attend at all labaratory exercises					
Knowledge evaluation during semester	3 exams: At least 50 percent from every exam to pass					
Knowledge evaluation after semester	Written and oral exam: At least 50 percent from every exam to pass					
Student activities:	Aktivnost ECTS (Constantly tested knowledge) 4 (Oral exam) 1					
Remark	This course can be used for final thesis theme					
Prerequisites:	No prerequisites.					
Proposal made by	Senior lecturer Mato Fruk, dipl.ing.					

Study programme	for academic year	2018/2019
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Code WEB/ISVU	23486/155998	ECTS	5.0	Academic year	2018/2019		
Name	Programmable Logic Co	ontrollers					
Status	6th semester - Control	and computer engineering	ng in automation (Redov	ni elektrotehnika) - elec	tive course6th semester		
Taa ahin u mada	- communication and computer technology (Redovni elektrotennika) - elective course						
leaching mode	Lectures + exercises (a work at home	uditory + laboratory + s	eminar + metodology +	construction)	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 be introdu	iced to solving particular	problems in process tec	:hnology			
Learning outcomes:	1.ability to connect the	elements of a system w	ith software . Level:6				
	2.ability to sketch control logic based on graphic programming language. Level:6,7						
	4.ability to establish rel	ation between software,	computer and end hard	ware elements of the sy	stem. Level:6,7		
	5.ability to solve a simple problem in facilities and processing technology using PLC . Level:6,7						
Methods of carrying	Ex cathedra teaching						
out lectures	Discussion						
	Questions and answers						
	Seminar, students pres	entation and discussion					
	The lectures are based	on a number of presenta	ations of particular mate	rials related to control s	ystems and PLC		
Methods of carrying	l aboratory exercises or	a laboratory equipment					
out laboratory	Laboratory exercises, c	omputer simulations					
exercises	Group problem solving						
	Interactive problem sol	ving ad out on various BLC do	vices connected to PCs				
Course content	1 Elementary functiona	I parts of a PLC 2h	vices connected to PCS.				
lectures	2. Interaction with the e	environment and the PLC	input and output contro	ol , 2h			
	3.Programming languag	ge and the application de	evelopment software, 2h				
	4.Application simulation	n on a PC, 2h	2				
	5.Specific application p	rogramming languages,	Zh				
	7.Statement list (STL).	2h					
	8.Sequencal function ch	harts (SFC), 2h					
	9.Function block diagra	m (FBD), 2h					
	10.Instruction list (IL), 2	2h Sananaa of control dowig	a realized by a DLC. 2h				
	12 Protocols and stand	ards 2h	es realized by a PLC, 21				
	13.Connecting separate	e systems into a whole, 2	?h				
	14.Human machine inte	erface, 2h					
	15.Scada system, 2h						
Course content	1.Basic parts of a PLC. I	Interaction with the envi	ronment, 2h				
laboratory	2.Methods, ways of pro	gramming, addressing, 2	2h				
	3.Connecting a PLC to a	PC, work with software	used for developing con	trol applications, 2h			
	4.Interaction with the e	nvironment and the PLC vals (sensors) on a PLC a	nput and output contro	l, Zn Jes 2h			
	6.Ladder diagrams (LAI	D), 2h	na work with analog var	100, 211			
	7.Statement list (STL), 2	2h					
	8.Sequencal function ch	narts (SFC), 2h					
	10.Instruction list (II). 2	ni (FBD), 211 Ph					
	11.Control switching eq	uipment, sequential con	trol, 2h				
	12.Work with mathema	tics instructions, 2h					
	13.Work with comparise	on instructions, 2h					
	15.Writing the project of	locumentation. 2h					
Required materials	Basic: classroom, black	board, chalk					
	Special purpose laborat	tory					
	Overhead projector						
Exam literature	Basic literature:						
	1. Priručnici za rad sa o	dabranim PLC-om.					
	Clarence T Jones: STEP	7 in 7 Stens - A Practica	l Guide to Implementing	\$7-300/\$7-400 Program	nmable Logic		
	Controllers, 1st Edition,	Patrick-Turner Publishin	g, United States, 2006.	2. 500,07 100 110grun			
	H. Berger: Automating	with STEP 7 in LAD and F	BD, 3rd revised edition,	Publicis Corporate Publi	shing, Berlin and		
	Munich, 2005.						
Students obligations	Mandatory attendance	(80% level)					
Knowledge	Colloguium numerical t	asks, Seminar Verbal kn	owledge testing				



evaluation during semester			
Knowledge evaluation after semester	The written exam Verbal exam Seminar		
Student activities:	Aktivnost (Written exam) (Oral exam)	ECTS 3 2	
Remark	This course can be used for final thesis theme		
Prerequisites:	No prerequisites.		
ISVU equivalents:	32771;		

Code WEB/ISVU	22870/22303	ECTS	5.0	Academic year	2018/2019
Name	Programming				
Status	4th semester - Electric computer engineering computer technology (al power engineering (Re in automation (Redovni e Redovni elektrotehnika)	edovni elektrotehnika) - elektrotehnika) - obligat - obligatory course	elective course4th seme ory course4th semester	ster - Control and - Communication and
Teaching mode	Lectures + exercises (a work at home	auditory + laboratory + s	seminar + metodology -	+ construction)	30+30 (0+30+0+0) 90
Teachers	Lectures:1. Tomislav N Lectures:2. Prof.dr.sc. Laboratory exercises: I Laboratory exercises: ⁷ Laboratory exercises: ⁹	lovak mag. ing. inf. et co Slavica Ćosović Bajić Nikola Majstorović dipl.in Tomislav Novak mag. ing Vatroslav Zuppa Bakša	mm. techn. g. . inf. et comm. techn.		
Course objectives	students will acquire b	asic knowledge and com	petences in programmir	ng	
Learning outcomes:	1.ability to develop ma 2.ability to decompose 3.ability to classify the 4.ability to propose an 5.ability to predict bord	athematical algorithm for parts of algorithm into s elements of algorithm ir example of mathematica derline cases of applying	solving numerical probl imple elements. Level:6 nto data and procedures al algorithm in the form the algorithm . Level:6,	ems. Level:6,7 . Level:6,7 of computer program co 7	de. Level:6,7
Methods of carrying out lectures	Ex cathedra teaching Case studies Demonstration Simulations Questions and answers Lectures: The subject r constantly motivated t	s matter is taught by using o take an active part in c	a great number of parti lass.Teaching equipmer	icular examples C progra tt: board, overhead proje	mmes.Students are ector and LCD projector.
Methods of carrying out laboratory exercises	Laboratory exercises, of Group problem solving Traditional literature a Computer simulations Workshop Laboratory: Students s	computer simulations nalysis olve practical examples	on computers.		
Course content lectures	1. Basics of programmi 2. Data types, 2h, Learn 3. Variables, constants, statements, 2h, Learn 4. Cast operators. relat 5. Selection Statements 6. Program loops (for, v known number of repe 7. Data arrays. Charact 8. Arrays (two-Dimensio 9. Solving problems giv 10. Functions, The Gen 11. Pointers, methods of Learning outcomes: 2, 3 12. Built-in libraries and 13. Working with files: 4 14. Working with files: 4 15. Solving problems giv	ng and C language, 2h, L ning outcomes:1,2,3 operators and operands ing outcomes:1,2,3 ional and logical express s which include if, nested vhile, do-while). Loops wi titions. Termination of th er array (string), 2h, Lea onal Arrays and multidim ren in midterm test, 2h, L eral Form of a Function .1 of data transfer to functio 8,4,5 d functions (strings, math formatted files (text), 2h, unformatted files (binary iven in the final test, 2h,	earning outcomes:1,2 . Assignment operators, ions and operators , 2h, lifs and switch, 2h, Lear th test criteria at the be e loop., 2h, Learning ou rning outcomes:2,3 ensional Arrays). Examp earning outcomes:1,2,3 Function Parameters and ons (call by value, call by n functions etc.), 2h, Lea Learning outcomes:2,3), 2h, Learning outcome Learning outcomes:1,2,	arithmetical operators. Learning outcomes:1,2,3 ning outcomes:1,2,3,4 ginning or at the end of tcomes:1,2,3,4 oles, 2h, Learning outcom ,4,5 d Arguments., 2h, Learni , reference), work with a mining outcomes:1,2,3,4,9 ,4 s:2,3,4 3,4,5	Expressions, arithmetical 3 the structure. Loop with nes:2,3 ng outcomes:2,3,4 rrays in functions, 2h, 5
Course content laboratory	1.no classes, 2h 2.no classes, 2h 3.no classes, 2h 4.introduction, using IE 5.data types, 2h, Learr 6.arithmetic operators 7.relational and logic o 8.usage of all accumul outcomes:1,2,3,4,5 9.midterm, 2h, Learnin 10.loops (for, while, do 11.working with arrays 12.using and writing ft 13.using built-in functi 14.final exam, 2h, Lear 15.working with files, 2	DE, 2h, Learning outcome ning outcomes:1,2,3 (math type tasks), 2h, Lo operators and selection o ated knowledge in comp ated knowledge in comp ong outcomes:1,2,3,4,5 p-while), 2h, Learning out s, 2h, Learning outcomes unctions, 2h, Learning ou ons for strings and advar rning outcomes:1,2,3,4,5 2h, Learning outcomes:1,2,3,4,5	es:2,3 earning outcomes:1,2,3 perators (if, switch) (sim lex computer problems of comes:1,2,3,4 t1,2,3,4 tcomes:1,2,3,4,5 nced math, 2h, Learning 2,3,4	ople tasks), 2h, Learning (preparing for midterm), outcomes:1,2,3,4,5	outcomes:1,2,3,4 2h, Learning
Required materials	Basic: classroom, black General purpose comp Whiteboard with marke Overhead projector	kboard, chalk uter laboratory ers			
Exam literature	Basic literature: 1. S.Čosović Bajić, G.Tı stranici odjela www.tvz Additional literature:	rutanić PROGRAMIRANJE z.hr	u C-u i vježbe , Udžbenil	k u pripremi , radni mate	rijal nalazi se na WEB

	1. Boris Motik, Julijan Šribar:Demistificirani C++, Zagreb, Element , 1997				
Students obligations	50% of maximum points from mini tests held on laboratory exercises				
Knowledge	Tests during the semester may allow exemption from the written exam and the oral examination, depending on the				
evaluation during	scoring:				
semester					
	- mini test - 67,5% or 87,5% (depends on wanted exemption)				
	- numerical tests (midterm, final term) - over 50% of maximum points				
Knowledge	Written exam gives 50% of final mark				
evaluation after	Oral exam gives the other 50%.				
semester					
Remark	This course can be used for final thesis theme				
Prerequisites:	No prerequisites.				
ISVU equivalents:	22275;				
Proposal made by	Stipe Predanić, dipl.ing				

