

FACULTY OF ELECTRICAL ENGINEERING, MECHANICAL ENGINEERING AND NAVAL ARCHITECTURE

DETAILED PROPOSAL OF THE STUDY PROGRAMME

GRADUATE UNIVERSITY STUDY IN INFORMATION AND COMMUNICATION TECHNOLOGY

1.1. List ofmandatory and elective courses

Studyprogramme module: WIRELESS COMMUNICATIONS - 241

	List ofcourses									
Year of study:1.										
Semester:I.										
07.47110	CODE	COLIDOR	НО	ECTS						
STATUS		COURSE	L	S	AE	LE	DE	ECTS		
	FELJ01	Digital telecommunications	45	0	15	15	0	6		
Mandatory	FELJ28	Radars	30	0	0	30	0	5		
	* L = lecture	es, S = seminars, AE = auditoryexcercise, LE = labora	atoryex	cercise	, DE =	design	excerci	se		

	List ofcourses										
Year of study:1.											
Semester:II.											
CTATUC			HOURS IN SEMESTER*					ГОТО			
STATUS CODE		COURSE	L	S	AE	LE	DE	ECTS			
	FELJ24	Bioelectromagnetics	30	0	0	30	0	5			
Manadatam	FELJ33	Antennas	30	0	15	15	0	6			
Mandatory	FETJ01	Project management	30	0	0	15	0	4			
	* L = lectures	S, S = S seminars, AE = auditoryexcercise, LE = labora	atoryex	ercise	, DE =	design	excerci	se			

	List ofcourses										
Year of study:2.											
Semester:III.											
OTATUC.	CODE	001707		HOURS IN SEMESTER*							
STATUS	CODE	COURSE	L	S	AE	LE	DE	ECTS			
	FELH25	Electromagnetic compatibility	45	0	15	15	0	6			
	FELJ26	Electromagnetic ecology and dosimetry	30	0	0	15	0	4			
Mandatory	FELJ22	Measurements in wireless systems	30	0	15	15	0	5			
	FELJ36	Systems for wireless transmission of energy	30	0	0	30	0	5			
	FELH41	Medical electronic devices	30	0	0	30	0	5			
	* L = lecture	es, S = seminars, AE = auditoryexcercise, LE = labor	atoryex	cercise	, DE =	design	excerci	se			

Studyprogramme module:: TELECOMMUNICATIONS AND INFORMATICS - 242

	List ofcourses										
Year of study	Year of study:1.										
Semester:I.											
STATUS			HOURS IN SEMESTER*					ГОТО			
	CODE	COURSE	L	S	AE	LE	DE	ECTS			
	FELJ01	Digital telecommunications	45	0	15	15	0	6			
Mandatory	FELJ28	Radars	30	0	0	30	0	5			
	FELJ02	Radio communications	30	0	15	15	0	5			
	* L = lecture	es, S = seminars, AE = auditoryexcercise, LE = labor	atoryex	cercise	, DE =	design	excerci	se			

	List ofcourses										
Year of study:1.											
Semester:II.											
STATUS	CODE	COURSE	НО	ECTS							
	CODE	COURSE	L	S	AE	LE	DE	ECIS			
	FELJ12	Algorithms	30	0	15	15	0	5			
	FELJ14	Mobile communications	30	0	15	15	0	5			
	FETJ01	Project management	30	0	0	15	0	4			
	* L = lectures	s, S = seminars, AE = auditoryexcercise, LE = labora	atoryex	cercise	, DE =	design	excerci	se			

	List ofcourses										
Year of study	:2.										
Semester:III.											
OT ATUO	0005	COLIDOR	НО	ГОТО							
STATUS	CODE	CODE COURSE -	L	S	AE	LE	DE	ECTS			
	FELH30	Local and access networks	30	0	0	30	0	5			
	FELJ24	Bioelectromagnetics	30	0	0	30	0	5			
Mandatory	FELH41	Medical electronic devices	30	0	0	30	0	5			
	FELJ20	Multimedia systems	30	0	0	30	0	5			
	FELJ22	Measurements in wireless systems	30	0	15	15	0	5			
Elective	FELJ36	Systems for wireless transmission of energy	30	0	0	30	0	5			
	* L = lecture	es, S = seminars, AE = auditoryexcercise, LE = labor	atoryex	cercise	DE =	design	excerci	se			

1.2. Course description

NAME OF THE COURSE	DIGITAL TELECOMMUNICATIONS								
Code	FELJ01	Year of study	1.						
Course teacher	Joško Radić, Ph.D., Associate Professor	Credits (ECTS)	6						
Associate teachers	Petar Šolić, Ph.D., Assistant Professor	Type of instruction (number of hours)	L 45	S 0	AE 15	LE 15	DE 0		
Status of the course	Obligatory	Percentage of application of e-learning	0						
	COURSI	E DESCRIPTION							
Course objectives	 Application of analytical design of digital community Implement and analysis 	ucture of a digital communial models necessary to unduring the communication systems e a simple communication about the ways of realization	derstan system	d the e	effects				
Course enrolment requirements and entry competences required for the course	None								
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	 5. Select the corresponding ARQ system with respect to the parameters of the communication channel 6. Identify the topology of the communication network and describe ways of switching in the network 7. Multistage switch design 								
	Course content			ı	L hours		\E ours		
	Real channelsEqualisation				3		2		
	Nyquistfilters, correlationfil	ters,			3		2		
	Linearandnon-linearequaliz	zation, Nyquistsignalingfilte	ers,		3		2		
	Echocancellation, scramble	ing,			3		2		
Course content	Parallelandserial, synchror simplexandduplextransmis				3		2		
broken down in	Synchronizationofdigitalsig	nals (clock, theframeandc	arrier)		3		2		
detail by weekly	Redundantcoding, block, c	onvolutionsandtrelliscodes	S,		3		2		
class schedule (syllabus)	First midterm exam								
	BCH and Reed-Solomon of	odes, turbo coding							
	ARQ system, FEC systems	s, encryptionandprotocols,			3		2		
	Thetopologyofthe network.	networkinggroupsandsigr	aling		3		2		
	Routingandnumbering plan	n, typesofswitchingsystems	3		3		2		
	Circuitswitching, multistage	eswitching			3		2		
	Spatialandtemporalswitchi	ng			3		2		
	Second midterm exam								

	List of laboratory exe	ercises					L	E hours	
	Eye pattern							2	
	Equalisation							2	
	Scrembling							2	
	Channel coding: Bloc	ck code:	S					2	
	Channel coding: Cor	volution	nal codes					2	
	Optimum receiver							2	
	☑ lectures☐ seminars and workshops☐ independent assignments								
	□ multimedia								
Format of instruction	☐ on line in entirety ☐ laboratory								
	□ partial e-learning			□ wor	k with n	nentor			
	☐ field work				(othe	er)			
Studentresponsibiliti es	The presence on lec				t least 7	'0 % of the time	s sched	uled.	
Screening student	Class attendance	1,8	Researc			Practical traini	na		
work (name the	Experimental work	.,0	Report			Individual work		3	
proportion of ECTS credits for			Semina	r					
eachactivity so that the total number of	Essay		essay	•		Laboratory exe		0,5	
ECTS credits is equal to the ECTS	Tests	0,1	Oral exa	am	m Preparation for laboratory exercise			0,5	
value of the course) Written exam 0,1 Project			(Other)						
	During the semester there are two mid-term exams and the final exam. Mid-term and final exams consist of questions and tasks. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. The requirement for								
	passing grade is the positive assessment of laboratory exercises and 50 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:								
Grading and evaluating student	Grade (%) = 0,8 * (0.5 * M1 + 0,5 * M2) + 0,2 * L;								
work in class and at	M1, M2 - points at the mid-term expressed as a percentage, and L - points from the								
the final exam	laboratory (with completed all lab. Exercises) expressed as a percentage.								
	The final evaluation is determined as follows: percentage Rating								
	50% to 61% is sufficient (2)								
	62% to 74% good (3)								
	75% to 87% of very good (4)								
	88% 100% Excellen	t (5)				1			
		Title)			Number of copies in the library		oility via media	
Required literature (available in the									
library and via other media)	S. Benedetto: Pr with wireless app			ansmis	sion:				
,	L. W. Couch II: D. Communication State	igital ar	nd Analog	9					
Optional literature		<i>y</i> = 1-211							
(at the time of									
submission of study									

programme proposal)	
Quality assurance methods that ensure the acquisition of exit competences	 Evaluation of results in accordance with the above learning outcomes Feedback from students via surveys Self-evaluation of teachers Institutional and non-institutional evaluations
Other (as the proposer wishes to add)	

NAME OF THE COURSE	RADARS								
Code	FELJ28	Year of study	1						
Course teacher	Zoran Blažević, Ph.D., Full Professor	Credits (ECTS)	5						
Associate teachers	Maja Škiljo, Ph.D.	Type of instruction (number of hours)	L 30	S 0	AE 0	1E 30	DE 0		
Status of the course	Elective	Percentage of application of e-learning	0						
COURSE DESCRIPTION									
Course objectives	 explaining and increasing the knowledge about radiolocation principles, radar operation principle, and the role of all main radar subsystems. calculating and estimating the basic radar signal parameters differentiating between specific radar types and perceiving their advantages and disadvantages visualization of possibilities and characteristics of surveillance and targeting radar operation considering and investigating modern solutions in radar technology 								
Course enrolment requirements and entry competences required for the course	Finished the undergraduate study of Communications and Information Technology								
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - develop competencies in individual and team work in analyzing and designing certain radar subsystems - estimate and calculate radar target parameters - recognize the relation between certain tactical and technical radar requirements - evaluate and perceive advantages and disadvantages of certain radar types - consider and analyze characteristics of surveillance and targeting radars								
Course content	Course content					Lh	ours		
broken down in	Introduction to radar system	ns.					1		
detail by weekly class schedule	Basic principles of radar sy	vstems.					2		
(syllabus)	Parameters of radar signal						2		

Format of instruction seminars and workshops m m exercises la on line in entirety m w partial e-learning m w Student The presence on lectures in the amount of	radar signal. of devices using vector distance. ection. tion. ments. ments. ements.	3 3 2 2 3 3 3 3 2 2 2 2 2 1 LE hours 2 6 2 4 2 2 4 2 5 5 5					
Estimation of target position parameters to Basic radar hardware. Moving target indication (MTI) radar. Doppler impulse radar. Synthetic aperture radar (SAR). Meteorological radar. Ultra wideband (UWB) radar. Target tracking. Clutter cancelation in radar systems. List of laboratory exercises Transmission and reflection measurements network analyzer. Radar principles- the measurement of target Numerical simulation of target radar cross sets. SAR radar concept- simulation and measure MTI radar concept- simulation and measure UWB radar concept- simulation of target radar cross set under UWB radar concept- simulation of target radar cross set un	of devices using vector distance. ection. tion. ments. ments. ements.	2 2 3 3 3 2 2 2 2 1 LE hours 2 6 2 2 4 2 2 5					
Basic radar hardware. Moving target indication (MTI) radar. Doppler impulse radar. Synthetic aperture radar (SAR). Meteorological radar. Ultra wideband (UWB) radar. Target tracking. Clutter cancelation in radar systems. List of laboratory exercises Transmission and reflection measurements network analyzer. Radar principles- the measurement of target Numerical simulation of target radar cross of the measurement of bistatic radar cross of the measurement of target radar cross of tar	of devices using vector distance. ection. tion. ments. ments. ements.	2 3 3 2 2 2 2 1 LE hours 2 6 2 4 2 2 5					
Moving target indication (MTI) radar. Doppler impulse radar. Synthetic aperture radar (SAR). Meteorological radar. Ultra wideband (UWB) radar. Target tracking. Clutter cancelation in radar systems. List of laboratory exercises Transmission and reflection measurements network analyzer. Radar principles- the measurement of target Numerical simulation of target radar cross sets. SAR radar concept- simulation and measure UWB radar concept- simulation of target radar cross set set set set set set set set set s	distance. ection. etion. ments. nents. ements.	3 3 2 2 2 2 1 LE hours 2 6 2 4 2 2 5					
Doppler impulse radar. Synthetic aperture radar (SAR). Meteorological radar. Ultra wideband (UWB) radar. Target tracking. Clutter cancelation in radar systems. List of laboratory exercises Transmission and reflection measurements network analyzer. Radar principles- the measurement of target Numerical simulation of target radar cross of the measurement of bistatic radar cross of SAR radar concept- simulation and measure UWB radar concept-	distance. ection. etion. ments. nents. ements.	3 2 2 2 2 1 LE hours 2 6 2 4 2 2 5					
Synthetic aperture radar (SAR). Meteorological radar. Ultra wideband (UWB) radar. Target tracking. Clutter cancelation in radar systems. List of laboratory exercises Transmission and reflection measurements network analyzer. Radar principles- the measurement of target Numerical simulation of target radar cross of the measurement of bistatic radar cross of the measurement of target radar cross of	distance. ection. etion. ments. nents. ements.	2 2 2 1 LE hours 2 6 2 2 4 2 2 5					
Meteorological radar. Ultra wideband (UWB) radar. Target tracking. Clutter cancelation in radar systems. List of laboratory exercises Transmission and reflection measurements network analyzer. Radar principles- the measurement of target Numerical simulation of target radar cross of the measurement of bistatic radar cross of the measurement of target radar cross of the measurement of target radar cross of the measurement of bistatic radar cross of the measurement of target radar cross of the measurement of target radar cross	distance. ection. etion. ments. nents. ements.	2 2 2 1 LE hours 2 6 2 4 2 2 5					
Ultra wideband (UWB) radar. Target tracking. Clutter cancelation in radar systems. List of laboratory exercises Transmission and reflection measurements network analyzer. Radar principles- the measurement of target Numerical simulation of target radar cross of The measurement of bistatic radar cross of SAR radar concept- simulation and measure UWB radar conce	distance. ection. etion. ments. nents. ements.	2 2 1 LE hours 2 6 2 2 4 2 2 5					
Target tracking. Clutter cancelation in radar systems. List of laboratory exercises Transmission and reflection measurements network analyzer. Radar principles- the measurement of target Numerical simulation of target radar cross of the measurement of bistatic radar cross of the measurement of target radar cross of	distance. ection. etion. ments. nents. ements.	2 1 LE hours 2 6 2 2 4 2 2 2 5					
Clutter cancelation in radar systems. List of laboratory exercises Transmission and reflection measurements network analyzer. Radar principles- the measurement of target Numerical simulation of target radar cross of the measurement of bistatic radar cross of the measurement of target radar cross of target radar cross of the measurement of target radar cross of target radar cross of the measurement of target radar cross of target radar	distance. ection. etion. ments. nents. ements.	1 LE hours 2 6 2 2 4 4 2 2 5 5					
List of laboratory exercises Transmission and reflection measurements network analyzer. Radar principles- the measurement of target Numerical simulation of target radar cross so The measurement of bistatic radar cross so SAR radar concept- simulation and measure UWB radar concept	distance. ection. etion. ments. nents. ements.	LE hours 2 6 2 2 4 2 2 5					
Transmission and reflection measurements network analyzer. Radar principles- the measurement of target Numerical simulation of target radar cross so The measurement of bistatic radar cross so SAR radar concept- simulation and measure UWB r	distance. ection. etion. ments. nents. ements.	2 6 2 2 4 2 2 2 5					
network analyzer. Radar principles- the measurement of target Numerical simulation of target radar cross so The measurement of bistatic radar cross so SAR radar concept- simulation and measure UWB	distance. ection. etion. ments. nents. ements.	6 2 2 4 2 2 2 5					
Numerical simulation of target radar cross so The measurement of bistatic radar cross so SAR radar concept- simulation and measure UWB radar concept- simula	ection. tion. ments. ments. ements. EMEDITION OF THE PROPERTY OF THE PROPERT	2 2 4 2 2 2 5					
The measurement of bistatic radar cross see SAR radar concept- simulation and measure MTI radar concept- simulation and measure UWB radar concept- simulation and measure Group visit to HRM (Croatian Navy) in Lora Group visit to Naval centre of electronics (F	tion. ments. nents. ements. EE) Split.	2 4 2 2 5					
SAR radar concept- simulation and measure MTI radar concept- simulation and measure UWB radar concept- simulation and measure Group visit to HRM (Croatian Navy) in Lora Group visit to Naval centre of electronics (F Electures	ments. nents. ements. EE) Split.	4 2 2 5					
MTI radar concept- simulation and measure UWB radar concept- simulation and measure Group visit to HRM (Croatian Navy) in Lora Group visit to Naval centre of electronics (F Electures	nents. ements. CE) Split.	2 2 5					
UWB radar concept- simulation and measured Group visit to HRM (Croatian Navy) in Loral Group visit to Naval centre of electronics (Fig. 1)	ements. CE) Split.	2 5					
Group visit to HRM (Croatian Navy) in Lora Group visit to Naval centre of electronics (F	CE) Split.	5					
Group visit to Naval centre of electronics (F Seminars and workshops Sint							
Format of instruction Seminars and workshops Single in mile in entirety William William		5					
Format of instruction Seminars and workshops Image: I							
Format of instruction Seminars and workshops mexercises mexercises late mexercises	ependent assignments						
Format of instruction on line in entirety partial e-learning field work Student The presence on lectures in the amount of	Itimedia						
□ partial e-learning □ field work Student The presence on lectures in the amount of	oratory						
	k with mentor						
Student The presence on lectures in the amount of	(other)						
· ·	t least 70 % of the times so	hodulod					
responsibilities Performed all laboratory exercises required		Tieddied.					
Screening student Class attendance 1.5 Research	Practical training						
work (name the proportion of ECTS Experimental work Report	Individual work						
credits for each activity so that the Essay Seminar essay	2 Laboratory exercis	ses 1					
total number of ECTS credits is equal to the ECTS Tests 0,5 Oral exam	Preparation for laboratory exercise	es					
value of the course) Written exam Project	(Other)						
Grading and evaluating student work in class and at the final exam lecturing and the seminar essays are present includes individual work and work in groups students that did not pass the test take part of the seminar essay is obligatory. The management of the seminar essay is obligatory. The management of the seminar essay is obligatory.	There is one midterm test and seminar essay. The midterm test is after 7 weeks of lecturing and the seminar essays are presented during the next part of the semester. The midterm test consists of theoretical questions and numerical. Seminar essay includes individual work and work in groups, and the presentation of the results. The students that did not pass the test take part In the final exams and the presentation of the seminar essay is obligatory. The midterm test is carried out as written test. Grade (in percentage) is formed according to the formula: Grade(%) = 0,1 NP + 0,1 LV + 0,4 (M + S) the activities in percentage:						

	 LV – laboratory assessment, M - test results, S- seminar essay 	M - test results, S- seminar essay							
Required literature (available in the library and via other media)	Title	Number of copies in the library	Availability via other media						
	M. Škiljo:: Radari, predavanja		e-learning portal						
	Skolnik, M: Introduction to Radar Systems, McGraw-Hill, 1990.	1							
	Peebles, P. Z: "Radar Principles", John Wiley & Sons, 1998.	1							
Optional literature (at the time of submission of study programme proposal)	 Tait, P: "Introduction to Radar Target Recognition", IEE, 2005. Zentner, E.: Antene i radiosustavi, Graphis Zagreb, 2001. 								
Quality assurance methods that ensure the acquisition of exit competences	 Evaluation of results in accordance with the above learning outcomes Feedback from students via surveys Self-evaluation of teachers Institutional and non-institutional evaluations 								
Other (as the proposer wishes to add)									

NAME OF THE COURSE	BIOELECTROMAGNETIC	BIOELECTROMAGNETICS								
Code	FELJ24	ELJ24 Year of study 1.								
Course teacher	Antonio Šarolić, Ph.D., Full Professor	Credits (ECTS)	5							
Associate teachers	Niko Ištuk, Teaching	Type of instruction	L	S	AE	LE	DE			
Associate teachers	Assistant	(number of hours)	30			30				
Status of the course	Elective	Percentage of application of e-learning								
COURSE DESCRIPTION										
Training students for: - understanding the human electrophysiology - acquiring knowledge on therapeutic and diagnostic methods - application of specialized interdisciplinary knowledge in biomedical applications							ations			
Course enrolment requirements and entry competences required for the course	None.									
Learning outcomes expected at the level	Students will be able to:									

of the course (4 to 10 learning outcomes)	 describe the cell structure describe the electrophysiology of excitable cells and tissues apply the electrophysiology knowledge for understanding the brain and heart function analyze the electric activity of heart and brain with applications in diagnostics link the electrophysiology principles to the function of other bodily organs and to potential biomedical applications 							
	Course content						L hours	AE hours
	Introduction and history. 2						0	
	Structure of neuron and muscle cells.					2	0	
	Membrane potential.						2	0
	Axon as transmissio	n line (c	able).				2	0
Course content	Membrane activation	າ.					2	0
broken down in	Synapses, receptors	and bra	ain.				2	0
detail by weekly	Heart.						2	0
class schedule (syllabus)	Volume source. Volu	ıme con	ductor.				2	0
(0)	Electrocardiography (ECG).						2	0
	Electroencephalograhpy (EEG).					2	0	
	Electrophysiology of	the eye	. Electrod	dermal	reaction	l	2	0
	Other diagnostic and electromagnetics. M						2	0
	Visit to Medical School companies related to				plit. Visi	t to	2	0
	List of laboratory or	design e	exercises					LE hours
	Membrane potential.							4
	Axon as transmission	ı line (ca	able).					2
	Membrane activation							4
	Synapses, receptors	and bra	in.					2
	Electrocardiography	(ECG).						2
	Electroencephalogra	hpy (EE	G).					2
	Electrodermal reaction	n.						2
	Other diagnostic and electromagnetics. Ma							2
	Visit to Medical Scho related to the course		Universi	ty of Sp	olit. Visit	to companie	es	6
	⊠ lectures			□ inda	- a a a d a r	t sesianmon	40	
	⊠ seminars and wor	rkshops			epender timedia	nt assignmen	เร	
Format of instruction	⊠ exercises				oratory			
1 Office of motions	☐ on line in entirety				k with m	nentor		
	□ partial e-learning⋈ field work				(othe			
Student responsibilities	Student is required t least 70% of the sch the amount of 100% laboratory exercises	edule. S of the s	Student is	require	ed to att	end the labo	ratory exe	ercises in
Screening student	Class attendance	1	Researc	:h		Practical tra	ining	_
work (name the proportion of ECTS	Experimental work	0,5	Report			Laboratory 6	exercises	0,5

	1	1	1	1	1		1
credits for each activity so that the	Essay		Seminar essay	1	Individual work	(1
total number of ECTS credits is	Mid-exam	0,5	Oral exam		(Other)		
equal to the ECTS value of the course)	Written exam	0,5	Project		(Other)		
Grading and evaluating student work in class and at the final exam	During the semester the middles of the sexercises are comply. The first mid-exam is exam is based on the To pass at each midexam containing nutron to go for points must from the lectures). To earn the right to earned from the parfrom auditory exercifirst mid-exam contains the passed the whole who is a student earns the have passed the whole who is a student earns the have passed the whole who is a student earns the have passed the whole who is a student earns the have passed the whole who is a student earns the have passed the whole who is a student earns the have passed the whole who is a student earns the have passed the whole who is a student earns the have passed the whole who is a student earns the first exam termal that all other exam term term earns accordingly the sex of the first earns that all other exam terms accordingly the sex of the first earns that all other exam terms accordingly the sex of the first earns are considered.	semester eted, so so based are first so decam, imerical be earned approat of the ses) and ining the nel position of the sex ams in the sex am	er, while the secthedules to be agon the first half econd half of the min. 50% of poi problems (material from the second refirst mid-exam of min. 30% of poi ecory (material from the grades on both mouth the grades of haven't passed lents must take the edefining the overguestions, correspondingly.	ond will greed wi of the co course nts mus erial from of the e mid-exa containir ints mus om the le oth mid- e calcula e to take at mid- e whole ulfilling erall gra ected by orming ent with	be held after ith the students purse material. In the earned from auditory exercises and containing m, min. 30% on any numerical prost be earned from ectures). In exams, he/she ated as averaging the requirement of the requirement of the result of or a practical project the teacher.	the lectur. The seco m the particises) are theory (r f points in oblems (rom the particises) are the particises on the particise of the partic	res and mid- rt of the nd min. material nust be material rt of the ered to oth mid- nly that course student average tion:
		Title			copies in the library	Availabi other r	
Required literature	 Jaakko Malmivud Bioelectromagne Applications of B Fields, Oxford U 1995. 	etism - P Bioelectri niversity	rinciples and ic and Biomagne Press, New Yor				
(available in the library and via other media)	Handbook of bio electromagnetic Bioengineering a Electromagnetic and Ben Greene	fields (thand Biop Fields, I	nird edition): hysical Aspects Ed. Frank S. Bar	nes			
	Handbook of bio electromagnetic and Medical Asp Ed. Frank S. Bar CRC Press, 200	fields (the ects of lance	nird edition): Biol Electromagnetic	Fields,			
Optional literature (at the time of	Šantić, A: Biomedicinska elektronika, Školska knjiga, Zagreb, 1995.						

submission of study programme proposal)	The Biomedical Engineering Handbook (Second Edition), Ed. Joseph D. Bronzino, CRC Press, 2000.
Quality assurance methods that ensure the acquisition of exit competences	Surveys providing student feedback
Other (as the proposer wishes to add)	