Code WEB/ISVU	22982/32767	ECTS	5.0	Academic year	2018/2019	
Name	Protection and Measure	ements in Switchgear				
Status	6th semester - Electrica	al power engineering	(Redovni elektrotel	nnika) - elective course		
Teaching mode	Lectures + exercises (a	auditory + laboratory	+ seminar + metod	dology + construction)	30+30 (30+0+0+0)	
	work at home	D			90	
Teachers	Lectures:1. dr.sc. Davo	r Petranović dipl.ing.e	el. lint ing el			
Course objectives	Students will be qualified to independently solve problems in the field of protection and measurements in power plants					
Learning outcomes:	1. ability to analyze requirements for plant protection. Level 6					
	2.ability to design the t	type of protection. Lev	vel:6			
	3.ability to identify the	problem related to pr	rotection. Level:6			
	4.ability to calculate th	e time required for pr	rotective action. Lev	vel:6		
	S.ability to classify vali	ous types of protection	on which can be app	blied. Level.0,7		
Involvement of	5.1.EE Razumjeti princi	p rada električnih rot	acijskih strojeva, tra	ansformatora, dalekovoda i skl	opnih aparata: 30h in	
learning outcomes	150h					
of the course in	6.5.KIRT Izabrati transformatore, nadzemne vodove i sklopne aparate za prijenos i distribuciju električne energije: 30h					
Methods of carrying	Ex cathodra toaching					
out lectures	Case studies					
	Discussion					
	Drawings, tables and d	iagrams are used to e	ease understanding	. Specific examples are also sh	own through	
	photographs, design, p	roject and test docum	nentation. All expos	ed materials are analyzed and	discussed with students	
Methods of carrying	Group problem solving			exboard and ECD projector.		
out auditory	Traditional literature ar	nalysis				
exercises	Data mining and knowl	edge discovery on the	e Web			
	Discussion, brainstorm	ing				
	Computer simulations					
	Workshop					
-	Problems are solved or	the blackboard but w	with the students pa	articipation.		
Course content	1. Lask and development	nt of measurement ar	nd protection in swi	tchgears and networks of diffe	ent voltage level , 2h,	
lectures	2.Task and development	, s nt of measurement ar	nd protection in swi	tchgears and networks of diffe	rent voltage level , 2h,	
	Learning outcomes:1,2	,3		J		
	3.Stationary and extrem	me states of electrica	l systems , 2h, Lear	ning outcomes:1,2,3		
	4.Stationary and extrem	ne states of electrica	i systems , 2n, Lear	ning outcomes:1,2,3		
	6.Symmetrical compon	ents , 1h, Learning ou	utcomes:1,3,4			
	Typical failures -Measuring systems in electrical systems: constructions and functions , 1h, Learning outcomes:2,3,4					
	7. Typical failures -Meas	suring systems in elec	ctrical systems: con	structions and functions, 2h, L	earning outcomes:1,2,3	
	9.Current and voltage t	transformers and tran	isducers (current, v	oltage, frequency, power and p	bhase angle), 2h, Learning	
	outcomes:2,3,4					
	10.Current and voltage	transformers and tra	ansducers (current,	voltage, frequency, power and	phase angle), 1h,	
	Protection systems in s	,s witchgears and struc	tures and time char	racteristics . 1h. Learning outco	mes:2.3.4	
	11.Protection systems	in switchgears and st	ructures and time o	haracteristics , 2h, Learning ou	itcomes:1,2,3	
	12.Over-current, voltag	je, impedance, reacta	ance, admittance, d	irectional and frequency protec	tion relays , 2h, Learning:	
	13 Protection of feeder	s husbars transform	ers generators and	motors 2h Learning outcome	o:1 2 4	
	14.Remote control and	management, 2h, Le	arning outcomes:2,	,3,4	5.1,2,1	
	15.Measurement, prote	ection and control inte	egration in switchge	ear, 2h, Learning outcomes:2,3	.4	
Course content	1 Examples of chart sir	cuit calculations 2h	Loorning outcome	~.4 F		
auditory	2.Examples of short-cir	cuit calculations , 2h,	Learning outcome	s:4,5 s:3.4.5		
, ,	3.Examples of short-cir	cuit calculations , 2h,	Learning outcome	s:3,4,5		
	4.Examples of sizing ar	nd selection of measu	iring devices , 2h, L	earning outcomes:3,4,5		
	5.Examples of sizing ar 6 Examples of sizing ar	nd selection of measu	iring devices , 2n, L iring devices 2h I	earning outcomes:3,4,5 earning outcomes:3,4,5		
	7.Examples of sizing ar	nd selection of protect	tion devices , 2h, Le	earning outcomes:2,3,4		
	8.Examples of sizing ar	nd selection of protect	tion devices , 2h, Le	earning outcomes:3,4,5		
	9.Examples of sizing ar	nd selection of protect	tion devices , 2h, Le	earning outcomes:3,4,5		
	11.Review of project do	ocumentation , 2h, Le	arning outcomes:3	.4,5		
	12.Review of project do	ocumentation , 2h, Le	arning outcomes:3,	4,5		
	13.Review of catalog d	ocumentation, 2h, Le	arning outcomes:3,	4,5		
	15. Review of catalog d	ocumentation, 2n, Le	arning outcomes:3, arning outcomes:3.	4,5 4.5		
				·/=		
Required materials	Basic: classroom, black	board, chalk				
	Whiteboard with marke	ers				
	overnead projector					
Exam literature	Basic literature:					

	 S.Nikolovski;Zaštita u elektroenergetskom sustavu, ETF, H. Požar, Visokonaponska rasklopna postrojenja, Tehnič Additional literature: Tehnički priručnik, Končar, Zagreb, 1999. Siemens Engineering Guide, Edition 7.1 Numerički releji zaštite RFX i RFD, Končar Inem 	, Osijek,2008.god. ka knjiga, Zagreb
Students obligations	80 % class attendence	
Knowledge evaluation during semester	Writting test #1#100#50\$	
Knowledge evaluation after semester	Writting exame #1#80#50\$ Oral exame #1#20#50\$	
Student activities:	Aktivnost (Written exam) (Oral exam)	ECTS 4 1
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
Proposal made by	Senior lecturer Davor Petranović MSEE (hon.)	

Code WEB/ISVU	23636/157314	ECTS	4.0	Academic year	2018/2019	
Name	Quality Management					
Status	4th semester - Control a	and computer engineerir	ng in automation (Redov	ni elektrotehnika) - oblig	atory course	
Teaching mode	Lectures + exercises (a	uditory + laboratory + s	eminar + metodology +	construction)	30+0 (0+0+0+0)	
-	work at home				90	
Teachers	Lectures:1. dr.sc. Davor	^r Petranović dipl.ing.el.			-	
	Lectures:2. dr.sc. Ljubiv	oj Cvitaš dipl.ing.				
Course objectives	students will be qualifie	d to manage the tasks o	f testing and assessing t	he quality of electronic	products; be familiar	
	with the equipment and	I the ways of testing				
Learning outcomes:	1.ability to organize tes	ting of electrotechnical p	products/systems in proc	luction line. Level:6,7		
	2.ability to prepare intro	oduction of quality contr	ol system in an organiza	tion . Level:6,7		
	3.ability to relate the ef	fect to the cause of the f	failure by using Isikawa (Jiagram. Level:6,7		
	4.ability to plan protect	ive measures from too h	igh touch voltage. Level	.b,/		
	Sability to device maintenance of electrotechnical reducts Lovalis 7					
	7 ability to plan general	Jability to devise maintenance of electrolecrinical products. Levelso,7				
	8.ability to analyze requ	uirements of ISO 9001 ar	nd ISO 14001 standards.	Level:6		
	9.ability to manage the	activities for process im	provement using PDCA of	cycle. Level:6,7		
Methods of carrying	Ex cathedra teaching					
out lectures	Guest lecturer					
	Case studies					
	Homework presentatior) 				
	leaching material is de	livered exclusively with t	the use of an LCD projec	tor, and a synopsis of th	e key lessons is	
	published in the reposit	ory of the course.				
Course content	1.Introductory lecture, 2	2h, Learning outcomes:1	,2,7,8 (.1.0.7.0		
lectures	2.GENERAL TERMS AND	DEFINITION OF QUALITY	(, 2h, Learning outcomes	\$:1,2,7,8		
		STANDARDS, 211, LEATHIN	IQ OULCOMES: 1,2,7,0	mec 1 2 / 7 8		
	5 OUALITY MANAGEMEN	IT SYSTEM - REOUREME	NT 2h Learning outcom	1es·1 2 4 7 8		
	6.Environmental Manag	ement Systems, 2h. Lea	rning outcomes:8	(5).1,2, 1,7,0		
	7.QUALITY CONTROL, 2	h, Learning outcomes:1,4	4,5			
	8.Repetition knowledge 1-6, 2h, Learning outcomes:1,2,4,8,9					
	9.Testing and measurement techniques 1, 2h, Learning outcomes:1,5					
	10.Testing and measurement techniques 2, 2h, Learning outcomes:1,5					
	11.GENERAL PRODUCT TESTING, 2h, Learning outcomes:1,5					
	12.TYPE PRODUCT TESTING, 2h, Learning outcomes:6					
	13.MAINTENANCE TECH	inical SISTEMS, 211, Lea	anning outcomesto			
	15 Repetition knowledg	e 9-15 2h Learning outcom	comes:367			
		e 5 15, 21, Leanning out	comc3.5,0,7			
Required materials	Basic: classroom, black	board, chalk				
	Overhead projector					
Exam literature	Basic literature:					
	1. Lj. Cvitaš, Bilješke s p	oredavanja, 2012				
	2. ISO standardi serije 9	0000				
	Additional literature:					
	1. I. Bakija, Osiguranje i	kvalitete, Privredni vjesn	ik, Zagreb, 1991.			
Students obligations	presence in 30 lectures	10 auditory exercises	15 Jahoratory exercises :	and naccod mini test		
Knowlodgo	Kolokuji toorijeka nitani	in #2#0#0¢Domozodo10	15 100010101 y exercises (
evaluation during	Kulukvij, teorijska pitalij	Ja#2#0#0\$D0IIIa2aua10	J#0#0\$			
semester						
Knowledge	Written and oral examin	nation				
evaluation after	the written part of the e	examination consists of 3	30 questions.			
semester	the oral part of the exa	mination, if the student e	earned 60 % of points or	more in the written part	t of the examination	
Student activities:	Aktivnost		ECTS			
	(Written exam)		3			
	(Oral exam)		1			
Remark	This course can be used	d for final thesis theme				
Prerequisites:	No prerequisites.					
ISVU equivalents:	22267;					
Proposal made by	dr. sc. Liubivoi Cvitaš s	enior lecturer				
sposal made by						