NAME OF THE COURSE	ANTENNAS							
Code	FELJ33	Year of study	1.					
Course teacher	Antonio Šarolić, Ph.D., Full Professor	Credits (ECTS)	6					
Associate teachers	Niko Ištuk, Teaching Assistant	Type of instruction (number of hours)	S	AE 15	LE 15	DE		
Status of the course	Obligatory	Percentage of application of e-learning	0		<u> </u>			
	COURSE	DESCRIPTION						
Course objectives	Training students for: - understanding the phenomena of radiation - analysis of antennas as radiating structures - application of antennas in wireless communication systems							
Course enrolment requirements and entry competences required for the course	None.							
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - utilize the antenna parameters as the basis for antenna application in ICT - elaborately assess the applicability of a certain antenna for specific purpose - calculate the electromagnetic field in the surrounding of simple antenna structures - analyze the parameters of linear antennas - analyze simple uniform antenna arrays							
LCourse content					or S nours		\E ours	
detail by weekly class schedule	detail by weekly Introduction. Antenna parameters. Polarization. Radiation				2		1	
(syllabus)	Directivity. Gain. Antenna i	mpedance. Effective area.			2		1	

	Effective length. Ant parameters. Friis eq		ctor. Rela	ations li	nking th	e antenna	2	1			
	Elementary electrica	al dipole	(EED). F	ield arc	ound the	EED.	2	1			
	Radiated power and EED.	l radiatio	on resista	nce of I	EED. Ef	ficiency of	2	1			
	Zones surrounding the antenna – near and far field. 2										
	Resonant dipoles. H	lalfwave	dipoles.	Fullwa	ve dipol	es.	2	1			
	Electrically short dip	ole and	unipole.				2	1			
	Mutual impedance of	of dipole:	s.				2	1			
	Antenna array. Unifo	orm line	ar antenn	a array			2	1			
	Array with uniform a	mplitude	e distribu	tion.			2	1			
	Arrays with non-unif	orm am	plitude di	stributio	on.		2	1			
	Practical examples	of anten	na install	ations i	n use –	field trip.	2	1			
	List of laboratory or	st of laboratory or design exercises						LE hours			
	Introduction. Antenna parameters. Polarization. Radiation patt Directivity. Gain. Antenna impedance. Effective area.						n.	2			
	Effective length. Anto parameters. Friis equaround the EED.						ield	2			
	Radiated power and Zones surrounding th					iciency of E	EED. 2				
	Resonant dipoles. Halfwave dipoles. Fullwave dipoles. Electrically dipole and unipole.					lly short	2				
	Mutual impedance or array.	f dipoles	s. Antenn	a array.	. Uniforr	n linear ante	enna	2			
	Array with uniform ar amplitude distribution		distribut	ion. Arr	ays with	n non-uniforr	m	2			
	Practical examples of		na installa	ations				1			
Format of instruction	 ☑ lectures ☐ seminars and wo ☐ exercises ☐ on line in entirety ☐ partial e-learning ☒ field work 	rkshops		□ mul	ependei Itimedia oratory k with n	nentor	nts				
Studentresponsibiliti es	Student is required to least 70% of the schule the amount of 100% laboratory exercises	nedule. So of the s	Student is	require	ed to att	end the lab	oratory ex	ercises in			
Screening student	Class attendance	2	Researc	ch		Practical tra	aining	0,5			
work (name the proportion of ECTS	Experimental work	0,5	Report			Laboratory	exercises	0,5			
credits for eachactivity so that the total number of	Essay		Seminal essay	r		Individual v	vork	1			
ECTS credits is equal to the ECTS	Mid-exam	0,5	Oral exa	am		(Oth					
value of the course)	Written exam	0,5	Project		0,5	(Oth	ner)				
Grading and evaluating student work in class and at the final exam											

During the semester, two mid-exams will be held. The first mid-exam will be held in the middles of the semester, while the second will be held after the lectures and exercises are completed, schedules to be agreed with the students.

The first mid-exam is based on the first half of the course material. The second midexam is based on the first second half of the course material.

To pass at each mid-exam, min. 50% of points must be earned from the part of the exam containing numerical problems (material from auditory exercises) and min. 50% of points must be earned from the part of the exam containing theory (material from the lectures).

To earn the right to approach the second mid-exam, min. 30% of points must be earned from the part of the first mid-exam containing numerical problems (material from auditory exercises) and min. 30% of points must be earned from the part of the first mid-exam containing theory (material from the lectures).

If a student earns the positive grades on both mid-exams, he/she is considered to have passed the whole exam with the grade calculated as average from both mid-exams.

At the first exam term, students may choose to take the exam containing only that half of the material that they haven't passed at mid-exams.

At all other exam terms, students must take the whole exam, containing all the course material.

Approaching the exams is subject to fulfilling the requirements on student responsibilities.

The overall point percentage defining the overall grade is calculated as the average of points earned in all exam questions, corrected by the result of oral verification:

Percentage -> Grade

50% - 62,4% -> sufficient (2)

62,5% - 74,9% -> good (3)

75% - 87,4% -> very good (4)

87,5% - 100% -> excellent (5)

Final grade can be supplemented by performing practical project work involving individual and experimental work, in agreement with the teacher.

Exam terms: according to the academic year calendar

Required literature	Title	Number of copies in the library	Availability via other media
(available in the library and via other media)	E. Zentner: Antene i radiosustavi, Graphis, Zagreb 2001.		
media)	Constantine A. Balanis: AntennaTheory: Analysisand Design, Wiley, 1997.		
Optional literature (at the time of submission of study programme proposal)	 V. Roje: Antene I dio, skripta, Sveučilište u Splitu Handbook of antennas in wireless communication 		, 2002.
Quality assurance methods that ensure the acquisition of exit competences	Surveys providing student feedback		
Other (as the proposer wishes to add)			

NAME OF THE COURSE	PROJECT MANAGEMEN	PROJECT MANAGEMENT							
Code	FETJ01	Year of study	2.						
Course teacher	Ivica Veža, Ph.D., Full Professor	Credits (ECTS)	4	4					
Associate teachers	Marko Mladineo, Ph.D.	Type of instruction (number of hours)	L 30	S 0	AE 0	LE 15	DE		
Status of the course	Obligatory Percentage of application of e-learning 0								
	COURSI	E DESCRIPTION							
Course objectives	Training students for: - planning and mana - calculating profitab	aging projects oility of the project and retu	ırn of inv	/estm	ent (R	OI)			
Course enrolment requirements and entry competences required for the course	None								
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	evel (Work Breakdown Structure)								
	Course content				L hours		\E ours		
	Introduction and basic con-	cepts			2				
	The concept and definition	of project and project mar	nageme	nt	2		0		
	Projects - vision, strategy, shipbuilding industries)	goals (examples - automo	tive and		2		0		
	The strategy and project management.	nanagement. Multi-project			2		0		
Course content	Basics of organization. The	e project organizational str	ucture.		2		0		
broken down in detail by weekly class schedule (syllabus)	The phases of the project (selection, project planning, project)				2		0		
(Jyliabus)	Methods for project planning	ng.			2		0		
	Quality management (plan control)	nt (planning of improvement and quality					0		
Cost management. Continuous Improvement - Kaizen. 2 Risk management. 2							0		
							0		
	Psychological and social conference of Project manager.	omponent of project mana	gement		2		0		
	Teamwork. 2 0								

Introduction to the technique of network planning. Basic concepts of network planning technique Analysis of time CPM method PERT method PRECEDENCE method Cost analysis Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams Mapping processes Comparison of different process diagrams lectures seminars and workshops multimedia laboratory partial e-learning field work work with mentor partial e-learning field work work with mentor performed all required laboratory exercises. Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course) Grading and evaluating student work in the same and the minimum number of students is two, maximum number of project work team and the minimum number of students is two, maximum number of buring the osures they determine the content of their project. Toroject work team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of stu	0	2	Communication and motivation in the team. Methods for stimulating creativity.						
Basic concepts of network planning technique Analysis of time CPM method PERT method PRECEDENCE method Cost analysis Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams lectures lectures lindependent assignments multimedia laboratory labor	LE hours					exercises		T T	
Analysis of time CPM method PERT method PRECEDENCE method Cost analysis Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams Seminars and workshops Individual work Student responsibilities Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course) Written exam Grading and evaluating student work in class and at the final exam Analysis of time CPM method PRECEDENCE method Cost analysis Resource - Microsoft Project Introduction to the software - Microsoft Project All Software - Microsoft Project Al	1		g.	nning.	rk plan	of netwo	chnique	Introduction to the te	
CPM method PERT method PERT method PRECEDENCE method Cost analysis Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams Seminars and workshops Seminar Individual work	1			ıe	echniqu	anning te	twork pl	Basic concepts of ne	
PERT method PRECEDENCE method Cost analysis Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams Lectures Impartial e-learning Impartial e-learning	1							Analysis of time	
PRECEDENCE method Cost analysis Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams lectures seminars and workshops laboratory work with mentor laboratory work with mentor laboratory work with mentor laboratory laboratory	1							CPM method	
Cost analysis Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of processed diagrams Mapping processes Comparison of different process diagrams lectures seminars and workshops multimedia laboratory multimedia laborat	1							PERT method	
Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of processed lagrams Mapping processes Comparison of different process diagrams lectures seminars and workshops independent assignments multimedia laboratory work with mentor (other)	1						nod	PRECEDENCE meth	
Introduction to the software - Microsoft Project Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams lectures seminars and workshops multimedia laboratory work with mentor (other)	1	st analysis							
Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams lectures seminars and workshops multimedia laboratory work with mentor (other)	1							Resource analysis	
Basics of process diagrams Mapping processes	1			ect	ft Proje	Microso	ftware -	Introduction to the so	
Mapping processes Comparison of different process diagrams □ lectures □ seminars and workshops □ on line in entirety □ partial e-learning □ field work Student responsibilities □ creening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course) Written exam Grading and evaluating student work in class and at the final exam Mapping processes Comparison of different process diagrams □ lindependent assignments □ multimedia □ laboratory □ work with mentor □ (other) □ work with mentor □ (other) □ Research □ Practical training □ field work Report □ Individual work □ Preparation for laboratory exercises □ Oral exam □ Project □ 1,5 (Other) □ During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number of students is two, maximum number of the course they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS plan the time for each activity and determine the critical path. Students all the costs, calculate project profitability (ROI) and analyze risks. On test students their work which is evaluated (grade M). On the other side students have one test in the field of Network planning tech (LV) at the end of the semester. • LV - grade of laboratory exercises,	1			ent	ageme	ess man	ess prod	Introduction to busine	
Comparison of different process diagrams Comparison of different process diagrams	1						agrams	Basics of process dia	
Format of instruction Secretizes Independent assignments Independent Independent Independent Independent Independent Independent Independent Independent Independent Independent Independent Independent Independent Independent Independent Independent Independ	1							Mapping processes	
Format of instruction Seminars and workshops Independent assignments Independent In	1				ams	ess diagr	ent proc	Comparison of different	
Format of instruction Seminars and workshops Individual work with mentor Individual work		nto	ndont assignmo	lonondor	⊠ ind			⊠ lectures	
Format of instruction On line in entirety		.115	X seminars and workshops						
Student responsibilities Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS value of the course) Written exam Grading and evaluating student work in class and at the final exam Grading student work in class and at the final exam □ on line in entirety □ partial e-learning □ (other) □ work with mentor □ (other) □ content of at least 70 % of the times schedul Performed all required laboratory exercises. □ laboratory exercises □ laboratory exercises □ laboratory exercises □ Preparation for laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number of students is t								⊠ exercises	Format of instruction
Student responsibilities The presence on lectures in the amount of at least 70 % of the times schedul Performed all required laboratory exercises. Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course) Written exam Crading and evaluating student work in class and at the final exam Student The presence on lectures in the amount of at least 70 % of the times schedul Performed all required laboratory exercises. Class attendance 1,0 Research Practical training Seminar essay laboratory exercises Oral exam Preparation for laboratory exercises Written exam Project 1,5 (Other) During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. Seminar essay laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. Seminar essay laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. Seminar essay laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number of students is two, maximum number in During the course they determine the content of their project and main targets. Seminar essay laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students th			•	I □ <i>on line</i> in entirety				r omiat or monaction	
Student responsibilities The presence on lectures in the amount of at least 70 % of the times schedul Performed all required laboratory exercises. Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course) Written exam Grading and evaluating student work in class and at the final exam The presence on lectures in the amount of at least 70 % of the times schedul Performed all required laboratory exercises. Class attendance 1,0 Research Practical training Seminar essay laboratory exercises O Oral exam Project 1,5 (Other) During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number of During the course they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the content of their project and main targets. Since the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the content of their project and main targets. Since the project profitability (ROI) and analyze ris			□ partial e-learning □ (other)					•	
Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS value of the course) Grading and evaluating student work in class and at the final exam Performed all required laboratory exercises. Class attendance 1,0 Research Practical training Individual work Report Individual work Seminar essay Iaboratory exercises Preparation for Iaboratory exercises Value of the course) Written exam Project 1,5 (Other) During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the costs, calculate project profitability (ROI) and analyze risks. On test students their work which is evaluated (grade M). On the other side students have one test in the field of Network planning tech (LV) at the end of the semester. • LV - grade of laboratory exercises.				•					
work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course) Grading and evaluating student work in class and at the final exam Experimental work Report Individual work Report Individual work Seminar essay Iaboratory exercises Preparation for laboratory exercises Project 1,5 (Other) During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the content of their project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students are capacities and determine the conte	Juled.	imes sche	ast 70 % of the t						
proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course) Written exam During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. T project work team and the minimum number of students is two, maximum number i During the course they determine the content of their project and main targets. S develop the main activities of project and the structure of distribution of work (WBS plan the time for each activity and determine the critical path. Students als capacities and determine bottlenecks and balance capacities. At the end they determine the content of their project and main targets. S develop the main activities of project and the structure of distribution of work (WBS plan the time for each activity and determine the critical path. Students als capacities and determine bottlenecks and balance capacities. At the end they determine the critical path. Con the other side students have one test in the field of Network planning tech (LV) at the end of the semester. • LV - grade of laboratory exercises		aining	Practical tra		h	Researc	1,0	Class attendance	
activity so that the total number of ECTS credits is equal to the ECTS value of the course) Written exam During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the critical path is evaluated (grade M). On the other side students have one test in the field of Network planning tech (LV) at the end of the semester. • LV - grade of laboratory exercises	1,0	vork	eport Individual work		Report		Experimental work	proportion of ECTS	
ECTS credits is equal to the ECTS value of the course) Written exam During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number of During the course they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the critical path is capacities and determine bottlenecks and balance capacities. On test students their work which is evaluated (grade M). On the other side students have one test in the field of Network planning tech (LV) at the end of the semester. • LV - grade of laboratory exercises.	0,5	exercises	laboratory		r			Essay	activity so that the
During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. T project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the critical path of the costs, calculate project profitability (ROI) and analyze risks. On test students their work which is evaluated (grade M). On the other side students have one test in the field of Network planning tech (LV) at the end of the semester. • LV - grade of laboratory exercises,			·		am	Oral exa	0	Tests	ECTS credits is
parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. Students are develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the critical path are capacities and determine bottlenecks and balance capacities. At the end they determine the critical path are capacities and determine bottlenecks and balance capacities. On test students their work which is evaluated (grade M). On the other side students have one test in the field of Network planning tech (LV) at the end of the semester. • LV - grade of laboratory exercises,		er)	5 (Oth	1,5		Project		Written exam	value of the course)
The final grade (in percentage) is formed according to the formula: Grade (%) = 0,30 LV + 0,70 M	. There is er is three. Students BS). They also plan determine ts present	On the other side students have one test in the field of Network planning technique (LV) at the end of the semester. • LV - grade of laboratory exercises, • M - points achieved from the project. The final grade (in percentage) is formed according to the formula:							evaluating student work in class and at
Required literature (available in the Title Title Title Number of copies in the library other m		Availa	copies ir				Title		

library and via other media)	Veža, I., Bilić, B., Gjeldum, N., Mladineo, M., "Upravljanje projektima", Fakultet elektrotehnike, strojarstva i brodogradnje, Split, 2011.		e-learning portal			
	Majstorović, V. Projektni menadžment, Sveučilište u Mostaru, Mostar, 2010.	5				
	Omazić, M.A. Projektni menadžment, Sinergija, Zagreb, 2005.	5				
Optional literature (at the time of submission of study programme proposal)	"A Guide to the Project Management Body of Knowledge, PMBOK Guide", Project Management Institute, Newtown Square, 2004. Wysocki, R. K., McGary, R., "Effective Project Management: Traditional, Adaptive, Extreme", John Wiley & Sons, 2003.					
Quality assurance methods that ensure the acquisition of exit competences	 Student survey in order to evaluate teachers Self-evaluation of teachers 					
Other (as the proposer wishes to add)						

NAME OF THE COURSE	ELECTROMAGNETIC COMPATIBILITY								
Code	FELH25	Year of study	2.						
Course teacher	Dragan Poljak, Ph.D., Full Professor Antonio Šarolić, Ph.D., Full Professor	Credits (ECTS)	6						
Associate togehere	Associate teachers Niko Ištuk, Teaching Type of instruction		L	S	ΑE	LE	DE		
Assistant (number of hours)	(number of hours)	45		15	15				
Status of the course	Obligatory	Percentage of application of e-learning	0						
	COURSE	DESCRIPTION							
Training students for:									
Course enrolment requirements and	None.								

entry competences required for the course							
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - analyze electronic components and circuits from the aspect of electromagnetic compatibility - calculate electromagnetic field around parasitic antenna structures, as well as disturbance voltages induced in such structures - analyze the conducted emissions and susceptibility of electrical devices - design filters for rejection of disturbances - analyze shielding and grounding of electrical devices and circuits - test the electromagnetic compatibility by measurements in accordance with standards and regulations - analyze electromagnetic compatibility of devices and systems using models with concentrated parameters, distributed parameters and transmission lines - analyze wire antennas with the application in electromagnetic compatibility						
	Course content		AE hours				
	Introduction to electromagnetic compatibility.	hours 3	1				
	Electronic components and their equivalent circuits.	3	1				
Course content broken down in	Radiated emissions and susceptibility.	3	1				
	Conducted emissions and susceptibility	3	1				
	Filtering.		1				
	Shielding.	3	1				
	Grounding.	3	1				
detail by weekly class schedule	Measurements in electromagnetic compatibility.		1				
(syllabus)	Electromagnetic compatibility requirements, standards and regu- lations. Electromagnetic compatibility in radiocommunication systems.		1				
	Historical overview of EMC modelling. Low-frequency models with concentrated parameters.		1				
	High-frequency models with distributed parameters.	3	1				
	Analysis of wire antennas in EMC applications.	3	1				
	Transmission line models.	3	1				
	List of laboratory or design exercises		LE hours				
	Introduction to electromagnetic compatibility.		1				
	Electronic components and their equivalent circuits.		1				
	Radiated emissions and susceptibility.		1				
	Conducted emissions and susceptibility		1				
	Filtering.		1				
	Shielding.						
Grounding.							
	Measurements in electromagnetic compatibility.		1				
	Electromagnetic compatibility requirements, standards and regula Electromagnetic compatibility in radiocommunication systems.	ations.	1				
Historical overview of EMC modelling. Low-frequency models with concentrated parameters.							
	High-frequency models with distributed parameters.		1				
	Analysis of wire antennas in EMC applications.		1				

	Transmission line models.								
	⊠ lectures	-ll		⊠ inde	epender	nt assignments			
	□ seminars and wo⋈ exercises	rksnops		☐ multimedia					
Format of instruction	□ on line in entirety				oratory				
	□ partial e-learning			□ wor	k with n				
	☐ field work				(othe	er)			
Studentresponsibiliti es	least 70% of the sch	edule. S of the s	Student is	require	ed to att	ry exercises in the am end the laboratory exe e all tasks associated	ercises in		
Screening student work <i>(name the</i>	Class attendance	2	Researc	:h		Practical training	0,5		
proportion of ECTS credits for	Experimental work	0,5	Report			Laboratory exercises	0,5		
eachactivity so that the total number of	Essay		Seminai essay	•		Individual work	1		
ECTS credits is equal to the ECTS	Mid-exam	0,5	Oral exa	ım		(Other)			
value of the course)	Written exam	0,5	Project		0,5	(Other)			
Grading and evaluating student work in class and at the final exam	the middles of the sexercises are compled. The first mid-exam is exam is based on the To pass at each midexam containing nutsons of points must from the lectures). To earn the right to earned from the parfrom auditory exercistirst mid-exam containing nutsons of the parfrom auditory exercistirst mid-exam contains the passed the whee passed the whee material that all other exam termaterial. Approaching the exam termaterial. Approaching the exercise of points earned in a percentage -> Grad 50% - 62,4% -> suff 62,5% - 74,9% -> go 75% - 87,4% -> very 87,5% - 100% -> ex	semeste eted, sc s based e first se d'exam, imerical be earne approat t of the ses) and ining the ne position exams in the sexams in the sexam	r, while the dules to the dules to on the firecond hamin. 50% problemed from the second from t	the sector be agreed to be agre	ond will greed with of the co course ints must rial from of the e mid-exa containing ints must on the le oth mid-exa containing erall gra cted by orming ent with	purse material. The sematerial. It be earned from the mauditory exercises) exam containing theory m, min. 30% of pointing numerical problems to be earned from the ectures). I exams, he/she is contained as average from the exam containing exams. I e exam, containing all the requirements of the requirements of the result of oral verification practical project works the teacher.	ectures and econd mid- part of the and min. If (material series (material part of the sidered to both mid- gonly that the course in student e average ication:		

Required literature	Title	Number of copies in the library	Availability via other media			
(available in the library and via other media)	Clayton R. Paul: Introduction to ElectromagneticCompatibility, Wiley, 2006.					
	Dragan Poljak: "Advanced modelingincomputationalelectromagneticcompat ibility", WileyInterscience, 2007.	Dragan Poljak: "Advanced modelingincomputationalelectromagneticcompat				
Optional literature (at the time of submission of study programme proposal)	 HandbookofElectromagneticCompatibility, ed. R. Tesche, F.M.: Ianoz, M.V., Karslsson, T.: EMC AnalysisMethodsandComputationalModels, John 	•				
Quality assurance methods that ensure the acquisition of exit competences	Surveys providing student feedback					
Other (as the proposer wishes to add)						

NAME OF THE COURSE	ELECTROMAGNETIC EC	COLOGY AND DOSIMETE	RY								
Code	FELJ26 Year of study 2										
Course teacher	Dragan Poljak, Ph.D., FullProfessor	Credits (ECTS)	4								
Associate teachers	Anna Šušnjara,	Type of instruction	L	S	ΑE	LE	DE				
Associate teachers	TeachingAssistant	(number of hours)	30	0	0	15					
Status of the course	Obligatory Percentage of application of e-learning 0										
	COURSE	DESCRIPTION									
Course objectives	simetry, - Assessmentof lowfrequencyandhight - Permanentadoptingar	olyfundamentalprinciplesof human frequencyelectromagnetic nddeepeningknowledgeintl andinternationalregulations ingradiation	ex ields nearea	posure ofbioel	ectror	nagne	to tism				
Course enrolment requirements and entry competences required for the course	- Electromagnetic fields	s, Electromagnetic waves									

	0. 1								
	Students will be able to: - Definefundamentalnotionsinbioelectromagnetics,								
	- Applymethods for themeasurementofexternal LF and HF fields								
	- Applymethods for themeasurementorexternal LF and HF fields - Applymethods for thecalculationofexternal LF and HF fields								
Learning outcomes	- Analyzethelevelofthe human bodyexposure	• • •							
expected at the level	ionizingradiationusingnationalandinternationalregulations	10	11011						
of the course (4 to	- Mathematicallyformulatesimplecasesofelectromagneticwave	andradiat	ionfromthi						
10 learning	nwirestructures.								
outcomes)	- Analyzesimpletransmissionlines, groundingsystemsandante								
	- Computefundamentalparametersofinternaldosimetrybymear	nsofsimple	bodymod						
	els Use commercial software pac	skogoo	for						
	applicationofrealisticdosimetrymodelsofthe human body.	ckages	for						
	Course content	L	AE						
		hours	hours						
	Electrosmog: electromagneticpollutionoftheenvironment. Ionisingandnon-ionisingradiation.	2							
	Couplingmechanismsofelectromagneticfieldandthe human body. Biologicaleffectsofelectromagneticfields. Lowfrequencyandhighfrequencyeffects. Epidemiologicalandstatisticalstudies.	2							
	Fundamentalquantitiesofelectromagneticdosimetry, currentdensity, inducedelectricfield, specificabsorption rate (SAR), specificabsorption(SA), externalfields, powerdensity.	2							
	Guidelines for protectionofnon-ionisingradiation. National and and an and an and an an area area area area area area. Protection measures.	2							
	Methodsoftheoreticalandexperimentaldosimetry. Incident and an	2							
Course content	Incident fielddosimetry; Radiationsourcecharacterization. Calculationandmeasurementof LF electricfield. Exposure to powerlinesandsubstationtransformers.	2							
broken down in detail by weekly class schedule	Incident fielddosimetry; Calculationandmeasurementof HF electromagneticfield. Exposure to RFID antennas, mobilephones, base stations.	2							
(syllabus)	Classificationofmodels for internaldosimetry. Simplifiedandanatomicalbodymodels.	2							
	LF Electromagneticmodeling. LF Electromagneticmodelingofthebody. Wholebodyexposure to lowfrequencies.	2							
	HF Electromagneticmodeling. Theeyeandbrainexposure to non-ionisingradiation.	2							
	The human bodyexposure to transientradiation.	2							
	Thermalresponseofthe human bodyexposed to HF electromagnetic radiation visokih frekvencija. Thermalresponse to theeyeandbraindue to plane waveexposure.	2							
	Biomedicalapplicationsofelectromagneticfields. Electricalstimulationofnerves. Laser radiationoftheeye. Methodsofthe human brainstimulation. Transcranialmagneticstimulation.	2							
	List oflaboratoryor design exercises		LEhours						
	Human exposure to non-ionising EM radiation (frequenciesup to	10 MHz)	2						
	- simulationmodels		۷						