Code WEB/ISVU	22873/22314	ECTS	5.0	Academic year	2018/2019
Name	Radar Systems				
Status	5th semester - Commu	nication and computer t	echnology (Redovni elek	trotehnika) - elective co	urse
Teaching mode	Lectures + exercises (a	auditory + laboratory +	seminar + metodology +	construction)	30+30 (15+15+0+0)
-	work at home				90
Teachers	Lectures:1. Mirko Jukl				
	Auditory exercises: Mir	ko Jukl			
	Laboratory exercises:	Mirko Jukl			
	Laboratory exercises: S	Siniša Lacković struč.spe	c.ing.el.		
Course objectives	students will acquire ba	asic knowledge of radar	sabsystems needed for f	urther professional deve	lopment and work with
	radars	here's freehouse of the second	la o stana a la constata a colorada	- Landa - Sala - Angele a teo	- In a factor of the second second
Learning outcomes:	Lability toconnect the	basic features of the rac	ar signal and the physical	al principles of radar tec	inniques with prior
	2 ability to analyze cor	nnlex radar signals using	a different models. Level.	·6	
	3.ability to calculate th	e main characteristics o	f radar systems using the	e acquired knowledge ar	nd additional resources.
	Level:6				
	4.ability to measure fu	ndamental parameters o	of radar subsystems and	analyze test results. Lev	vel:7
	5.ability to compare m	athematical models with	the obtained of measure	ements radar signals. Le	evel:6,7
	6.ability to make concl	usion on optimal parame	eters of radar subsystems	s. Level:6,7	
Mothoda of corruing	Ex cathodra toaching				
Methods of carrying	Ex catheora teaching				
out lectures	Demonstration				
	Simulations				
	Discussion				
	Questions and answers	5			
	Seminar, students pres	sentation and discussion			
	Lectures: Multi media I	essons with verbal com	nunication between the t	eacher and students.	
Methods of carrying	Group problem solving				
exercises	Interactive problem sol	lvina			
	Excercises on solving r	numerical problems in ra	dar technology		
Methods of carrying	Laboratory exercises o	n laboratory equipment			
out laboratory	Laboratory exercises, o	computer simulations			
exercises	Interactive problem so	lving			
	Workshop				
Course contout	Laboratory excercises	in small grups on particu	llar radar system using re	egueded methods and e	quipment.
Course content	Radar equation for mo	ning outcomes:1,2,3	and the radar with active	feedback 2h Learning	outcomes:1236
lectures	2.Detection of radar sig	anals in noise. 1h. Learn	ing outcomes:1.2.3	reeuback, zii, Leanning	0010011103.1,2,3,0
	Impact of clutter land,	rain and sea on target d	etection, 1h, Learning ou	tcomes:1,2,3	
	Measurement of ang	jular coordinates, covera	age volume, search time,	resolution and the accu	racy of angular
	coordinate measureme	ents, 2h, Learning outcor	mes:1,2,3		
	4. Radar transmitters, 1	2h, Learning outcomes:	1,2,3,6		
	6 Microwaye compone	nts in radar technology	first a small test 10 minu	utes 2h Learning outco	mes 1 2 3
	7. Radar antenna, para	bolic reflector antennas	. 1h. Learning outcomes:	1.2.3	11163.1,2,5
	Radar antennas with e	lectronic scanning anter	na - phased array antenr	na, 1h, Learning outcom	es:1,2,3,6
	Radar receivers, 1h, Le	earning outcomes:1,2,3			
	8.Radar receivers, First	t colloquium outside the	planned teaching, 1h, Le	arning outcomes:1,2,3	
	Moving target selection	n system, 2h, Learning o	utcomes:1,2,3		
	9 Radar consoles 1h	Learning outcomes:1,2			
	Digital processing of ra	idar signals , 2h, Learnin	g outcomes:1,2,3		
	10. Surveillance radars	, first a small test, 10 m	inutes, 2h, Learning outc	omes:1,2,3,5	
	Tracking radars, 2h, Le	arning outcomes:1,2,3,5	5		
	11.Radar networks , 2h	n, Learning outcomes:1,2	2,5		
	Methods and effects of	electronic jamming of r	adar systems, 2h, Learnii	ng outcomes:1,2,3,6	
	13.No classes, second	colloquium outside the r	lanned teachingcollogui	um	
	14.No classes		namieu teueningeonoquit		
	15.No classes				
Course content	1.No classes				
auditory	2.Basic principles of ra	diolocation, 2h, Learning	outcomes:2,3		
	3.Basic principles of ra	2h Learning outcomes	outcomes:2,3		
	5 Radar system range	21, Learning outcomes	.2,5 2 3		
	Computer simulated ra	dar range calculation. 2	h. Learning outcomes:2.3	3	
	6.Radar reflection area	, 2h, Learning outcomes	:3		
	7.Radar reflection area	, 1h, Learning outcomes	::3		
	8.No classes, Learning	outcomes:1,2,3			
	9.Presentations of sem	inar papers., 1h, Learnir	ng outcomes:1,2,3,6		
	10.NO Classes				
	12. Presentations of cer	ninar papers 1h Learn	ing outcomes 1 2 3 6		
	13.No classes				
I	1				

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	14.No classes 15.No classes
Course content laboratory	 1.No classes 2.No classes 3.No classes 4.No classes 5.No classes 5.No classes 6.No classes 7.No classes 8.No classes 9.No classes 10.No classes 11.No classes 12.Measurements of parameters of radar transmitter : LE1 Introduction to radar cabinet, measuring instruments and equipment and measurement , 1h, Learning outcomes:2,3,4 LE1 Measurement, pulse period, pulse width and power of the transmitter, simulation using the transmitter pulse generator and signal generator , 2h, Learning outcomes:2,3,4 LE3 Measurement of frequency and frequency spectrum of a pulsed radar transmitter, transmitter simulation using the pulse generator and signal generator , 2h, Learning outcomes:2,3,4 LE3 Measurements of parameters of radar receivers: LE4 Measurement sensitivity of the radar receiver , 2h, Learning outcomes:2,3,4 LE5 Measurement pass band of the receiver , 2h, Learning outcomes:2,3,4 LE5 Measurement poise receivers , 2h, Learning outcomes:2,3,4 LE7 Measurement of noise receivers , 2h, Learning outcomes:2,3,4 LE7 Measurement of noise receivers , 2h, Learning outcomes:2,3,4 LE7 Measurement of noise receivers , 2h, Learning outcomes:2,3,4 LE7 Measurement of noise receivers , 2h, Learning outcomes:2,3,4 LE7 Measurement of noise receivers , 2h, Learning outcomes:2,3,4 LE7 Measurement of noise receivers , 2h, Learning outcomes:2,3,4 LE7 Measurement of noise receivers , 2h, Learning outcomes:2,3,4 LE7 Measurement of sensitive time control characteristics (STC), 2h, Learning outcomes:2,3,4
Required materials	Basic: classroom, blackboard, chalk Special purpose laboratory Whiteboard with markers Overhead projector Maquette Classes are conducted in small groups, on a laboratory model of radar
Exam literature	Basic literature: 1. M.Jukl, Radarski sklopovi lekcije, TVZ, Zagreb 2013. 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. Additional literature: Internet teme vezane za radarske sklopove
Students obligations	Class attendance, max. 8 points: Lectures by 4 points, 1 point for delay or failure to appear. Condition: min 0 points Exercises by 4 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 15 points and tasks, max 10 points The theoretical part of the learning outcomes, max. 40 points Two small test by 5 points, the passage of> 2.5 points Two preliminary tests by 15 points, the passage of> 7 points A positive evaluation of the theory: Both exams by> 7 points Tasks, max 20 points Tasks, max 20 points Tasks, max 20 points Each of the colloquiums will have a fix. Laboratory exercises, max. 32 points to 5 points per exercise. Evaluates the preparation, dedication and the content and layout of the report. Class attendance, max. 8 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 20 points: The classic exam 20 points, passage> 10 Positive assessment of tasks: The classic exam> 10 Classical exam the poppy max 40 points: Laboratory exercises, max 32 points Class attendance, max. 8 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
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
Proposal made by	Mr.sc. Mirko Jukl, lecturer	

Code WEB/ISVU	22872/22311	ECTS	4.0	Academic year	2018/2019
Name	Radiocommunicatio	n Techniques and	Systems		_
Status	5th semester - Com	munication and co	mputer technology (Red	ovni elektrotehnika) - obligator	y course
Teaching mode	Lectures + exercise	s (auditory + labo	ratory + seminar + meto	dology + construction)	30+30 (15+15+0+0)
	work at home				60
Teachers	Lectures:1. Prof.dr.s	c. Slavica Ćosović	Bajić		
	Lectures:2. mr.sc. K	runoslav Martinčić			
	Auditory exercises:r	nr.sc. Krunoslav M s: Siniča Lacković	artincic struč spos ing ol		
	Laboratory exercise	s: offisa Eackovic s:mr.sc. Krunoslav	Martinčić		
Course objectives	students will acquire	e basic knowledge	and competences in the	radio communication systems	
Learning outcomes:	1.ability to analyze	adio communicat	ion system, definitions ar	d divisions, definition of electr	omagnetic wave (EM).
	Level:6				5
	2.ability to design b	asic radio systems	. Level:6		
	3.ability to identify a	active microwave	components. Level:6	vol:6	
	5. ability to analyze	point to point and	mobile systems. Level:6.	7	
	6.ability to generalize	e on television, sa	tellite and optical system	ns. Level:6,7	
Methods of carrying	Ex cathedra teachin	g			
out lectures	Case studies				
	Simulations				
	Modelling				
	Seminar, students p	resentation and d	iscussion		
	The subject matter i	s taught by using	a number of particular ex	kamples. Students are constan	tly questioned in order to
	motivate them to ta	ke an active part i	n class.Teaching equipm	ent: board, overhead projector	and LCD projector.
Methods of carrying	Computer simulation	ns aplac with the uce	of computors		
exercises	Students solve exam	iples with the use	of computers.		
Methods of carrying	Interactive problem	solving			
out laboratory	Students solve exan	nples with the use	of computers		
exercises					
Course content	1.Classification of ra	dio equipment an	d systems, 2h, Learning o	outcomes:1	
lectures	2.Electromagnetic w	vave, 2h, Learning	outcomes:1,3		
	4 ITU frequency ban	w, zn, Learning of ds classification	utcomes:3 2h Learning outcomes:1.	4	
	5.Interferences and	distortions. 2h. Le	arning outcomes:3.4	-	
	6.Noise, S/N ratio, 2	h, Learning outcor	mes:3		
	7.Passive and active	electronic compo	nnents in radio equipme	nt, 2h, Learning outcomes:2	
	8.Radio receiver and	l transmitter, Hete reuite in radio ogu	erodyne Rx, 2h, Learning	outcomes:1	
	10. Pulse and dopple	r radar. 2h. Learn	ing outcomes:4	comes.o	
	11.Radio telescope,	2h, Learning outc	omes:6		
	12.GSM (Global Syst	em for Mobile Cor	nmunications), 2h, Learn	ing outcomes:6	
	13.GPS (Global Posit	ioning System), 2	h, Learning outcomes:6		
	14.WIREless network	s, 2n, Learning ou	itcomes:6		
	15.Ruulo relay syste	inis, zn, ceuning	outcomes.o		
Course content	1.Propagation of EM	W, 4h, Learning o	utcomes:1,2		
auditory	2.Propagation of EM	W, 4h, Learning o	utcomes:3		
	3.S/N ratio calculatio	on, 2h, Learning o	utcomes:3,6		
	4.Propagation of EM	w, 3n, Learning of	utcomes:2,3,4,5 adar 2b Learning outcor	nes:3.6	
	6			1123.3,0	
	7				
	8				
	9 10 -				
	11				
	12				
	13				
	14				
	15				
Course content	1.Free space EMW n	ropagation, 2.5h.	Learning outcomes:1		
laboratory	2.Noise Figure and S	5/N Ratio, PC simu	lation, 2.5h, Learning out	comes:2,3	
	3.Connector Losses,	2.5h, Learning ou	tcomes:4,5		
	4.Harmonic Mixer Pr	oducts, PC simula	tion, 2.5h, Learning outco	omes:1,5	
	6 DVB-T and FM rad	LUSSES, Z.ON, LEA	trum 2.5h Learning out	comes:4.6	
	7.No classes	Si caacast, spet	Lish, Lish, Leanning Out		
	8.No classes				
	9.No classes				
	10.No classes				
	12.No classes				
1	1				

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	13.No classes
	14.No classes
	TS No classes
Required materials	Special purpose laboratory
	General purpose computer laboratory
Exam literature	Basic literature:
	1. Zentner, Antene i radiosustavi ,Graphis, Zagreb, 2001
	Additional literature:
Students obligations	50% of class attendance. Additional assignments required (essay-discussion, an article review, seminar paper, etc.) for 50% to 70% of class attendance
Knowledge	Redovitost pohaa#10#10#0\$Mini-test#2#10#0\$Kolokvij, numeri zadaci#2#10#0\$Kolokvij, teorijska
evaluation during	pitanja#2#20#0\$Usmena provjera znanja#1#50#0\$
semester	
Knowledge	Written examination#1#50#50\$
evaluation after	Oral examination#1#50#50\$
semester	
Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
Proposal made by	Doc. dr. sc. Slavica Čosović-Bajić, mr. sc. Krunoslav Martinčić, lecturer