	Human exposure to r – simulationmodels	uman exposure to non-ionising EM radiation (frequenciesabove 10 MHz) simulationmodels						
	Measureequipmenta EM fields	ndmetho	ods for th	neasses	smento	f human expos	ure to	3
	Measurementof LF e	lectricfie	elds					2
	Measurementof LF m	nagnetic	fields					2
	Measurementof HF E	EM fields	S					2
	EM fieldcalculationin	thevicini	ityof base	station	าร			2
Format of instruction	 ☑ lectures ☐ seminars and wor ☑ exercises ☐ on linein entirety ☐ partial e-learning ☐ field work 	□ independent assignments □ seminars and workshops □ exercises □ on linein entirety □ partial e-learning □ independent assignments □ multimedia □ laboratory □ work with mentor □ (other)						
Studentresponsibiliti es	The presence on lec Performed all require				t least 7	0 % of the time	s sched	uled.
Screening student	Class attendance	1,8	Researc	ch		Practical training	ng	
work (name the proportion of ECTS	Experimental work		Report			(Other)		1,8
credits for eachactivity so that the total number of	Essay		Semina essay	r		(Other)		0,1
ECTS credits is	Tests	0,1	Oral exa	Oral exam		(Other)		0,1
equal to the ECTS value of the course)	Written exam	0,1	Project			(Other)		
	There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test (120 min in duration) consists of 3 questions (each containing theoretical part and short numerical problem) and 2 longer numerical problems. The requirement for passing grade is the positive assessment of laboratory exercises and 50 % points on each midterm. Grade (in percentage) is formed according to the formula:							
	Grade(%) = 0,5 (M1 + M2)							
Grading and	where M1 and M2 are the midterm test results, and is determined through following percentage score:							
evaluating student work in class and at the final exam	Percentage score:		Grad	le:				
the final exam	From 50% to 62% sufficient (2) From 63% to 75% good (3) From 76% to 88% very good (4) From 89% to 100% excellent (5)							
	Students who do no duration) in winter/facontaining theoretical problems. The redisformedaccording to carried out as written	all exan al part a quirement to thede	nination and shor nt for p	period. t nume assing	Final te rical pro grade	est consists of oblem) and 2 I is 50 % po	4questic onger n ints.Fina	ons(each umerical al grade
Required literature (available in the		Title	•			Number of copies in the library		oility via media

library and via other media)	D.Poljak, <i>Teorija elektromagnetskih polja</i> s primjenama u inženjerstvu, Šk. knjiga Zagreb, 2014.							
	D. Poljak: <i>Izloženost ljudi elektromagnetskom zračenju</i> , Kigen, Zagreb, 2007.							
Optional literature (at the time of submission of study programme proposal)	 D. Poljak, AdvancedModelinginComputationalElectromagneticcompatibility, WileyInterscience, New York 2007. D. Poljak: Human Exposure to Electromagnetic Fields, WIT Press, Southampton- Boston, 2003 R.W.Y. Habash, ElectromagneticFieldsandRadiation, Marcel Dekker, 2002. D. Poljak: Exposure of Humans to Electromagnetic Radiation, SoftCOM Library 2002. 							
Quality assurance methods that ensure the acquisition of exit competences Other (as the proposer wishes to add)	 Evaluation of results in accordance with the above learning outcomes Feedback from students via surveys Self-evaluation of teachers Institutional and non-institutional evaluations 							

NAME OF THE COURSE	MEASUREMENTS IN WIRELESS SYSTEMS									
Code	FELJ22	Year of study	2							
Course teacher	Zoran Blažević, Ph.D., Full Professor	Credits (ECTS)	5							
Associate teachers	Maja Škiljo, Ph.D.	Type of instruction	L	S	AE	LE	DE			
Associate teachers	iviaja Skiijo, Fii.D.	(number of hours)	30	0	15	15	0			
Status of the course	Obligatory: 241 Percentage of application of e-learning 0									
	COURSE DESCRIPTION									
Course objectives	various radio systems,	radio propagation in differ					٦.			
Course enrolment requirements and entry competences required for the course	Finished the undergraduate study of Communications and Information Technology									
Learning outcomes expected at the level of the course (4 to	Students will be able to: - calculate radio-channe	Students will be able to: - calculate radio-channel parameters,								

10 learning outcomes)	 perform measurements and analysis of fixed and mobile radio systems parameters statistically characterize radio propagation of arbitrary radio-systems on the base of measurements, Apply various channel models 							
	Course content					L hours	AE hours	
	Introduction to Measurements in Wireless Systems.						1	
	Fixed radio-links cha					2	1	
	Ground radio links p	•				2	2	
	Fading in mobile rad					2	1	
	Mobile radio channe					2	1	
	Propagation path-los			ura mode	el.	3	1	
	First midterm exam							
Course content	Statistical channel m			orks comp	parison	2	1	
broken down in detail by weekly	Satellite radio-chann measurements (Loo				1	4	1	
class schedule (syllabus)	Wide-band channel	parame	ters. Wide-ban	d measuı	ements.	4	3	
	Wide-band channel	models	based on mea	surement	s.	2	1	
	Wide-band indoor ra	3	1					
	Second midterm exa		LE hours					
	List of laboratory exercises							
	Antenna measurements by Vector Network Analyser measurements. Measurements calibration.						3	
	Narrow-band channel measurements at various frequencies.						3	
	Wide-band channel measurements						3	
	Wide-band indoor ch						3	
	Radio-links planning	by using	g measured da	ta and so	oftware.		3	
Format of instruction	□ lectures □ seminars and work □ exercises □ on line in entirety □ partial e-learning ☑ field work	rkshops	□ m ⊠ la	depender ultimedia boratory ork with n (othe	nentor	nts		
Studentresponsibiliti es	The presence on lec Performed all labora				70 % of the	times sche	eduled.	
Screening student	Class attendance	2,0	Research		Practical tr	aining		
work (name the proportion of ECTS	Experimental work		Report		Individual v	work	1.5	
credits for eachactivity so that	Essay		Seminar essay		Laboratory	exercises	0,8	
the total number of ECTS credits is equal to the ECTS	Tests	0,5	Oral exam		Preparation laboratory		0,2	
value of the course)	Written exam		Project		(Oth	ner)		
Grading and evaluating student work in class and at the final exam	There are two midte lecturing and the sec tests consists of the the midterm exams	cond on oretical	e is after the n questions and	ext 6 wee	eks. Each m I. The stude	nidterm tes ents that di	st and final d not pass	

	carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises and 40 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula: Grade(%) = 0,1 NP + 0,1 LV + 0,4 (M1 + M2) the activities in percentage: NP - attendance at lectures, LV - laboratory assessment, M1, M2 - test results.					
	Title	Number of copies in the library	Availability via other media			
Required literature (available in the	 Z. Blažević; Mjerenja u bežičnim sustavima, predavanja 		e-learning portal			
library and via other media)	M. Patzold: "Mobile FadingChannels", Wiley, 2002.	1				
	Doble, J.: "Introduction to Radio Propagation for Fixedand Mobile Communications", Artech House Boston - London, GB, 1996.	1				
Optional literature (at the time of submission of study programme proposal)	 G. H. Bryant: "Principles of Microwave Measurem Zentner, E.: Antene i radiosustavi, Graphis Zagre 		blishing, 1993.			
Quality assurance methods that ensure the acquisition of exit competences	 Evaluation of results in accordance with the above learning outcomes Feedback from students via surveys Self-evaluation of teachers Institutional and non-institutional evaluations 					
Other (as the proposer wishes to add)						

NAME OF THE COURSE	SYSTEMS FOR WIRELESS TRANSMISSION OF ENERGY								
Code	FELJ36	ELJ36 Year of study 2							
Course teacher	Zoran Blažević, Ph.D., Full Professor	Credits (ECTS)	5						
Associate to achore	Associate to allow Maio Čkilia Dh. D. Type of instruction	L	S	AE	LE	DE			
Associate teachers	Maja Škiljo, Ph.D.	(number of hours)	30	0	0	30	0		
Status of the course	Elective	Percentage of application of e-learning	0						
	COURSE	DESCRIPTION							

	Training students for:								
	 understanding of basic principles of and problemacy of systems for wireless transmission of energy, 								
Course objectives	- designing of radio system for near-field transmission of energy								
	- design of radio system for far-field power transmission								
	- calculation and analysis of wirele	calculation and analysis of wireless energy systems parameters							
Course enrolment									
requirements and entry competences	Finished the undergraduate study of	Communications and Infor	mation Te	chnology					
required for the	in morrou and and graduate study of		manon ro	omiology:					
course									
Learning outcomes expected at the level	Students will be able to:	minaian taabainaa							
of the course (4 to	analyse power and energy transrcalculate and estimate wireless e	·	n naramet	۵re					
10 learning	- designing basic transmission sys	• • • • • • • • • • • • • • • • • • • •	-	ers,					
outcomes)	3 3			۸۲					
	Course content		L hours	AE hours					
	Introduction. Historical perspective of	radio and wireless	2						
	transmission.		_						
	Principles and techniques for radio-tr Transformers and resonant transform		4						
	electrically small antennas.	-							
	Antenna scattering matrix. Coupled-N	_							
	Spherical Mode Theory-Antenna Mod transmission of energy systems.	4							
Course content broken down in	Rectennas.	2							
detail by weekly class schedule	Near-field energy and power transmistransformer.	4							
(syllabus)	Far-field power transfer.		4						
	Ground energy transfer by far-field sy	stems concept	3						
	Satellite energy transfer system cond	ept	3						
	Norms and standards for wireless en standard.	2							
	Electromagnetic Compatibility of wireless	2							
	Interference problem between radio- and radio systems for wireless energ	2							
	Midterm exam								
	List of laboratory exercises			LE hours					
	Measurements and adjustments of incantennas	ductively fed electrically sm	nall	8					
	Measurements of transfer performand Oscilloscope	ces by Spectrum Analyser,	and by	8					
	Measurements of transfer performances by Vector Network Analyser								
	Tesla Coil Measurements.								
	⊠ lectures	⊠ independent assignme	nto						
	☐ seminars and workshops	☑ independent assignme☑ multimedia	nis						
Format of instruction	□ exercises	□ Inditiffedia□ Iaboratory							
- Simulation instruction	□ on line in entirety	work with mentor							
	☐ partial e-learning	☐ (other)							
	⊠ field work	(,							

Studentresponsibiliti es	The presence on lec Performed all labora			t least 7	0 % of the time	s schedu	led.
Screening student	Class attendance	1.5	Research		Practical traini	ng	
work (name the proportion of ECTS	Experimental work		Report		Individual work	<	2
credits for eachactivity so that	Essay		Seminar essay		Laboratory exc	ercises	0,8
the total number of ECTS credits is equal to the ECTS	Tests	0,5	Oral exam		Preparation fo laboratory exe		0,2
value of the course)	Written exam		Project		(Other)		
Grading and evaluating student work in class and at the final exam	of theoretical questic midterm exams take out as written tests. Iaboratory exercises rest of the grade depercentage) is formed the activities in percentage. NP - attendate to the test rest in the activities in percentage.	there are one midterm and one final exam. Both midterm test and final test contributed theoretical questions and numerical problems. The students that did not pass different exams take part in the final exams. The midterm and final exams are can as written tests. The requirement for passing grade is the positive assessme foratory exercises, 40 % points on the midterm exam or the final exam, and stof the grade depends on the seminary work presented by the student. Grading reentage) is formed according to the formula: Grade(%) = 0,1 NP + 0,1 LV + 0,4 (M + S) activities in percentage: NP - attendance at lectures, NP - laboratory assessment, M - test results., S - seminary work results and presentation					ass the carried ment of and the
	Title				Number of copies in the library	Availabi other r	
Required literature	 Ki Young Kim (editor), "Wireless Power Transfer-PrinciplesandEngineeringExplorations", InTech, January 2012. 					e-learning portal	
(available in the library and via other media)	Volakis J., C. C. Chen and K. Fujimoto, "Smallantennas: miniaturizationtechniquesandapplications", New York, McGraw-Hill, 2010.					e-lear por	-
	Special issue "So Wireless Power" Magazine, Vol. 3	1					
Optional literature (at the time of submission of study programme proposal)	 Lee J. and S. Nam, "Fundamental aspects of near-field coupling small antennas for wireless power transfer", IEEE Trans. Antennas Propag., Vol. 58, No. 12, 3442-3449, 2010. P. Sample, D. T. Meyer, J. R. Smith: Analysis, experimental results, and range adaptation of magnetically coupled resonators for wireless power transfer, IEEE Transactions on Industrial Electronics, Vol. 58, No. 2, 2010, p.p 544-554. N. Tesla, A. Marinčić: Colorado Springs Notes, Nolit, Beograd, 1978. Carol Gray Montgomery, Robert Henry Dickeand Edward M. Purcell, 					12, range r, IEEE	
Quality assurance methods that ensure the acquisition of exit competences	Evaluation of resFeedback from sSelf-evaluation o	 "Principlesofmicrowavecircuits", McGraw-Hill Book Company, Inc., USA, 1948. Evaluation of results in accordance with the above learning outcomes Feedback from students via surveys Self-evaluation of teachers Institutional and non-institutional evaluations 					
Other (as the proposer wishes to add)	za.a.a.a.a.a		and the second of a second of				