Code WEB/ISVU	23087/85705	ECTS	5.0	Academic year	2018/2019	
Name	Radiofrequency and Mic	crowave Electronics				
Status	5th semester - Commur	nication and computer t	echnology (Redovni elek	trotehnika) - obligatory o	course	
Teaching mode	Lectures + exercises (a	uditory + laboratory +	seminar + metodology +	- construction)	30+30 (0+30+0+0)	
	work at home				90	
Teachers	Lectures:1. mr.sc. Krund	oslav Martinčić	,			
	Laboratory exercises:m	r.sc. Krunoslav Martinci	C		ante and sime its used in	
Course objectives	the equipment in the fie	scuteries will be incloduced to topologies, operating modes and properties or electronic components and circuits used in the field of high and misrowayo frequencies and high enced disingle inclusion with				
Learning outcomes:	1. ability to analyze func	tion of electronic modu	ile. Level:6	speed digital encales		
	2.ability to detect possi	ble problems in function	nality of the system com	ponents. Level:6,7		
	3.ability to suggest arch	nitecture of specific elec	tronic modules. Level:6,	7		
	4.ability to inspect the f	functionality of each blo	ock. Level:6			
	5.ability to organize pro	ocurement of standard a	and specific components	of the system. Level:6,7		
Methods of carrying	Ex cathedra teaching					
out lectures	Simulations					
	Discussion					
	Questions and answers					
Mothods of corruing	Laboratory oversises or	laboratory oquinmont				
out laboratory	Laboratory exercises of	omputer simulations				
exercises	Traditional literature an	alysis				
	Discussion, brainstormi	ng				
-						
Course content	1.Z,Y,S-parameters, 2h, 2 Hybrid Bi Model (Ciac)	, Learning outcomes:1	aing outcomes:1			
lectures	3.Microwave Active Con	nponets. Diodes. 2h. Lean	arning outcomes:1.2.5			
	4.Microwave Active Con	nponets, Transistors, M	IMICs, 2h, Learning outco	omes:1,2,5		
	5.Dielectric Materials (S	upstrats), 2h, Learning	outcomes:1,2,5			
	6.Diodes in Microwave (Circuits, Detectors, Muli	rpiers, 2h, Learning outc	omes:3		
	8. Diodes in Microwave (Circuits: Attenuators, Ph	nase Shifters, 2h. Learnin	a outcomes:3		
	9. Transistors in Microwa	ave and HF Circuits: Am	plifiers, 2h, Learning out	comes:3,4		
	10.Transistors in Microw	vave and HF Circuits: Fr	equency Multitpliers, Mix	ers, 2h, Learning outcor	nes:3,4	
	11.Transistors in Microw	vave and HF Circuits: O	scillators, 2h, Learning o	utcomes:3,4		
	12.Passive Circuits: Filte	ers, Power Splitters, Att icon: Coaxial Microstrin	enuators, 2n, Learning of MIMIC 2b Learning out	utcomes:4,5		
	14.Ultra High Speed Dig	aital Circuits. 2h. Learni	na outcomes:4.5	Leomes.4,5		
	15.Measuring Instrumer	nts: VNA, Spectrum Ana	llyzer, Power Meter, 2h, L	_earning outcomes:4		
-						
Course content	1.Characteristic Impeda	ance Simulation, PC, 5h,	Learning outcomes:1			
laboratory	3.S-Parameters, Gain, N	loise. PC-Simulation. 5h	Learning outcomes:2.3	.5		
	4.Low Noise Amplifier, 5	5h, Learning outcomes:	4,5	,0		
	5.Square Law Power De	tector, PC-Simulation, 5	bh, Learning outcomes:3,	4,5		
	6.VNA, S-Parameter Me	asurements, 5h, Learni	ng outcomes:3,5			
	7 8					
	9					
	10					
	11					
	12					
	14					
	15					
Required materials	Basic: classroom, blacki Special purpose laborat	board, chalk				
	General purpose compu	iter laboratory				
	Whiteboard with marke	rs				
	Overhead projector					
F	lungi Dantali (Milusuala		2012 Z amak			
Exam literature	Juraj Bartolic, Mikrovaln	a elektronika, Graphis,	2012 Zagreb			
	S.A. Maas. Microwave M	lixers. Artech House. 19	993.			
Students obligations	presence in 70% of lect	ures and in all laborato	ry exercises			
Knowledge	Redovitost pohaa#5#5	#100\$Kolokvij, numeri	zadaci#2#70#35\$Kolok	vij, teorijska pitanja#2#3	13#35\$Prakti	
evaluation during	rad#6#12#50\$					
semester						
Knowledge	Written examination#1	#30#50\$				
semester	Practical examination#1#40	∪#∪\$ 1#30#0\$				
Remark	This course can be used	d for final thesis theme				
Prereguisites:	No prerequisites.					



Proposal made by mr.sc. Krunoslav Martinčić, lecturer

Code WEB/ISVU	23102/104554	ECTS	6.0	Academic year	2018/2019		
Name	Renewable energy reso	ources					
Status	5th semester - Electrical power engineering (Redovni elektrotehnika) - obligatory course						
Teaching mode	Lectures + exercises (a work at home	auditory + laboratory +	- seminar + metodology	+ construction)	30+30 (15+15+0+0) 120		
Teachers	Lectures:1. Zvonimir M	leštrović mag. ing.					
	Auditory exercises: Zvo	onimir Meštrović mag. i	ng.				
Course abiantiusa	Catting over ant lenguide	zvonimir Mestrovic mag	J. ING.				
Course objectives	L analyza pros and cor	standy expert when every of renewable energy inch					
Learning outcomes.	 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 system. Level:6 4.examime behaviour of photovoltaic modules in laboratory conditions. Level:6 5.propose appropriate type of renewable energy technology for specific application. Level:6,7 6.measure I-V curve of photovoltaic module in laboratory. Level:7 7.compare various energy storage technologies in renewable energy context. Level:6,7 						
Methods of carrying out lectures	Ex cathedra teaching Demonstration Discussion Questions and answers Seminar, students pres	s sentation and discussio	n				
Methods of carrying out auditory exercises	Group problem solving						
Methods of carrying out laboratory exercises	Laboratory exercises o	n laboratory equipmen	t				
Course content lectures Course content auditory	1.Introduction and org 2.Introduction to renew 3.Energy basics in rene 4.Solar energy, 2h, Lee 5.Photovoltaic systems 6.Geothermal energy, 7.Small hydropower pl: 8.First midterm exam, 9.Wind energy, 2h, Lea 10.Wind energy, 2h, Lea 11.Biomass energy, 2h 12.Energy storage in R 13.Fuel cell, 2h, Learni 14.Hybrid autonomous 15.Final exam, 2h 1.AV1, 2h, Learning ou 2.AV2, 2h, Learning ou	anization, 2h vable energy systems, 2 evable energy context, arning outcomes:1,2,3 s, 2h, Learning outcomes 2h, Learning outcomes ants, 2h, Learning outco 2h arning outcomes:1,2,3 rsion systems, 2h, Lear 1, Learning outcomes:1, ES , 2h, Learning outco ng outcomes:1,2,3 power supply systems tcomes:2 tcomes:2	2h, Learning outcomes:1 2h, Learning outcomes: es:1,2,3,4,6 :1,2,3 omes:1,2,3 ning outcomes:1,2,3 2,3 omes:7 , 2h, Learning outcomes	,2,3 1,2,3 :1,2,3,6			
	3.AV3, 2h, Learning ou 4.AV4, 2h, Learning ou 5.AV5, 2h, Learning ou 6.AV6, 2h, Learning ou 7.AV7, 2h, Learning ou 9.no class 10.no class 11.no class 12.no class 13.no class 14.no class	tcomes:2 tcomes:2 tcomes:2 tcomes:2 tcomes:2 tcomes:2					
Course content laboratory	1. PV measurement wit 2. PV measurement wit 3. U-I characteristic of F 4. Shading of pv modul 5. Temperature impact 6. Charging lead acid b 7. Solar thermal collect 8. Solar thermal collect 9. no class 10. no class 11. no class 12. no class 13. no class 14. no class 15. no class	h various light intesity, h various light incident PV panel, 2h, Learning o e, 2h, Learning outcom on PV module, 2h, Leai attery with PV module, or - installation, 2h, Lea or - commissioning and	2h, Learning outcomes: angle, 2h, Learning outco butcomes:4 es:4 rning outcomes:4 2h, Learning outcomes:4 arning outcomes:4 I measurements, 1h, Lea	4 :omes:4 1 rning outcomes:4			



Required materials	Basic: classroom, blackboard, chalk Special purpose laboratory Whiteboard with markers Overhead projector				
	 - P. Kulišić, Novi izvori energije II. dio - Sunčana energija i energija vjetra, Školska knjiga, Zagreb 1991. - Gilbert M. Masters, Renewable and Efficient Electric Power Systems, John Wiley Sons Inc. - L. Freris, D. Infield, Renewable Energy in Power Systems, Wiley, 2008. 				
Students obligations	Final points > 50%				
Knowledge evaluation during semester	Seminar papper: 10 points Laboratory: 10 points 1. midterm: 40 points 2. midterm: 40 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)				
Student activities:	Aktivnost ECTS (Written exam) 6				
Remark	This course can be used for final thesis theme				
Prerequisites:	No prerequisites.				
Code WEB/ISVU	23086/85647	ECTS	6.0	Academic year	2018/2019
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Name	Signals, theory and pr	ocessing			
Status	3rd semester - Comm	unication and comp	outer technology (Re	dovni elektrotehnika) - obligator	y course
Teaching mode	Lectures + exercises work at home	(auditory + laborat	ory + seminar + me	todology + construction)	45+30 (15+15+0+0) 105
Teachers	Lectures:1. dr. sc. Mla	den Sokele predav	ač		
	Auditory exercises:dr.	sc. Mladen Sokele	predavač		
	Laboratory exercises:	dr. sc. Mladen Soke Vioran Šimunić	ele predavač		
Course chiestiyes	Laboratory exercises:	vjeran Simunic	oon, of signals these	n, matheds and application of th	
course objectives	processing in commun	nication and inform	ation systems	ry, methods and application of th	le allalog signal
Learning outcomes:	1.ability to differentiat	te electrical signals	identified by their b	asic properties. Level:6	
-	2.ability to compare n	nathematical mode	Is with the obtained	signal measurement results. Lev	el:6,7
	3.ability to analyze co	mplex signals using	g different models. L	evel:6	
	4.ability to compose c	omplex periodic sig	gnals. Level:6,7		
	6 ability to categorize	lusion on ontimal r	and model random parameters of A/D ar	d D/A signal conversion Level.6	7
	7.ability to present an	alog modulation pr	ocedures. Level:6,7		
	8.Generate, measure	and analyze modul	ated signals Level	6,7	
	9.ability to compare o	riginal, modulated	and interference sig	nals of a telecommunication char	nnel. Level:6,7
Methods of carrying	Ex cathedra teaching				
ouriectures	Demonstration				
	Simulations				
	Modelling				
	Discussion			-	
	Oral lecturing support	ed with a modern p	presentation technol	ogy. Theoretical explanation and	equations derivation is
	analysis and processin	ng. Discussion with	students is frequent	too.	elecommunication signals
Methods of carrying	Laboratory exercises	on laboratory equip	oment		
out auditory	Laboratory exercises,	computer simulation	ons		
exercises	Computer simulations				
	Numerical problem so	Iving on the blackb	loard and in noteboo	ks is supported with a spreadshe	et MS Excel and MatLab.
Methods of carrying		ns laboratory equir	ment		
out laboratory	Laboratory exercises,	computer simulation	ons		
exercises	Computer simulations	•			
	Laboratory with 6 wor	kplaces equipped v	vith certain specializ	ed measurement instruments an	d PC-s for data analysis
	and reporting. Workin	g in the pairs of stu	idents.		
Course content	1. The plan of the cour	se content and exa	ims, In htest 3h Learning	outcomes:1	
	2.Harmonic signal def	initions and examp	les; Time domain sid	nal presentation (signal graph),	2h, Learning outcomes:1,2
	3.Parameters of the h	armonic signal; Wa	veform dependence	on signal parameters., 2h, Learn	ing outcomes:1,2
	Frequency domain (sp	ectrum) signal pre	sentations. Phasor re	epresentation of harmonic signal	s., 2h, Learning
	Outcomes:2 4 The synthesis of diff	erent signal preser	tations: Time frequ	ancy and phasor signal presentation	tions examples 2h
	Learning outcomes:2	erent signar preser	itations, nine, nequ	ency and phasor signal presenta	lons, examples., zn,
	dB and dBm, example	s;, 2h, Learning ou	tcomes:2		
	5.Mathematics for the	analysis and mode	eling of signal., 2h, L	earning outcomes:2	
	6.FR, definitions, calcu	ulation, FR for harm	ionic signals, pulse s	ignals and FR, examples, 2h, Lea	rning outcomes:3,4
	7 DFT properties FFT	DFT comparison v	with FFT 1h Learnin	n outcomes:3.4	Jucomes:3,4
	FFT, properties, FFT in	the lab, results an	alyzing and commer	its, 1h, Learning outcomes:3,4	
	8.Random signals, det	finitions and proper	ties; Stochastic sign	als, measurement and generatin	g, 2h, Learning
	outcomes:5 Bandom signals, pros	antation and analys	ic 1h Loorning out	amos F	
	Kandom Signais, prese K1 First preliminary ex	am 1h Learning of	outcomes 1 2 3 4 5	.omes:5	
	9.LTI systems, 2h, Lea	arning outcomes:9	Juccomes.1,2,3, 1,3		
	Impulse response and	transfer function, 2	2h, Learning outcom	es:9	
	10.Discrete systems a	ind signals; Exampl	es and properties, 2	h, Learning outcomes:6	
	A / D conversion, sam	DIING THEOREM, 2N, ΔΜ DSB SSB Δη	alog modulation PM	2h Learning outcomes:7	
	Analog modulation, FN	4. AM and FM Com	parison. 2h. Learning	outcomes:7.8	
	12.Digital modulation,	ASK, and FSK, Dig	ital modulation, PSK	and QPSK, 2h, Learning outcome	es:6
	Digital modulation, QA	AM and MTM, ASK, I	FSK, PSK; conclusion	of the course., 2h, Learning out	comes:8
	13.K1A, repeated first	preliminary exam,	Th, Learning outcor	nes:1,2,3,4,5	
	15.K2 Second prelimir	harv exam. 1h. Lea	rning outcomes:6.7.8	3.9	
	K2A, repeated second	preliminary exam,	1h, Learning outcor	nes:6,7,8,9	
L					
Course content	1.No exercises				
auditory	2.NU exercises	neration and measu	irement of harmonic	signals 1h Learning outcomes	126
	4.The first project: get	neration and measure	urement of harmonic	signals, 1h, Learning outcomes:	1,2,6
	5.Nema vjebi			5 · -, ·	
	6.The first project: get	neration and measu	urement of harmonic	signals, 1h, Learning outcomes:	1,2,6