NAME OF THE COURSE	MEDICAL ELECTRONIC	DEVICES							
Code	FELH41 Year of study 2.								
Course teacher	Antonio Šarolić, Ph.D., Full Professor Ivan Marinović, Ph.D., Full Professor	Credits (ECTS)	5						
A i - t - t l	Nille IVA de mana di mana al	Type of instruction	L	S AE	LE	DE			
Associate teachers	Niko Ištuk, mag. ing. el.	(number of hours)	30		30				
Status of the course	Elective	Percentage of application of e-learning	0						
	COURS	E DESCRIPTION							
Course objectives	electronic/communicati - knowledge on therapeu - understanding the specielectronic devices	izations and application are fon/information technology utic, diagnostic and control cifics of functional and safe plication of success criteria	in medica medical e ty require	electronic ments fo	devic r med	ical			
Course enrolment requirements and entry competences required for the course	None.								
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	 analysis and developm use the knowledge of hanalysis and developm analyze the componenthuman body medical econceive the electronic characterize a medical 	numan physiology, especia ent of medical devices ts of medical electronic dev	lly electro vices and medical aspect of	physiolo their inte device safety	gy, for	n with			
	Course content		•	L		AE			
		المستعداء	la au c	hour	s h	ours			
	Basics of human electroph		logy	2		0			
Course content	Measurement medical electro			2		0			
broken down in	Diagnostic medical electro			2		0			
detail by weekly	Therapeutic medical electronic devices Electronic circuits and components in medical devices					0			
class schedule (syllabus)		ectric and magnetic stimula		% 2		0			
		ermal procedures at high fr	equencie	s 2		0			
	Electrical safety aspects a aspects of medical electron	nd electromagnetic compa		2		0			

	Theranostic medical	control and auxiliary medical electronic devices. E-Health. heranostic medical electronic devices – unifying the nerapeutics and diagnostics in innovative medical devices anethods							0
	Translational resaers from lab to clinics (fr Assessment of clinic technology (Health	rom the cal and e	workbend economic	ch to the efficac	e bedsic y of med	le).	2		0
	Clinical studies: prin of medical devices					nical trials	2		0
	List of laboratory or	design e	exercises					LE	E hours
	•	ics of human electrophysiology							2
	Amplifier circuits								4
	Electrostimulator circ								4
	Noise and disturband			ı electro	nic dev	ices			2
	Electromagnetic com	•	y testing					-	2
	Electrical safety testi			• • • • • • • •					2
	Measurements of die					antronia davi	500		2
	Measurement, diagn field trip (visit to med				edicai ei	ectronic devi	ices –		8
	⊠ lectures			 inde	ppander	nt assignmen	ite		
	⊠ seminars and wo	rkshops	;		timedia	il assiyiiiileii	115		
Format of instruction	⊠ exercises			□ mui					
FUIIIAL OF ITISH GORDIN	□ on line in entirety				k with m	contor			
	☐ partial e-learning								
	⊠ field work				(othe	1)			
Studentresponsibiliti es	Student is required t least 70% of the sch		d the lecti	ures and	d audito	ry exercises	in the ar	nou	nt of at
Screening student	Class attendance	1	Researc	ch		Practical tra	ining		
work (name the proportion of ECTS	Experimental work	0,5	Report			Laboratory	exercise	s	0,5
credits for eachactivity so that the total number of	Essay		Seminal essay	r	1	Individual w	ork		1
ECTS credits is	Mid-exam	0,5	Oral exa	am		(Othe	er)		
equal to the ECTS value of the course)	Written exam	0,5	Project			(Othe	er)		
Grading and evaluating student work in class and at the final exam	Lectures are given in Marinović (1/3 of lec Exam: presentation	ture hou	urs).				hours) a	and	prof.
		Title	е			Number of copies in the librar	n Avai		ility via nedia
Required literature (available in the library and via other	Ante Šantić: Biomed knjiga, Zagreb, 1995		elektroni	ka, Škol	lska				
media)	Bioelectromagnetism of Bioelectric and Bi	ga, Zagreb, 1995. lkko Malmivuo & Robert Plonsey: electromagnetism - Principles and Applications Bioelectric and Biomagnetic Fields, Oxford versity Press, New York, 1995.							
Optional literature (at the time of submission of study programme proposal)	Handbook of biod Bioengineering are Barnes and Ben Control Handbook of biold Medical Aspects of Greenebaum, CR	logical end Bioph Greeneb ogical ef of Electro	effects of nysical As paum, CRO fects of el romagnetion	pects of C Press, ectroma	Electror , 2007. agnetic fi	magnetic Fiel	ds, Ed. F ition): Bio	ranl olog	

	- The Biomedical Engineering Handbook (Second Edition), Ed. Joseph D. Bronzino, CRC Press, 2000.
Quality assurance methods that ensure the acquisition of exit competences	Surveys providing student feedback
Other (as the proposer wishes to add)	

NAME OF THE COURSE	RADIO COMMUNICATIO	RADIO COMMUNICATIONS										
Code	FELJ02	Year of study	1.									
Course teacher	Zoran Blažević, Ph.D., Full Professor	Credits (ECTS)	5	5								
Associate teachers	Maja Škiljo, Ph.D.	Type of instruction	L	S	ΑE	LE	DE					
Associate teachers	iviaja Skiijo, Pii.D.	(number of hours)	30	0	15	15	0					
Status of the course	Obligatory	Percentage of application of e-learning	0									
COURSE DESCRIPTION												
Course objectives	radio-propagation, - radio-channel physical	olication of basic principles phenomena modelling, and deepening of knowledg					h					
Course enrolment requirements and entry competences required for the course	Finished the undergraduate study of Communications and Information Technology											
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	propagation, - apply fundamental law	s of radio-propagation and	l mode	l basic			define the fundamental phenomena, the quantities and the laws of Earth radio-					

	apply channel mapply basic meth			•	•		
	Course content					L hours	AE hours
	Introduction to Radio Communications. History perspective of radio engineering. SI units.					1	-
	Radiowave propaga Atmosphere.	tion. Su	rface Wa	ves. Div	vision of	2	1
	Radio-antenna param	neters ar	nd effectiv	e isotro	pic radiated power.	2	2
	Free space radioway	ve propa	agation. F	Radio-g	ain.	2	1
	Propagation by Trop	osphere	Э			1	1
	Effective Earth Radio	us Mode	el and Fla	t Earth	Model. Ducting.	3	1
	Radio-horizon by ref	raction.	Influence	of Ear	th curvature	2	1
	Tropospheric loss by	/ hydror	neteors a	ind gas	ses	1	1
Course content	Propagation by Iono	sphere				3	1
broken down in	First midterm exam						
detail by weekly class schedule (syllabus)	Propagation by diffra Knife-Edge Model.	action. F	resnel w	ave the	ory on diffraction.	4	1
(Syllabus)	Approximate method	ds for m	ultiple dif	fraction	loss estimation	2	2
	Geometrical Theory of Diffraction. Keller's law of diffraction.					1	1
	Propagation by reflection. Fresnel reflection coefficients. Ground roughness influence. Divergence factor.					4	1
	Interference by direct and ground reflected wave. Power law.					2	1
	Second midterm exam						
	List of laboratory exercises						LE hours
	Introduction to laboratory instruments, devices and other equipm					nent	2
	Reflection parameters measurements						4
	Transmission parameters measurements						4
	Measurements of radio-channels by spectrum analyser						3
	Software estimations of diffraction loss						2
Format of instruction	 ☑ lectures ☐ seminars and work ☑ exercises ☐ on line in entirety ☐ partial e-learning ☑ field work 	rkshops		□ mul ⊠ labo	ependent assignme timedia oratory k with mentor (other)	nts	
Studentresponsibiliti es	The presence on lec Performed all labora				t least 70 % of the	times sche	eduled.
Screening student	Class attendance	2,0	Researc	:h	Practical tr	aining	
work (name the proportion of ECTS	Experimental work		Report		Individual	work	1.5
credits for eachactivity so that	Essay		Seminal essay	r	Laboratory	exercises	0,8
the total number of ECTS credits is equal to the ECTS	Tests	0,5	Oral exa	ım	Preparatio laboratory		0,2
value of the course)	Written exam		Project		(Oth	ner)	
Grading and evaluating student	There are two midte lecturing and the sec						

work in class and at the final exam	the midterm exams take part In the final exams. The carried out as written tests. The requirement for assessment of laboratory exercises and 40 % points final exam. Grade (in percentage) is formed according	 NP - attendance at lectures, LV – laboratory assessment, 					
	Title Number of copies in the library Availability vi						
Required literature (available in the	I. Zanchi, Z. Blažević: Radiokomunikacije, predavanja, FESB		e-learning portal				
library and via other media)	Boithias, L.: Radio WavePropagation, North Oxford Academic 1987.	1					
	Zentner, E.: Radiokomunikacije, Školska knjiga - Zagreb, 1980.	2					
Optional literature (at the time of submission of study programme proposal)	 Zentner, E.: Antene i radiosustavi, Graphis Zagrel Parsons, J. D.: "The Mobile Radio Propagation Cl Publishers - London, GB, 1992. Doble, J.: "Introduction to Radio Propagation for F Communications", Artech House Boston - Londor 	hannel", Penterixed and Mob					
Quality assurance methods that ensure the acquisition of exit competences	 Evaluation of results in accordance with the above learning outcomes Feedback from students via surveys Self-evaluation of teachers Institutional and non-institutional evaluations 						
Other (as the proposer wishes to add)							

NAME OF THE COURSE	ALGORITHMS						
Code	FELJ12	Year of study	1.				
Course teacher	Matko Šarić, Ph.D., Assistant Professor	Credits (ECTS)	5				
A a a a sinta ta a ab ava	Ante Topić,	Type of instruction	L	S	ΑE	LE	DE
Associate teachers	eachingAssistant (number of ho	(number of hours)	30	0	15	15	0
Status of the course	Obligatory	Percentage of application of e-learning	0				
	COURSE	EDESCRIPTION					
Course objectives	Training students for: - Design of efficient algomemory)	orithms and analysis of alg	orithms	s prope	erties	(speed	and

	 Adopting the practical knowledge about sorting algorithms a algorithms 	and graph	-based
Course enrolment requirements and entry competences required for the course	BsC degree.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - Analyze the execution time of the algorithm - explain and apply different sorting algorithms - explain and apply graph-based algorithms - apply dynamic programming		
	Course content	L or S hours	AE hours
	Introduction. What are algorithms. Analyzing algorithms in Example D-2 maximum	3	0
	Analyzing of the loops. Solving of summations. Solving 2-D maximum - method of crossing the plane.	3	0
	Asymptotic notation. Limited rule.	3	0
	The technique of divide and rule. Mergesort (pseudocode, execution time analysis).	3	0
	Recursion (search pattern, iteration, recursion tree method). Master theorem.		0
	Heap data structure. Heapsort (pseudocode, execution time analysis).		0
	Quicksort (pseudocode, execution time analysis)	3	0
	The lower limit of sorting algorithms execution time. Sorting by linear time. (counting sort, radix sort).		0
	The algorithms based on graphs (basic concepts and definitions).		0
Course content broken down in detail by weekly	Graph representation using the adjacency matrix and adjacency list. BFS algorithm.		0
class schedule (syllabus)	All pairs shortest paths. Dynamic programming. Floyd-Warshall algorithm.	3	0
	Longest common subsequence. Matrix chain multiplication	3	0
	Decision problems. NP-problems and polynomial time verification. NP completeness. Reduction. Hamiltonian path and Hamiltonian cycle.	3	0
	List of laboratory or design exercises		LE hours
	Analysis of typical running times		2
	Solving of summations		2
	Recursions		2
	Merge sort I		2
	Merge sort II		2
	Heap sort		2
	Quicksort		2
	Linear time sorting algorithms		2
	Graph representation		2
	BFS algorithm		2
	Floyd-Warshall algorithm		2

	Longest common sul	bsequer	nce					2
	Matrix chain multiplic	ation						2
Format of instruction	 ☑ lectures ☐ seminars and wo ☑ exercises ☐ on line in entirety ☐ partial e-learning ☐ field work 	rkshops		□ mul ⊠ labo	epender Itimedia oratory k with m (othe			
Studentresponsibiliti es								
Screening student	Class attendance	2,0	Researc	h		Practical traini	ng	
work (name the proportion of ECTS	Experimental work		Report			Individual work	<	2,2
credits for eachactivity so that	Essay		Seminal essay	r 		Laboratory exe	ercises	0,5
the total number of ECTS credits is equal to the ECTS	Tests	0,2	Oral exa	am		Preparation fo laboratory exe		
value of the course)	Written exam	0,1	Project			(Other)		
Grading and evaluating student work in class and at the final exam	lecturing and the se consist of theoretica that did not pass th carried out as writt assessment of labor final exam. Grade (in the activities in perconal M1, M2 – te The final grade is de 50% do 63% sufficie 64% do 77% good (in the section of the	here are two midterms and final exams. The first midterm exam is after 7 wee cturing and the second one is after the next 6 weeks. Midterm test and final exams of theoretical questions and numerical problems. In the final exams studied in the pass the midterm exams take part. The midterm and final exams arried out as written tests. The requirement for passing grade is the possessment of laboratory exercises and 50 % points on each midterm exam of nal exam. Grade (in percentage) is formed according to the formula: Grade(%) = 0,5 (M1 + M2) The activities in percentage: M1, M2 – test results. The final grade is defined in the next way: O' do 63% sufficient (2) M4% do 77% good (3) M5% do 91% very good (4)					final test s students exams are e positive	
		Title	•			Number of copies in the library		ability via er media
Required literature (available in the	Individual work						e-learr portal	ning
library and via other media)	Laboratory exercises	S						
modiay	Preparation for labor	ratory ex	xercises					
Optional literature (at the time of submission of study programme proposal) Quality assurance	secondedition, thirdp	T.Cormen, C.Leiserson, R.Rivest, C.Stein: "Introduction to Algorithms", secondedition, thirdprinting, McGraw-Hill, 2002					<u> </u>	
methods that ensure	 Evaluation of results in accordance with the above learning outcomes Feedback from students via surveys 							

the acquisition of	- Self-evaluation of teachers
exit competences	- Feedback from students who have already obtained BsC degree
Other (as the	
proposer wishes to	
add)	

NAME OF THE COURSE	MOBILE COMMUNICATION	MOBILE COMMUNICATIONS						
Code	FELJ14	Year of study	1.					
Course teacher	Zoran Blažević, Ph.D., Full Professor	Credits (ECTS)	5					
Associate topobers	Maja Škiljo, Ph.D.	Type of instruction	L	S	ΑE	LE	DE	
Associate teachers	Iwaja Skiijo, Ph.D.	(number of hours)	30	0	15	15	0	
Status of the course	Obligatory: 241 Elective: 242	Percentage of application of e-learning	0					
	COURSE	DESCRIPTION						
Course objectives	Training students for: - understanding and application of basic principles of radio-networks, - physical OSI layer of cellular radio-networks calculation and analysis, - mobile radio networks analysis.							
Course enrolment requirements and entry competences required for the course	Finished the undergraduate	e study of Communications	s and Ir	nforma	ation T	echno	logy	
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: Calculate optimal radio system configuration in sense of selecting digital modulation and coding, model and perform basic calculation of cellular networks: base stations power and interference budget calculate and analyse (narrow- and wide-band) radio-channel parameters, conduct and analyse radio-channel measurements							
Course content broken down in	Course content			ı	L		AE ours	
detail by weekly	Introduction to Mobile Com	munications.			1		1	

class schedule	Classification of digit	al radio	-channel	<u> </u>		2	1
(syllabus)	Digital radio system			J.		2	2
	-	Systems with bandwidth limitation.					
	Power limited system		2	1			
	-	Power limited and bandwidth limited systems. Channel codir					
	Direct Sequence-Sp					2 2	1
	Cellular radio system interference.			-		2	1
	Path-loss law. Base	station	lina buda	et. Mult	ipath reception.	2	2
	First midterm exam		9 3				
	Cell radio-coverage	calculat	ion.			2	1
	Mobile propagation of	channel	analysis.			2	1
	Radio channel meas					2	1
	Propagation channe coherence bandwidt		ication. D	elay-sp	read and channel	2	1
	Second midterm exa	ım					
	List of laboratory exe	ercises					LE hours
	Radio channel charad measurements.	cterizati	on by Ve	ctor Ne	twork Analyser		5
	Communication syste	ems tes	ting and s	simulati	ng by Matlab and S	Simulink	2
	Analog and digital mo	odulatio	n simulat	ions			2
	Multipath fading char	nels sir	nulations				2
	Adjacent and co-chann	el interfe	rence in c	ellular s	ystems simulations by	y Simulink	2
	COST 207 and GSM	/EDGE	channel ı	nodels	by Matlab		2
Format of instruction	 ☑ lectures ☐ seminars and wor ☑ exercises ☐ on line in entirety ☐ partial e-learning ☑ field work 	rkshops		□ mul ⊠ labo	ependent assignme timedia oratory k with mentor (other)	nts	
Studentresponsibiliti es	The presence on lec Performed all labora				t least 70 % of the	times sche	eduled.
Screening student	Class attendance	2,0	Researc	:h	Practical tr	aining	
work (name the proportion of ECTS	Experimental work		Report		Individual v	work	1.5
credits for eachactivity so that	Essay		Seminai essay	•	Laboratory	exercises	5 0,8
the total number of ECTS credits is equal to the ECTS	Tests	0,5	Oral exa	ım	Preparation laboratory		0,2
value of the course)	Written exam		Project		(Oth	ner)	
Grading and evaluating student work in class and at the final exam	Written exam Project (Other) There are two midterms and final exams. The first midterm exam is after 7 wee lecturing and the second one is after the next 6 weeks. Each midterm test and tests consist of theoretical questions and numerical. The students that did not the midterm exams take part In the final exams. The midterm and final exams carried out as written tests. The requirement for passing grade is the possessment of laboratory exercises and 40 % points on each midterm exam of final exam. Grade (in percentage) is formed according to the formula: Grade(%) = 0,1 NP + 0,1 LV + 0,4 (M1 + M2)					st and final d not pass exams are ne positive	

	the activities in percentage: NP - attendance at lectures, LV - laboratory assessment, M1, M2 - test results.		
Required literature (available in the library and via other media)	Title	Number of copies in the library	Availability via other media
	 Z. Blažević: Mobilne komunikacije, predavanja, FESB 		e-learning portal
	I. Zanchi, Z. Blažević: Radiokomunikacije, predavanja, FESB		e-learning portal
	David Parson.: The Mobile Radio Propagation Channel, Pentech Press Pub. London, 1992.	2	
Optional literature (at the time of submission of study programme proposal)	 R. Steele: "Mobile Radio Communications", Pentech Press, London, GB and IEEE Press, Piscataway, USA, 1992. Vijag, K. Garg, Joseph, E. Wilkes: Wireless and Personal Communications Systems, Prentice Hall PTR, NY 1996. 		
Quality assurance methods that ensure the acquisition of exit competences	 Evaluation of results in accordance with the above learning outcomes Feedback from students via surveys Self-evaluation of teachers Institutional and non-institutional evaluations 		
Other (as the proposer wishes to add)			

NAME OF THE COURSE	PROJECT MANAGEMEN	PROJECT MANAGEMENT						
Code	FETJ01	Year of study	2.					
Course teacher	Ivica Veža, Ph.D., Full Professor	ILIPATIS (FLUS)						
Associate teachers	Marko Mladineo, Ph.D.	Type of instruction (number of hours)	L 30	S 0	AE 0	LE 15	DE	
Status of the course	Obligatory	Obligatory Percentage of application of e-learning 0						
	COURSI	E DESCRIPTION						
Course objectives	Training students for: - planning and mana - calculating profitab	aging projects oility of the project and retu	ırn of inv	/estm	ent (R	OI)		
Course enrolment requirements and entry competences required for the course	None	one						
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	 develop the main projet (Work Breakdown Strutter) plan the time (to deterning plan capacity (determing plan costs and risks) apply adopted knowledge a specific task 	als of the project and rank ect activities and the struct acture)	ure of di	ies) nplete	ed cou			
	Course content				L hours		\E ours	
	Introduction and basic con-	cepts			2		0	
	The concept and definition of project and project management						0	
	Projects - vision, strategy, goals (examples - automotive and shipbuilding industries)						0	
	The strategy and project management.	nanagement. Multi-project			2		0	
Course content	Basics of organization. The	e project organizational str	ucture.		2		0	
broken down in detail by weekly class schedule (syllabus)	The phases of the project (initiation of project, project selection, project planning, project management and end of project)				2		0	
(Jyliabus)	Methods for project planning	ng.			2		0	
	Quality management (planning of improvement and quality control)						0	
	Cost management. Continuous Improvement - Kaizen.				2		0	
	Risk management.				2		0	
	Psychological and social component of project management. Project manager.				2		0	
Teamwork.					2		0	