	 7.The first project: generation and measurement of harmonic signals, 1h, Learning outcomes:4,5 8.The first project: generation and measurement of harmonic signals, 1h, Learning outcomes:4,5 9.The first project: generation and measurement of harmonic signals, 1h, Learning outcomes:4,5 10.The second project: Signal transmission, 1h, Learning outcomes:9 11.The second project: Signal transmission, 1h, Learning outcomes:9 12.The second project: Signal transmission, 1h, Learning outcomes:9 13.The third project, signal modulation, 1h, Learning outcomes:8 14.The third project, signal modulation, 1h, Learning outcomes:8 15.The third project, signal modulation, 1h, Learning outcomes:8 15.The third project, signal modulation, 1h, Learning outcomes:8 15.The third project, signal modulation, 1h, Learning outcomes:8
Course content laboratory	 1.No exercises 2.No exercises 3.The first project: generation and measurement of harmonic signals, 1h, Learning outcomes:2 4.The first project: generation and measurement of harmonic signals, 2h, Learning outcomes:2 5.No exercises 6.The first project: generation and measurement of harmonic signals, 1h, Learning outcomes:2 7.The first project: generation and measurement of harmonic signals, 2h, Learning outcomes:2,3 8.The first project: generation and measurement of harmonic signals, 2h, Learning outcomes:2,3,4,5 9.The first project: generation and measurement of harmonic signals, 1h, Learning outcomes:2,3,4,5 9.The first project: Signal transmission, 1h, Learning outcomes:9 11.The second project: Signal transmission, 1h, Learning outcomes:9 13.The third project, signal modulation, 1h, Learning outcomes:8 14.The third project, signal modulation, 1h, Learning outcomes:8
Required materials	Basic: classroom, blackboard, chalk Special purpose laboratory General purpose computer laboratory Overhead projector Special equipment Laboratory with 10 workplaces equipped with certain specialized measurement instruments and PC-s for data analysis and reporting. Working in the pairs of students.
Exam literature	 Basic literature: 1. P. Valožić: Signali, skripta TVZ, 2011. 2. P. Valožić: Signali, zbirka riješenih zadataka, TVZ, 2011. 3. P. Valožić: Signali, laboratorijske vježbe,TVZ, 2011. Additional literature: 1.P. Valožić: Interaktivna zadaćnica numeričkih primjera za vježbu, TVZ, 2011. 2.R.K. Rao Yarlagadda: Analog and Digital Signals and Systems, Springer New York Dordrecht Heidelberg London, 2010 3. Simon Haykin, Michael Moher: Communication Systems, 5e, John Wiley Sons, Inc. New York, 2009. 4. Signal Processing for Communications free online textbook by Paolo Prandoni and Martin Vetterli (2008) 5. www, ključne riječi za pretragu: Telecommunications, signal, signal analysis, signal processing, Fourier analysis, random signals, LTI systems, modulation
Students obligations	Attendance, max. 30 points: Lectures: start 20 points, -1 point for delay or failure to appear. Condition: min. 15 points Exercises start 10 points, -1 point for delay or failure to appear. Condition: min. 8 points
Knowledge evaluation during semester Knowledge	The theoretical part of the learning outcomes, max. 20 points Two preliminary tests by 10 points, the passage> 5 points A positive evaluation of the theory: Both exams > 5 points Tasks (3, 5, 6, 7, 8 and 9), max 20 points Tasks (3, 5, 6, 7, 8 and 9), max 20 points Two preliminary tests by 10 points, the passage of> 6 points Each of the preliminary tests will have a second chance. Exercises, max. 30 points; 10 points per project. Evaluation: preparation, dedication and the content and layout of the report. Continuous assessment of exercises: individual report is a condition for a positive assessment exercises. Total, max. 100 points. 90 100 = 5 (A) 80 89 = 4 (B) 65 79 = 3 (C) 60 64 = 2 (D) 50 59 = 2 (E) 49 and under, under-achievement The theoretical part of the learning outcomes, max. 20 points
evaluation after	The classic exam 20 points, passage> 10

semester	A positive evaluation of the theory: The classic exam> 10 Tasks (3, 5, 6, 7, 8 and 9), max 20 points: The classic exam 20 points, passage> 12 Positive assessment of tasks: Both preliminary exams > 5 points or classic exam> 10 Total, max. 100 points. 90 100 = 5 (A) 80 89 = 4 (B) 65 79 = 3 (C) 60 64 = 2 (D) 50 59 = 2 (E) 49 and under, under-achievement	
Student activities:	Aktivnost (Classes attendance) (Written exam) (Oral exam) (Practical work)	ECTS 1 2 1 2
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
ISVU equivalents:	22302;	
Proposal made by	PhD. Predrag Valožić, prof.	

Study programme	for academic yea	2018/2019
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Code WEB/ISVU	22856/22265	ECTS	2.0	Academic year	2018/2019
Name	Social Philosophy				
Status	6th semester - Electr computer engineerin computer technology	ical power engin g in automation v (Redovni elektr	ieering (Redovni elektrote (Redovni elektrotehnika) otehnika) - obligatory cou	hnika) - obligatory course3rd : - obligatory course4th semest rse	semester - Control and er - Communication and
Teaching mode	Lectures + exercises work at home	(auditory + labo	oratory + seminar + meto	dology + construction)	30+0 (0+0+0+0) 30
Teachers	Lectures:1. Pred. Ida Lectures:2. Doc. dr. s	Popčević prof. sc. Lidija Tepeš G	Golubić v. pred.		
Course objectives	Students will acquire	basic knowledge	e of social philosophy		
Learning outcomes:	1.ability to comment 2.ability to compare 3.ability to distinguis 4.ability to analyze re 5.ability to formulate	on aspects of so law and justice. I h between peop elation between social aspects o	ocial philosophy. Level:6 Level:6,7 le and nation. Level:6 humans, world and histor of postmodernism. Level:6	y. Level:6 ,7	
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Discussion Questions and answe Seminar, students pr Homework presentat	ers esentation and c ion	discussion		
Course content lectures	1.Introductory lecture 2.Introduction to soci 3.Introduction to phil 4.Culture and society 5.Social interaction, 2 6.Family, 2h, Learin 7.Preliminary exam 1 8.Media and commur 9.Media and commur 10.Work and econom 11.Education, 2h, Lear 12.Religion, 2h, Lear 13.Ideology, 2h, Lear 14.World in changes, 15.Preliminary exam	e, 2h, Learning o iology, 2h, Learn osophy, 2h, Learn osophy, 2h, Learning out g outcomes:1,2, ., 2h, Learning ou nication, 2h, Learn nication, 2h, Learn arning outcomes:1 ning outcomes:1 2h, Learning ou 2, 2h, Learning ou 2, 2h, Learning ou	utcomes:1,2,3,4,5 ing outcomes:1,2,3,4,5 rning outcomes:1,2,3,4,5 utcomes:1,2,3,4,5 3,4,5 utcomes:1,2,3,4,5 rning outcomes:1,2,3,4,5 rning outcomes:1,2,3,4,5 ing outcomes:1,2,3,4,5 i:1,2,3,4,5 i:2,3,4,5 i,2,3,4,5 itcomes:1,2,3,4,5 outcomes:1,2,3,4,5		
Required materials	Basic: classroom, bla Overhead projector	ckboard, chalk			
Exam literature	Basic literature: 1. A. Giddens: Sociolo 2. M. Galović: Socijal 3. M. Haralambos: U Additional literature: 1. Blackwellova encil	ogija, Zagreb, Na na filozofija, Zag vod u sociologiju klopedija političk	akladni zavod Globus, 200 reb, 1996. (bilo koje izdanje) e misli I-III	7.	
Students obligations	Regular class attenda Seminar paper Written/oral exam	ance			
Knowledge	Regular class attenda	ance			
evaluation during semester	Activity in class Homework 2 written exam				
Knowledge evaluation after semester	Written exam Oral exam Seminar paper				
Student activities:	Aktivnost (Written exam)		EC 1	TS	
	(Seminar Work)		1		
Remark	This course can be u	sed for final thes	is theme		
Prerequisites:	No prerequisites.				
Proposal made by	Ida Popčević prof., 3	.6.2018			

Code WEB/ISVU	22864/22288	ECTS	4.0	Academic year	2018/2019		
Name	Switching Equipment						
Status	3rd semester - Electrica	al power engineering (R	edovni elektrotehnika) - o	obligatory course			
Teaching mode	Lectures + exercises (a	uditory + laboratory +	seminar + metodology +	· construction)	30+15 (15+0+0+0)		
	work at home				75		
Teachers	Lectures: 1. Prof. dr. sc. Kresimir Mestrovic						
Course objectives	students will be qualified	disc. Kresinin Mestrov	ic problems in the field of	f switching equipment			
Learning outcomes:	1 diferentiate Lovel:6	so to independently solv		r switching equipment			
Learning outcomes.	2.analyse. Level:6						
	3.calculate. Level:6						
	4.comment. Level:6						
	5.formulate. Level:6,7						
	olidentry. Levelto						
Methods of carrying	Ex cathedra teaching						
out lectures	Case studies						
	Discussion			·c			
	Drawings, tables and di	photographs, design, project and test documentation. All exposed materials are analysed and discussed with students					
	to achieve their active	photographs, design, project and test documentation. All exposed materials are analysed and discussed with students to achieve their active participation. It is necessary to have a blackboard and an LCD projector					
Methods of carrying	Group problem solving						
out auditory	Problems are solved on	the blackboard with th	e students participation.				
exercises							
Course content	1.Definitions, switching	equipment types accor	ding to the rated voltage	, function and circuit inte	erruption systems, 2h,		
lectures	2 Current voltage mer	chanical and chemical s	tresses 2h Learning out	comes 2 3			
	3.Current, voltage, med	chanical and chemical s	tresses, 2h, Learning out	comes:2,3			
	4.Basics of the electrica	al contact theory, 2h, Le	arning outcomes:3,4				
	5. Types and the selecti	on of the contact mater	ials, 2h, Learning outcom	1es:1,2,5			
	7 Current interruption t	heory 2h Learning out	comes 1 2	3:1,2,0			
	8.1. cologium, 2h	neory, zn, zeaning out	comc3.1,2				
	9.Transient phenomena	a during switching opera	ations, 2h, Learning outco	omes:1,2,3			
	10.Terminal fault, short	: line fault, phase oppos	ition, switching of the lon	ig lines, switching of the	capacitor banks,		
	Interruption of the small	Il inductive currents, 2h	, Learning outcomes:1,2,	3			
	12. Types and character	ristics of the low, mediu	m and high voltage switc	hing equipment, 2h. Lea	arning outcomes:1.6		
	13.Testing and standar	ds, 2h, Learning outcom	1es:2,5,6	5 - 1 - 1 - 7 - 7	5 , .		
	14.Sizing selection and	maintenance of the sw	itching equipment, 2h, Le	arning outcomes:1,4,5			
	15.2. coloqium, 2h						
Course content	1.Illustrative calculation	n examples of contact re	esistance. 1h. Learning or	utcomes:3			
auditory	2.Illustrative calculation	n examples of contact re	esistance, 1h, Learning o	utcomes:3			
	3.Illustrative calculation	n examples of contact re	esistance, 1h, Learning o	utcomes:3	2		
	4.Illustrative calculation	1 examples of switching	equipment current stres	ses, 1h, Learning outcon	nes:3		
	6.Illustrative calculation	n examples of switching	equipment voltage stres	ses, 1h, Learning outcom	nes:3		
	7.1. coloqium, 1h, Lear	ning outcomes:6					
	8.Illustrative calculation	n examples of switching	equipment voltage stres	ses, 1h, Learning outcor	nes:3		
	9.Illustrative calculation	1 examples of switching	equipment mechanical s	stresses, In, Learning ou	tcomes:3		
	11.Illustrative calculation	on examples of current	switching, 1h. Learning o	utcomes:3	ucomes.5		
	12.Illustrative calculation	on examples of current	switching, 1h, Learning o	utcomes:3			
	13.Illustrative calculation	on examples of current	switching, 1h, Learning o	utcomes:3			
	14.1110strative calculation	on examples of current	switching, In, Learning o	utcomes:3			
	20121 0010410111, 211						
Required materials	Basic: classroom, black	board, chalk					
	Whiteboard with marke	rs					
	Overhead projector						
Evam literature	Basic literature:						
	1. K. Meštrović: Sklopni	i aparati srednjeg i visol	kog napona, Udžbenik Sv	eučilišta u Zagrebu,Grag	his, Zagreb, 2007.		
	Additional literature:		5		-, -, -,,		
	1. B. Belin: Uvod u teor	iju električnih sklopnih a	aparata, Školska knjiga Z	agreb, 1978.			
	2. V. Jurjević: Električni	sklopni aparati niskog r	iapona, skripta FER, Zagi	reb, 1995.			
Students obligations	performed laboratory e	xercises					
Knowledge	Two colloquia by 16 po	ints, the passage of> 8	points.				
evaluation during	Repeated colloquium b	y 20 points, the passage	e of> 10 points.				
semester							
Knowledge	The classic exam 20 po	ints, passage> 10 point	IS.				
semester							
	1						



Student activities:	Aktivnost	ECTS
	(Constantly tested knowledge)	4
Remark	This course can be used for final thesis theme	
Prerequisites:	No prerequisites.	
Proposal made by	Prof.dr.sc. Krešimir Meštrović	

Code WEB/ISVU	23132/128246	ECTS	2.0	Academic year	2018/2019	
Name	Technology Entreprene	urship				
Status	6th semester - Electrica computer engineering i computer technology (F	al power engineering (Re n automation (Redovni e Redovni elektrotehnika) -	dovni elektrotehnika) - c elektrotehnika) - obligato - obligatory course	bbligatory course5th sen bry course6th semester -	nester - Control and Communication and	
Teaching mode	Lectures + exercises (a work at home	uditory + laboratory + s	eminar + metodology +	construction)	30+0 (0+0+0+0) 30	
Teachers	Lectures:1. mr.sc. Serge Lectures:mag.oec Kristi	ej Lugović MBA na Perec				
Course objectives	To introduce students how to recognise business opportunity in technology development, information and communication science and society as whole. It is also necessary to develop disciplines which will enable continuous screening of technology development, so opportunity could be recognised. Along the screening and recognition, its important to transfer opportunity to product or service and sell it to customer creating the new value, through new or increased income and employment.					
Learning outcomes:	1.Business Venture. Lev 2.Business team. Level: 3.ability to recognize bu 4.ability to analyze inta 5.ability to manage org	vel:6,7 :6,7 usiness opportunities . Le ngible values . Level:6 anizational culture. Leve	evel:6 l:6,7			
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Discussion Seminar, students prese	entation and discussion				
Course content lectures	1.Course introduction, 2 2.The role of entreprene 3.Business opportunitie 4.Vision and Business M 5.Risk and Return, 2h, I 6.Marketing and Sales, 7.Knowledge assessme 8.Intellectual Property, 9.3 dimensions of Orga 10.Management of ope 11.Profit and Harvest, 2 12.The Finacial Plan, 2h 13.Knowledge assessm 14.Business Model Can 15.Assessment and sen	2h, Learning outcomes:1 eurship in economy, 2h, s, 2h, Learning outcomes lodel, 2h, Learning outco Learning outcomes:2,3 2h, Learning outcomes:1 h, 2h, Learning outcomes:1 nization - Structure, Fund rations, 2h, Learning out th, Learning outcomes:1,2 ent, 2h, Learning outcom s, 2h, Learning outcom s, 2h, Learning outcom s, 2h, Learning outcom s, 2h, Learning outcom ninars, 2h, Learning outcom	Learning outcomes:1 s:1,2 pmes:1,2 L,2,3,4,5 es:1,2,5 L,2,3,4 ctions, Processes, 2h, Le comes:1,2,3,4,5 2,3,4,5 hes:1,2,3,4,5 hes:1,2,3,4,5 comes:1,2,3,4,5	arning outcomes:3,4,5		
Required materials	Basic: classroom, black	board, chalk				
Exam literature	Technology Ventures: F	rom Idea to Enterprise, (Thomas Byers, Richard	Dorf, Andrew Nelson)		
Students obligations	performed laboratory e	xercises				
Knowledge evaluation during semester	Mini-test#1#20#0\$Kolo provjera znanja#1#20#	okvij, numeri zadaci#1# #100\$	20#0\$Seminarski rad#1	L#20#100\$Prakti rad#1	#20#0\$Usmena	
Knowledge evaluation after semester	Pismeni ispit#1#25#10	00\$Usmeni ispit#1#25#	100\$Seminarski rad#1#	25#100\$Prakti rad#1#	25#100\$	
Remark	This course can be used	d for final thesis theme				
Prerequisites:	No prerequisites.					
ISVU equivalents:	22273;22297;22310;					
Proposal made by	Mr. sc. Dobrivoj Demete	er (hon.)				

Code WEB/ISVU	22871/22309	ECTS	5.0	Academic year	2018/2019	
Name	Telecommunication Net	tworks				
Status	5th semester - Communication and computer technology (Redovni elektrotehnika) - elective course					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) 30+45 (15+30+0+0)					
Teachers	Lectures:1 Mr.sc Vladi	imir Lebinac dipl ing			15	
	Lectures: Bruno Valić	inin Lebinde diplinig.				
	Auditory exercises:Mr.s	c. Vladimir Lebinac dipl.	ing.			
	Laboratory exercises:M	r.sc. Vladimir Lebinac di	pl.ing.			
a	Laboratory exercises: B	sruno Valić				
Course objectives	work with telecommuni	ication networks	unication networks neces	ssary for further profess	ional development and	
Learning outcomes:	1.ability to design TCP/	IP computer network for	small and medium busin	esses and institutions. L	_evel:6	
	2.ability to make profes	ssional requirements for	network design, technica	al requirements and cha	racteristics of particular	
	3 ability to identify part	ticular components devi	ces equipment protocol	ls interfaces in telecom	munication networks	
	Level:6					
	4.ability to integrate co	mponents and IP, FR sub	o-systems of ATM networ	ks into a functional com	puter network.	
	Level:6,7					
	5.ability to examine fur	ictionality of particular c	omponents of telecomm	unication networks. Leve	el:6	
	6.ability to analyze use	r requirements for desig	ning telecommunication	networks. Level:6,7	ns Loval:67	
	7.ability to sketch a ten	ecommunication network			Ins. Level.0,7	
Involvement of	1 1 OPĆI Služiti se strar	nim jezikom u literaturi i	svakodnevnoj stručnoj k	omunikaciji · 5h in 150h	 1	
learning outcomes	1.3.0PĆI Koristiti tehnik	(e, vještine i suvremene	alate neophodne za inže	njersku praksu.: 10h in (150h	
of the course in	1.4.OPĆI Povezati inžer	ijerske aktivnosti konstru	uiranja, proizvodnje i mar	rketinga s potrebama ko	orisnika proizvoda i	
study programme:	usluge.: 10h in 150h					
	1.5.0PCI Identificirati, r	nodelirati i rješavati inže	njerske probleme.: 20h i	n 150h		
	2.2.050BNE 00govorno	ost, dosijednost, tocnost, anie informacija, ideja, n	, azurnost.: 5n in 150n roblema i riešenia stručn	noi i općoj publici : 5h in	150b	
	2.10.OSOBNE Prilagodli	iivost novim tehnologijar	na i tehnikama kao dio p	rocesa cieloživotnog uče	enia.: 5h in 150h	
	2.12.OSOBNE Fleksibilr	iost i prilagodljivost u izr	alaženju tehničkih rješer	nja uz neupitno poštivan	je temeljnih etičkih	
	načela, pravnih normi i	pravila struke .: 5h in 15	0h			
	3.2.ELO Dimenzionirati	elemente i opremu pren	na tehničkim zahtjevima	korisnika i tehničkim no	rmama: 5h in 150h	
	3.5.ELO Voditi održavar	ije opreme, pružati koris	inicima pomoć pri korište	nju i servisiranju kod pro	oizvodaća i na terenu:	
	5 1 FE Bazumieti princi	n rada električnih rotacij	skih strojeva transforma	atora dalekovoda i sklor	nih anarata: 30h in	
	150h	p rudu elektrienin rotuelj				
	6.2.KIRT Organizirati i r	nadzirati kvalitetnu izved	bu projekata za postizan	je ciljanih funkcionalnos	ti telekomunikacijskih	
	objekata, mreža ili sust	ava : 20h in 150h				
	6.3.KIRT Formulirati teh	iničke zahtjeve za interv	encije na telekomunikaci	jskom objektu, mreži ili	sustavu kako bi se	
Mathada of complex		a s normama i zantjevim	a konshika: 20n in 150n			
Methods of carrying	Ex catheora teaching					
	Demonstration					
	Discussion					
	Questions and answers	i				
	Other	projection with verbal co	mmunications toachar at	tudanta		
Mothods of corruing	Croup problem colving			.uuents.		
out auditory	Data mining and knowl	edge discovery on the W	/eb			
exercises	Essay writing					
	Discussion, brainstormi	ing				
Methods of carrying	Laboratory exercises, c	omputer simulations	1 - 1-			
out laboratory	Data mining and knowl	edge discovery on the W	leb			
exercises	Computer simulations	ny				
	Workshop					
Course content	1.Entities, structure and	d functions of telecomm	unication networks. Trans	sport and routing inform	nation, 2h, Learning	
lectures	outcomes:3					
	2.Public and private net	tworks. Services in telec	ommunication networks.	Channel switching and	packet switching. , 2h,	
	3 Physical layer 2h Le	arning outcomes 1 3 4				
	4.Data link laver and pr	rotocols. 2h. Learning ou	tcomes:1.3			
	5.Network layer protoco	ols., 2h, Learning outcon	nes:1,3			
	6.Transport layer proto	cols. Additional layers ar	nd protocols, 2h, Learning	g outcomes:1,3		
	7.ISDN and B-ISDN, 2h,	Learning outcomes:2,3,	5			
	8.LANS., 2n, Learning o	utcomes:2,3,5				
	10.ATM, 2h, Learning o	utcomes:2.3.5				
	11.Internet, 2h, Learnin	ng outcomes:2,3,5				
	12.TCP/IP, 2h, Learning	outcomes:2,3,4,5				
	13.VoIP, 2h, Learning o	utcomes:2,3,4,5				
	14.Standards, 2h, Lear	ning outcomes:2,5,7	lavetestica Ob Leevaire			
	15.Network manageme	and Network security and	i protection, zn, Learning	Jourcomes: /		

Course content	1.Discussion of telecommunication systems and networks, 1h, Learning outcomes:2
auditory	2.Discussion about the information and signal transmission, 1h, Learning outcomes:2
	3. The characteristics of the physical layer (interfaces, signals, media), 1h, Learning outcomes: 2,4
	4.Analysis of DLL protocols (Ethernet, PPP), 1h, Learning outcomes:2,4
	5.Colloquium, 1h, Learning outcomes:2,3,5,7
	6.IP addressing IPv4, IPv6, 1h, Learning outcomes:3
	7.Analysis of transport protocols (TCP, UDP), 1h, Learning outcomes:3,5
	8.Discussion about ISDN, 1h, Learning outcomes:2,3,5
	9.Discussion about LANs, 1h, Learning outcomes:2,3,5
	10.Colloquium, 1h, Learning outcomes:2,3,5
	11.Discussion about FR ATM, 1h, Learning outcomes:2,3,5
	12.Discussion about Internet, 1h, Learning outcomes:2,3,5
	13.Analysis of the VoIP network by components, 1h, Learning outcomes:2,3,5
	14.Presentation of the most important standards in the Internet and their use, 1h, Learning outcomes:1
	15.Colloquium, 1h, Learning outcomes:1,2,3
Course content	1.Introduction to the network simulator and its use, 2h, Learning outcomes:3,7
laboratory	2.Simulation of the LAN (Ethernet and WiFi), 2h, Learning outcomes:3,7
	3.Simulation VLAN network (Ethernet), 2h, Learning outcomes:3,7
	4.Simulation WAN network (IP), 2h, Learning outcomes:3,7
	5.Simulation WAN network (IP) - routing, 2h, Learning outcomes:3,7
	6.Simulation integration of IP and IT networks in a WAN environment, 2h, Learning outcomes:3,7
	7.Simulation home network, 2h, Learning outcomes:3,7
	8.Project computer networks (LAN and WAN integration), 2h, Learning outcomes:1,2,3,4,7
	9.Project computer networks (LAN and WAN integration), 2h, Learning outcomes:1,2,3,4,7
	10.Project computer networks (LAN and WAN integration), 2h, Learning outcomes:1,2,3,4,5,6,7
	11.Project computer networks (LAN and WAN integration), 2h, Learning outcomes:1,2,3,4,7
	12.Project computer networks (LAN and WAN integration), 2h, Learning outcomes:1,2,3,4,7
	13.Project computer networks (LAN and WAN integration), 2h, Learning outcomes:1,2,3,4,6
	14.Project computer networks (LAN and WAN integration), 2h, Learning outcomes:1,2,3,4,6
	15.Labs Colloquium, 2h, Learning outcomes:1,2,3,4,5,6,7
_	
Required materials	Basic: classroom, blackboard, chaik
	General purpose computer laboratory
	Overnead projector
Frank literature	
Exam literature	Basic literature:
	1. V.Lebinaci, D.Valenci, Kacunaline mieże, Veleucinste Velika Gonca, 2015.
	z. v. Shikovic, illoimidujske mieze, skolska klijiga, zagreb, 1994. Adrižina litozatura
	Additional interature:
	 D. P. Hoang and K. L. Nuclear Structure Computer Computer Statement and Open Systems, wesley, 1990. D. B. Hoang and K. L. Nuclear Statement and Ammunication Networks Lacture Notes. 1005. School of Electronic Engineering.
	2. D.b. noang and K.J. Fye. Computer Communication Networks Lecture Notes, 1995., School of Electronic Engineering,
Ctudente eblinatione	La nobe oniversity
Students obligations	Attending fectures and excercises -> Requirement: 33% attendance.
	Execution of to laboratory exercises. Condition, o worked exercises.
Knowledge	Colloquia: Inree exams at 20 points (e-tests) = 60 points. The passage of 30 points.
evaluation during	Independent work on e-learnig system (expert discussions, seminars) = 20 points
semester	Ine presence of lectures and exercises = 10 points
	special dedication to teaching = 10 points
	Tatal maximum of 100 paints. The passage of 50 paints
	Total maximum of 100 points. The passage of 50 points.
	Poting.
	Rating.
	S0 + 0.0 points = J
	So to 6.00 points = 2
	less than 50 points = 1
Knowledge	Written evan (F text) = 60 points (roplaces colleguia)
Nilowieuge	written exam (c -test) = 60 points (replaces conoquia)
evaluation after	
Demester	This serves out to word for final thesis them.
Kemark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.

Code WEB/ISVU	24037/189951	ECTS	5.0	Academic year	2018/2019		
Name	Transformers			-			
Status	3rd semester - Electrica	al power engineering (Re	edovni elektrotehnika) - c	bligatory course			
Teaching mode	Lectures + exercises (a work at home	auditory + laboratory + s	seminar + metodology +	construction)	30+30 (15+15+0+0) 90		
Teachers	Lectures:1. Ivor Markov Auditory exercises: Ivor Laboratory exercises: N Laboratory exercises: T Laboratory exercises: T	vić , mag. ing. r Marković , mag. ing. Marko Babić Fomislav Đuran , dipl. in <u>c</u> vor Marković , mag. ing.].				
Course objectives	students will acquire kr	nowledge of construction	i, types and operating pr	inciple and operational	characteristics of		
Learning outcomes:	1.ability to calculate ba 2.ability to design powe 3.ability to make a spee 4.ability to calculate pa 5.ability to analyze solu	1.ability to calculate basic parameters of power transformers . Level:6 2.ability to design power transformer electrical protection. Level:6,7 3.ability to make a specification for power and instrument transformers. Level:6,7 4.ability to calculate parameters of instrument transformers. Level:6 5.ability to analyze solutions to measurements and eletrical protection design . Level:6					
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion The topics are presente characteristics of distril	ed by emphasizing funda bution and power transfo	amentals of transformers, prmers. Practical problem	, typical operation cond ns are elaborated.	itions and main		
Methods of carrying out auditory exercises	Laboratory exercises or Group problem solving	n laboratory equipment					
Methods of carrying out laboratory exercises	Laboratory exercises or Laboratory: Students h	n laboratory equipment ave to make preparation	ı for exercises, carry out	testing and finalize the	test report.		
Course content lectures	1.Operating principle, e 2.Operating principle, e 3. Main parts of a trans 4.Losses, no-load curre 5.No-load losses, no-loa 6.Load losses, efficienc 7.Load losses, efficienc 8.Short-circuit test, 2h 9.Heating, cooling and 10.Three-phase transfo 11.Transformers paralle 12.Scaling laws. Tap ch 13.Autotransformer, 2h 14.Transients at transfor Learning outcomes:1 15.Transformer testing	equivalent scheme and p equivalent scheme and p former, 2h, Learning out int, no-load test, 2h, Lear ad current, no-load test, cy, voltage drop, leakage y, voltage drop, leakage y, voltage drop, leakage , Learning outcomes:1 life cycle, 2h, Learning o ormer, connection circuit el operation, 2h, Learnin nanging. Voltage regulati n, Learning outcomes:1,3 ormer switch-on. Transie n, 2h, Learning outcomes	hasor diagram of a trans hasor diagram of a trans comes:1 rning outcomes:1 2h, Learning outcomes:1 reactance, 2h, Learning reactance, 2h, Learning outcomes:1 s, angular displacement, g outcomes:1 ion., 2h, Learning outcom ents at transformer short- :1,2,3	iformer, 2h, Learning ou former, 2h, Learning ou outcomes:1,3 outcomes:1,3 2h, Learning outcomes nes:1,3 -circuit, mechanical and	itcomes:1 itcomes:1 :1,3 thermal stresses, 2h,		
Course content auditory	Dimenzioniranje energe transformatora. Prorači	etskih transformatora. Pr un paralelnog rada. Pror	roračun zagrijavanja, hlao ačun gubitaka. Laborator	đenja i životnog vijeka e rijske vježbe.	energetskih		
Course content laboratory	1.no teaching, 2h, Lear 2.No-load test, 2h, Lear 3.No-load test, 2h, Lear 4.No-load test, 2h, Lear 5.No-load test, 2h, Lear 6.Short-circuit test, 2h, 7.Short-circuit test, 2h, 9.Short-circuit test, 2h, 10.Dielectric tests, 2h, 12.Dielectric tests, 2h, 13.Dielectric tests, 2h, 14.no teaching, 2h	ning outcomes:1 rning outcomes:1 rning outcomes:1 rning outcomes:1 Learning outcomes:1 Learning outcomes:1 Learning outcomes:1 Learning outcomes:1 Learning outcomes:1 Learning outcomes:1 Learning outcomes:1 Learning outcomes:1					
Required materials	Special purpose laborat Overhead projector	tory					
Exam literature	a						
Students obligations	performed laboratory e	exercises					
Knowledge evaluation during semester	Redovitost pohaa#15#	0#50\$Kolokvij, numeri z	zadaci#2#50#50\$Kolokv	/ij, teorijska pitanja#2#	50#50\$		
Knowledge evaluation after semester	Paper test#1#80#50\$\	Verbal exam#1#20#50	5				



Remark	This course can be used for final thesis theme
Prerequisites:	No prerequisites.
ISVU equivalents:	22289;156003;
Proposal made by	lecturer Zoran Kovačević, MSEE

Code WEB/ISVU	23490/156005	ECTS	5.0	Academic year	2018/2019	
Name	Transformers and Elect	trical Rotating Machines				
Status	4th semester - Control	and computer engineeri	ng in automation (Redov	ni elektrotehnika) - elec	tive course	
Teaching mode	Lectures + exercises (a work at home	auditory + laboratory + s	seminar + metodology +	- construction)	45+45 (30+15+0+0) 60	
Teachers	Lectures:1. mr.sc. Vese Auditory exercises: Tor Laboratory exercises: 1	elko Tomljenović viši pre nislav Đuran , dipl. ing. Tomislav Đuran , dipl. ing	davač			
Course objectives	Students will acquire q	eneral knowledge in the	field of power transform	ers and electromechanic	cal conversion of energy	
Learning outcomes:	1.ability to solve simple	e problems related to tra	insformers. Level:6		al conversion of energy.	
	 2.ability to calculate the examples related to the AC rotating machines. Level:6 3.ability to find out solutions to the problems related to the DC rotating machines. Level:6,7 4.ability to inspect experimentally (by measurements) some properties of transformers and electrical rotating machines. Level:6 5.ability to analyze the given problem, calculate required values and estimate physical aspect of the obtained calculated values. Level:6 					
Involvement of learning outcomes of the course in study programme:	5.1.EE Razumjeti princi 150h	ip rada električnih rotaci	jskih strojeva, transforma	atora, dalekovoda i sklor	onih aparata: 20h in	
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion Questions and answers Lectures are delivered production plant.	s with the help of PowerPo	pint presentations, physic	cal models and an excur	sion to the machine	
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorm Solving of examples wi	ing th active participation of	f students.			
Methods of carrying	Laboratory exercises o	n laboratory equipment				
out laboratory exercises	Group problem solving Test of student readine report, test of the acqu	ess for the exercise, stud ired knowledge.	ents carry out the exerci	ise as a team, individual	preparation of the	
Course content lectures	1.Construction of trans 2.Transformer at no loa 3.Three-phase transfor 4.Basics of electromecl outcomes:2 5.Model of a DC machi 6.Model of an AC machi 7.Alternating current M 8.Physical processes in 9.Synchronous machin 10.Construction of symo 11.Physical processes i 12.Construction of indu 13.Kolektorski stroj: fiz 14.Small electrical mac 15.Basics of testing the	formers. Equivalent sche ad and short circuit. Leal mer, connection circuits hanical energy conversion ne. Model of an AC mach ine. Current and MMF di IMF diagrams. Torque an a synchronous machines on an infinite busbar., chronous machines., 3h, in an induction machine. Jaction machines. Starting ikalna slika, izvedbe i sv chines: construction, par- e electrical rotating mach	eme and phasor diagram kage reactance., 3h, Lea Autotransformer., 3h, L on. Development of a cor agrams., 3h, Learning outcor agrams., 3h, Learning out di induced voltage., 3h, 1 a, 3h, Learning outcomes: 3h, Learning outcomes: 4, 3h, Learning outcomes 3, reversing and braking. ojstva., 3h, Learning out ameters and usage., 3h, hinery., 3h, Learning out	of a transformer., 3h, La rning outcomes:1 earning outcomes:1 nversion machine. Magne mes:2 utcomes:2 Learning outcomes:2 s:2 ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	earning outcomes:1 etic circuit., 3h, Learning :2	
Course content auditory	1. Elements of an equiv 2. Transformer at no-loa 3. Connection circuits o 4. Numerical examples 5. Torque and induced v 6. Examples of computa outcomes: 2, 5 7. Phasor diagram of a 9. Characteristic curves 10. Characteristic curves 11. Losses in induction 12. Speed regulation of 13. Speed regulation of 14. DC machine induced	alent circuit of a transfo ad and short circuit., 2h, f a three-phase transforr of electromechanical en voltage computation., 2h ation of synchronous ma synchronous machine., 2 synchronous machine., 2 of induction machine., 2 as of induction machine., 2h, induction machine., 2h, d voltage., 2h, Learning egulation of DC machine	rmer., 2h, Learning outco Learning outcomes:1 mer., 2h, Learning outcon ergy conversion., 2h, Lea h, Learning outcomes:2,3 chines on isolated netwo 2h, Learning outcomes:2,2 h, Learning outcomes:2,2 h, Learning outcomes: butcomes:2,5 Learning outcomes:2,5 Learning outcomes:2,5 outcomes:3,5 ., 2h, Learning outcomes	omes: 1 mes: 1 arning outcomes: 5 8,5 ork and infinite busbar., 2 5 5 5 2,5 2,5	?h, Learning	
Course content laboratory	1.Transformer at no-loa 2.Transformer at no-loa 3.Transformer at no-loa 4.Transformer at no-loa 5.No-load curve of a sy 6.No-load curve of a sy 7.Short circuit curve of 8.No-load curve of an in	ad and short circuit., 1h, ad and short circuit., 1h, ad and short circuit., 1h, ad and short circuit., 1h, ad and short circuit., 1h, nchronous machine., 1h a synchronous motor., 1 nduction motor., 1h, Lea	Learning outcomes:1,4 Learning outcomes:1,4 Learning outcomes:1,4 Learning outcomes:1,4 , Learning outcomes:4 Lh, Learning outcomes:4 In, Learning outcomes:4			

	9.No-load curve of an induction motor., 1h, Learning outcomes:4 10.Load and output curve of a DC motor., 1h, Learning outcomes:4 11.Load and output curve of a DC motor., 1h, Learning outcomes:4					
	12.Regulation of DC motors., 1h, Learning outcomes:4 13.Regulation of DC motors., 1h, Learning outcomes:4 14.Introduction to specialized test laboratories for rotating electrical machinery., 1h, Learning outcomes:4 15.Introduction to specialized test laboratories for rotating electrical machinery., 1h, Learning outcomes:4					
Required materials	Basic: classroom, blackboard, chalk Special purpose laboratory Overhead projector					
Exam literature	 Basic literature: 1. A. Dolenc, Transformatori, skripta Sveučilišta u Zgrebu, 1991. 2. R.Wolf, Osnove električnih strojeva, Školska knjiga, Zagreb, 1985. 3. I. Mandić, V. Tomljenović, M. Pužar: Sinkroni i asinkroni električni strojevi, Tehničko veleučilište u Zagrebu, 2012., http://nastava.tvz.hr/el-strojevill/SinAsink.pdf Additional literature: 1. L.M.Piotrovskij, Električni strojevi, Tehnička knjiga, Zagreb, 1974. 2. D. Ban, V. Štivčević, I. Gašparac, Osnove elelekromehaničke pretvorbe energije i električnih strojeva, Zbirka zadataka i ispitnih pitanja, Element, Zagreb, 1996. 3. I. Mandić, M. Pužar: Transformatori i električni rotacijski strojevi Bilješke s predavanja (PowerPoint format) 4. V. Tomljenović: Transformatori i električni rotacijski strojevi, Zbirka rješenja, TVZ, Zagreb, 2012. 5. Stephen D. Umans: Fitzgerald Kingsley's Electric Machinery, Seventh Edition, McGraw-Hill International Edition, 2014 					
Students obligations Knowledge evaluation during semester	Regular attendance, successfully performed laboratory exercises. Mid-term, numerical tasks#3#50#40\$Mid-term, theoretical questions#3#50#40\$					
Knowledge evaluation after semester	Written examination#1#50#40\$Oral examination#1#50#50\$					
Student activities:	Aktivnost ECTS (Constantly tested knowledge) 1 (Written exam) 2 (Oral exam) 2					
Remark	This course can be used for final thesis theme					
Prerequisites:	No prerequisites.					
ISVU equivalents:	28950;					

Code WEB/ISVU	23644/160839	ECTS	5.0	Academic year	2018/2019		
Name	Virtual Instrumentation	 ۱					
Status	6th semester - Electric	al power engineering (Re	dovni elektrotehnika) - e	elective course6th seme	ster - Control and		
	computer engineering	in automation (Redovni e	elektrotehnika) - elective	course6th semester - C	ommunication and		
	computer technology (Redovni elektrotehnika)	 elective course 				
Teaching mode	Lectures + exercises (a	auditory + laboratory + s	eminar + metodology +	construction)	30+30 (12+18+0+0)		
	work at home				90		
Teachers	Lectures:1. pred. Ivan I	Lujo , dipl.ing.					
	Auditory exercises:pred	d. Ivan Lujo , dipl.ing. Tomislav Novak mag. ing	inf at comm tachs				
Course objectives	To familiarizo studente	with the pessibilities and	hadvantagos of using vir	tual instruments instag	d of the standalone		
course objectives	variants	with the possibilities and		tuai mistruments misteat	i or the standalone		
Learning outcomes:	1.to analyze individual	steps of analog signal di	gitalization process. Leve	el:6			
	2.to analyze advantage	es and demands of comp	uter supported data acq	uisition systems. Level:6	j		
	3.to predict properties	for a system designed to	monitor a process (prov	vide measurements). Lev	/el:6,7		
	4.to combine gained pr	rograming skills into deve	eloping a modular electri	c measurement system.	Level:6,7		
	5.to design a method for	b.to design a method for gathering and storing data from a measurement. Level:6,7					
	7 to test the functional	ity of an existing measur	ement system Level.6	2vel.0,7			
		ity of an existing measur	emene system. Leveno				
Methods of carrying	Ex cathedra teaching						
out lectures	Guest lecturer						
	Case studies						
	Demonstration						
	Simulations						
	Questions and answers						
	Seminar, students pres	sentation and discussion					
	······						
Methods of carrying	Laboratory exercises o	n laboratory equipment					
out auditory	Laboratory exercises, o	computer simulations					
exercises	Group problem solving	ladaa diacayaay oo tha M	lah				
	Data mining and knowl	leage discovery on the w	eb				
	Computer simulations	ing					
	Workshop						
Methods of carrying	Laboratory exercises o	n laboratory equipment					
out laboratory	Laboratory exercises, o	computer simulations					
exercises	Group problem solving	ladaa diacayaay oo tha M	lah				
	Discussion, brainstorm	ina	eb				
	Computer simulations	ing					
	Interactive problem sol	lving					
	Workshop						
Course content	1 Data acquisition and	digitalization 2h Learni	na outcomos:1.2				
lectures	2 DAO system properti	es limitations and option	ng outcomes:1,2	s·1 2 3			
	3.Complex data structu	ures, 2h, Learning outcon	nes:3,4,5	.5.1,2,5			
	4.Measurement and da	ata display/analysis progr	am modularity , 2h, Leai	rning outcomes:3,4,5,6,7	7		
	5.Managing data files a	and hardware resources,	2h, Learning outcomes:4	1,5,6			
	6.Sequential and non s	equential programing, 2	n, Learning outcomes:4,5	5,6,7			
	8 Parallel process sinch	ow, 20, Learning outcome	1 earning outcomes: 1.5	67			
	9.Program arhitecture	implementation, 2h. Lea	ning outcomes:4.5.6.7	0,7			
	10.Running the user in	terface (events), 2h, Lea	rning outcomes:3,4,5,6,7	1			
	11.Input and output file	es, 2h, Learning outcome	s:3,4,5,6,7				
	12.Big data structuring	, search and analyze dat	a, 2h, Learning outcome	s:3,4,5,6,7			
	13.Upgrading existing	virtual instruments, 2h, L	earning outcomes:3,4,5,	,6,7 D 4 5 6 7			
	14.Delivering a final pr	lent projects in front of the	2n, Learning outcomes:	3,4,5,0,7			
			ien concugues, zh				
Course content	1.Computer assisted da	ata acquisition, data stru	cturing, in program man	ipulation, 3h, Learning o	utcomes:1,2,4,5,6		
auditory	2.Designing a user inte	erface, user ergonomy, co	de documentation, 3h, I	_earning outcomes:2,3,4	,6		
	3.Integrating LabVIEW	applications with mobile	device control interface,	remote access, 3h, Lea	rning outcomes:2,3,4,6		
	4.No classes						
	6 No classes						
	7.No classes						
	8.No classes						
	9.No classes						
	10.No classes						
	11.No classes						
	12.NO Classes						
	14.No classes						
	15.No classes						

Course content	1. Different DAO systems, low level management, 2h. Learning outcomes:1,2,3				
laboratory	2.Complex data structures, 2h, Learning outcomes:2,3,4,5,6 3.Producing a modular control program (MasteVI/SubVI), 2h, Learning outcomes:2,3,4,5,6				
	4.Implementing variables, measurement usage of variables, 2h, Learning outcomes:2,3,4,5,6				
	5. Picture acquisition and processing, 2h, Learning outcomes: 2, 3, 4, 5, 6				
	6.Controling the user interface using an event structure, 2h, Learning outcomes:2,3,4,5,6				
	7.Strucutring files for measurement data storage, 2h. Learning outcomes:2.3.4.5.6				
	8.Big data and diadem. 2h. Learning outcomes:2.3.4.5.6				
	9. Finishing program production, delivering a functional application, 2h, Learning outcomes: 2.3, 4.5, 6, 7				
	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 meterials	Decis slassraam blackbaard shalk				
Required materials	Basici classfoom, blackboard, chaik				
	Special purpose laboratory				
	Special purpose computer laboratory				
	Uvernead projector				
	Video equipment				
	Maquette				
Exam literature	LabVIEW Core1				
	LabVIEW Core2				
	prezentacije s predavanja				
	LabVIEW for Engineers, Ronald W. Larsen, 2011				
	Effective LabVIEW programming, Thomas Bress, 2013				
Students obligations	Completing all laboratory exercises with at least 50% total success				
Knowledge	Producing a student project in phases				
evaluation during					
semester					
Knowledge	Presentation of the completed students project				
evaluation after					
semester					
Student activities:	Aktivnost ECTS				
	(Classes attendance) 1				
	(Research) 2				
	(Practical work) 2				
Remark	This course can be used for final thesis theme				
Prerequisites:	No prerequisites.				