Introduction to the technique of network planning. Basic concepts of network planning technique Analysis of time CPM method PERT method PRECEDENCE method Cost analysis Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams Mapping processes Comparison of different process diagrams lectures seminars and workshops multimedia laboratory partial e-learning field work work with mentor partial e-learning field work work with mentor performed all required laboratory exercises. Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course) Grading and evaluating student work in the same and the minimum number of students is two, maximum number of project work team and the minimum number of students is two, maximum number of buring the osures they determine the content of their project. Toroject work team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of students is two, maximum number of team and the minimum number of stu	0	2	Communication and motivation in the team. Methods for stimulating creativity.						
Basic concepts of network planning technique Analysis of time CPM method PERT method PRECEDENCE method Cost analysis Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams lectures lectures lindependent assignments multimedia laboratory labor	LE hours					exercises		T T	
Analysis of time CPM method PERT method PRECEDENCE method Cost analysis Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams Seminars and workshops Individual work Student responsibilities Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course) Written exam Grading and evaluating student work in class and at the final exam Analysis of time CPM method PRECEDENCE method Cost analysis Resource - Microsoft Project Introduction to the software - Microsoft Project All Software - Microsoft Project Al	1		g.	nning.	rk plan	of netwo	chnique	Introduction to the te	
CPM method PERT method PERT method PRECEDENCE method Cost analysis Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams Seminars and workshops Seminar Individual work	1			ıe	echniqu	anning te	twork pl	Basic concepts of ne	
PERT method PRECEDENCE method Cost analysis Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams Lectures Impartial e-learning Impartial e-learning	1							Analysis of time	
PRECEDENCE method Cost analysis Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams lectures seminars and workshops laboratory work with mentor laboratory work with mentor laboratory work with mentor laboratory laboratory	1							CPM method	
Cost analysis Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of processed diagrams Mapping processes Comparison of different process diagrams lectures seminars and workshops multimedia laboratory multimedia laborat	1							PERT method	
Resource analysis Introduction to the software - Microsoft Project Introduction to business process management Basics of processed lagrams Mapping processes Comparison of different process diagrams lectures seminars and workshops independent assignments multimedia laboratory work with mentor (other)	1			PRECEDENCE meth					
Introduction to the software - Microsoft Project Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams lectures seminars and workshops multimedia laboratory work with mentor (other)	1	Cost analysis							
Introduction to business process management Basics of process diagrams Mapping processes Comparison of different process diagrams lectures seminars and workshops multimedia laboratory work with mentor (other)	1							Resource analysis	
Basics of process diagrams Mapping processes	1		•						
Mapping processes Comparison of different process diagrams □ lectures □ seminars and workshops □ on line in entirety □ partial e-learning □ field work Student responsibilities □ creening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course) Written exam Grading and evaluating student work in class and at the final exam Mapping processes Comparison of different process diagrams □ lindependent assignments □ multimedia □ laboratory □ work with mentor □ (other) □ work with mentor □ (other) □ Research □ Practical training □ field work Report □ Individual work □ Preparation for laboratory exercises □ Oral exam □ Project □ 1,5 (Other) □ During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number of students is two, maximum number of the course they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS plan the time for each activity and determine the critical path. Students all the costs, calculate project profitability (ROI) and analyze risks. On test students their work which is evaluated (grade M). On the other side students have one test in the field of Network planning tech (LV) at the end of the semester. • LV - grade of laboratory exercises,	1			ent	ageme	ess man	ess prod	Introduction to busine	
Comparison of different process diagrams Comparison of different process diagrams	1		Basics of process diagrams					Basics of process dia	
Format of instruction Secretizes Independent assignments Independent Independent Independent Independent Independent Independent Independent Independent Independent Independent Independent Independent Independent Independent Independent Independent Independ	1			Mapping processes					
Format of instruction Seminars and workshops Independent assignments Independent In	1				ams	ess diagr	ent proc	Comparison of different	
Format of instruction Seminars and workshops Individual work with mentor Individual work		nto	ndont assignmo	lonondor	⊠ ind			⊠ lectures	
Format of instruction On line in entirety		.115	-	I X seminars and workshops					
Student responsibilities Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS value of the course) Written exam Grading and evaluating student work in class and at the final exam Grading student work in class and at the final exam □ on line in entirety □ partial e-learning □ (other) □ work with mentor □ (other) □ content of at least 70 % of the times schedul Performed all required laboratory exercises. □ laboratory exercises □ Preparation for laboratory exercises □ Oral exam □ Project □ 1,5 □ (Other) □ During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum			│				Format of instruction		
Student responsibilities The presence on lectures in the amount of at least 70 % of the times schedul Performed all required laboratory exercises. Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course) Written exam Crading and evaluating student work in class and at the final exam Student The presence on lectures in the amount of at least 70 % of the times schedul Performed all required laboratory exercises. Class attendance 1,0 Research Practical training Seminar essay laboratory exercises Oral exam Preparation for laboratory exercises Written exam Project 1,5 (Other) During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. Seminar essay laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. Seminar essay laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. Seminar essay laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number of students is two, maximum number in During the course they determine the content of their project and main targets. Seminar essay laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students th			•	☐ on line in entirety ☐ work with mentor			offilat of motidetion		
Student responsibilities The presence on lectures in the amount of at least 70 % of the times schedul Performed all required laboratory exercises. Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course) Written exam Grading and evaluating student work in class and at the final exam The presence on lectures in the amount of at least 70 % of the times schedul Performed all required laboratory exercises. Class attendance 1,0 Research Practical training Seminar essay laboratory exercises O Oral exam Project 1,5 (Other) During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number of During the course they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since they determine the content of their project and main targets. Since the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the content of their project and main targets. Since the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the content of their project and main targets. Since the project profitability (ROI) and analyze ris				□ partial e-learning □ (other)					
Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS value of the course) Grading and evaluating student work in class and at the final exam Performed all required laboratory exercises. Class attendance 1,0 Research Practical training Individual work Report Individual work Seminar essay Iaboratory exercises Preparation for Iaboratory exercises Value of the course) Written exam Project 1,5 (Other) During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the costs, calculate project profitability (ROI) and analyze risks. On test students their work which is evaluated (grade M). On the other side students have one test in the field of Network planning tech (LV) at the end of the semester. • LV - grade of laboratory exercises.				•					
work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course) Grading and evaluating student work in class and at the final exam Experimental work Report Individual work Report Individual work Seminar essay Iaboratory exercises Preparation for laboratory exercises Project 1,5 (Other) During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the content of their project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students are capacities and determine the conte	Juled.								
proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course) Written exam During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. T project work team and the minimum number of students is two, maximum number i During the course they determine the content of their project and main targets. S develop the main activities of project and the structure of distribution of work (WBS plan the time for each activity and determine the critical path. Students als capacities and determine bottlenecks and balance capacities. At the end they determine the content of their project and main targets. S develop the main activities of project and the structure of distribution of work (WBS plan the time for each activity and determine the critical path. Students als capacities and determine bottlenecks and balance capacities. At the end they determine the critical path. Con the other side students have one test in the field of Network planning tech (LV) at the end of the semester. • LV - grade of laboratory exercises		Practical training		Research Practical		1,0	Class attendance		
activity so that the total number of ECTS credits is equal to the ECTS value of the course) Written exam During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the critical path is evaluated (grade M). On the other side students have one test in the field of Network planning tech (LV) at the end of the semester. • LV - grade of laboratory exercises	1,0	Individual work		Report Indiv			Experimental work	proportion of ECTS	
ECTS credits is equal to the ECTS value of the course) Written exam During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number of During the course they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the critical path is capacities and determine bottlenecks and balance capacities. On test students their work which is evaluated (grade M). On the other side students have one test in the field of Network planning tech (LV) at the end of the semester. • LV - grade of laboratory exercises.	0,5	exercises	laboratory		r			Essay	activity so that the
During the semester the stages of project management are introduced to st parallel they attend lectures and laboratory exercises to develop their project. T project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. So develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the critical path of the costs, calculate project profitability (ROI) and analyze risks. On test students their work which is evaluated (grade M). On the other side students have one test in the field of Network planning tech (LV) at the end of the semester. • LV - grade of laboratory exercises,		•			am	Oral exa	0	Tests	ECTS credits is
parallel they attend lectures and laboratory exercises to develop their project. The project work team and the minimum number of students is two, maximum number in During the course they determine the content of their project and main targets. Students are develop the main activities of project and the structure of distribution of work (WBS) plan the time for each activity and determine the critical path. Students also capacities and determine bottlenecks and balance capacities. At the end they determine the critical path are capacities and determine bottlenecks and balance capacities. At the end they determine the critical path are capacities and determine bottlenecks and balance capacities. On test students their work which is evaluated (grade M). On the other side students have one test in the field of Network planning tech (LV) at the end of the semester. • LV - grade of laboratory exercises,		er)	5 (Oth	1,5		Project		Written exam	value of the course)
The final grade (in percentage) is formed according to the formula: Grade (%) = 0,30 LV + 0,70 M	. There is er is three. Students BS). They also plan determine ts present	On the other side students have one test in the field of Network planning technic (LV) at the end of the semester. • LV - grade of laboratory exercises, • M - points achieved from the project. The final grade (in percentage) is formed according to the formula:						evaluating student work in class and at	
Required literature (available in the Title Title Title Number of copies in the library other m		Availa	copies ir				Title		

library and via other media)	Veža, I., Bilić, B., Gjeldum, N., Mladineo, M., "Upravljanje projektima", Fakultet elektrotehnike, strojarstva i brodogradnje, Split, 2011.		e-learning portal
	Majstorović, V. Projektni menadžment, Sveučilište u Mostaru, Mostar, 2010.	5	
	Omazić, M.A. Projektni menadžment, Sinergija, Zagreb, 2005.	5	
Optional literature (at the time of submission of study programme proposal)	"A Guide to the Project Management Body of Knowle Management Institute, Newtown Square, 2004. Wysocki, R. K., McGary, R., "Effective Project Management", John Wiley & Sons, 2003.		-
Quality assurance methods that ensure the acquisition of exit competences	 Evidence about class attendance The annual analysis of performance of the expension Student survey in order to evaluate teachers Self-evaluation of teachers Feedback from students who have already gof the course content 		it the relevance
Other (as the proposer wishes to add)			

NAME OF THE COURSE	LOCAL AND ACCESS NETWORKS									
Code	FELH30	Year of study	2.							
Course teacher	Josip Lörincz, Ph.D., Assistant Professor	Credits (ECTS)	5							
Associate teachers	Dinko Begušić, Ph.D., Full	Type of instruction	L	S	ΑE	LE	DE			
Associate teachers	Professor	(number of hours)	30	0	0	30				
Status of the course	- Obligatory (university graduate programme, 242) Percentage of application of e-learning									
	COURSE DESCRIPTION									
Training students for: - knowledge and understanding of the fundamental concepts of local and access networks, - knowledge of the characteristics of the medium for the transmission of information in local and access network (metal wires, optical fibre and wireless transmission), - capability to configure local and access networks and network devices, - qualification for participation in the design and maintenance of local and access networks, - permanent acquisition of knowledge in the field of new technologies used in local access networks.							ation on), ess			

Course enrolment requirements and entry competences required for the course	Knowledge of basic concepts and technology in the area of data information transfer and communication protocols. Knowledge of basic computer skills. Knowledge of English language.					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: define basic terms and concepts of local and access networks, evaluate and implement protocols, systems and techniques for transmission of information in local and access networks based on different transmission medias including metal wires, optical fibre and wireless transmission, configure local and access networks and network devices, participate in the design and maintenance of local and access networks, permanently acquire knowledge about new technologies in the area of local access networks.					
Course content L hours						
	Introduction. Standards.		2			
	The division of the LAN network according to different criteria.		2			
	Local area networks of type Ethernet.		2			
	Local area networks of type: Token ring, Token bus, FDDI, DQDB		2			
Course content	Gigabit Ethernet, switched LAN		2			
broken down in detail by weekly	Networks: ATM, ATM LAN		2			
class schedule	Virtual Private Networks-VPN		2			
(syllabus)	Wireless Communication Systems-general, cellular (mobile) systems		2			
	Wireless LAN (WLAN) networks		2			
	Broadband access networks-general		2			
	xDSL technology: HDSL, ADSL, VDSL		2			
	Fiber optical networks: FTTx technology		2			
	HFC technology, WiMAX technology		2			
	List of laboratory or design exercises		LEhours			
	Exercise 1.: Introduction - basics Riverbed Modeler simulator		2			
	Exercise 2.: Local Area Network - The role of Switch in LAN Eth network	ernet	2			
	Exercise 3.: Local Area Network - a network design (planning new with different users, terminals and services)	etwork	2			
	Exercise 4.: ATM (cell switching technology based on connectio oriented connections)	n	2			
	Exercise 5.: RIP protocol (Routing protocol based on an link algorithm state)					
	Exercise 6.: TCP Transmission Control Protocol (Trusted protocon pre-established links)	ol based	2			
	Exercise 7.: The methods of sorting (queuing, waiting to transmi discard packets)	t or	2			
	Exercise 8.: The wireless local area network (media access control for mobile station)					
	Exercise 9.: Mobile wireless networks (wireless cellular networks with mobile devices)					
	Exercise 10.: OSPF routing protocol based on an link-state algorithm					

	Exercise 11.: Border Gateway Protocol (BGP) - (Routing data traffic between different administrative domains)						2	
	Compensation exercises					2		
Format of instruction	□ on line in entirety □ partial e-learning □ field work □ (other)							
Studentresponsibiliti es	 positive assessr minimum preser presence on lab time in a semes minimum 50% p 	heconditions for overallpositiveassessment are: positive assessment of laboratory exercises (above 50 %) minimum presence during 70% of overall class teaching time in a semester, presence on laboratory exercises during 100% of overall laboratory exercise time in a semester, minimum 50% points at each mid-term or final exam (or correctional or commission exam).						
Screening student	Class attendance	1,0	Researc	h		Practical training		
work (name the proportion of ECTS	Experimental work		Report			Independent work	2,2	
credits for eachactivity so that the total number of	Essay		Seminar essay			Laboratory exercises	1,0	
ECTS credits is equal to the ECTS value of the course)	Tests		Oral exam			Preparation for Laboratory exercises	0,5	
	Written exam	0,3	Project			(Other)		
Grading and evaluating student work in class and at the final exam	will be after 8 weeks and 2nd of the final they did not pass of (correctional) exam, Rating (%) = 0.1PL · PL – presence on th LA- grades from labout M1, M2- the 1st and percentage), The final grade is depercentage Rating 50% to 61% is suffic 62% to 74% good (375% to 87% of very 88% 100% Excellen Independently on reand 4th final (correct the case of organization).	s of class exams, some student + 0,2LA e lecture oratory a 2nd midetermine sient (2) good (4 t (5) sults obtained) extermine sient sa pos	eses, and students of the miss take ex + 0.35 (Nes (expressessmed) das follows as students relatitive assessmed)	the 2nd take ex d-term am of considering the dents take expended to the take expense of take expense of the take expense of take expense of the take expense of take expense of the take expense of take e	d after 1 am of the exams. complete 2) percenoressed des or for 2 ake exam, studente admis	tage), in percentage), inal exam grades (exprending a mid-term exams, on a more of entire curricula core of the co	the 3 rd	

	4 th Final (correctional) exam 5 th Final (commission) exam (organized only based on decision of Faculty council in specific academic year)						
	Title	Number of copies in the library	Availability via other media				
Required literature (available in the library and via other media)	Milutin Kapov, Josip Lorincz, "Local and Access Networks", FESB-Split, 2015, (2009), internal script		e-learning portal				
	Josip Lorincz, "Instructions for performing laboratory exercises in local and access networks", FESB Split, internal script, 2015.		e-learning portal				
	Alen Bažant and others: "The basic architecture of the network", ELEMENT, Zagreb, 2004.	5					
	M. Vrdoljak and others: "New Communication Technologies", FESB Split, HT TKC Split, softcore library Split in 1999.	5					
Optional literature (at the time of submission of study programme proposal)	 M. Jose ., M. Caballero and others, "SDH / SONE Synchronization Networks", Artech House, Bostor Alex Gillespie: "Broadband Access Technology In Artech House, Boston, London, 2000. Annabel Z. Dodd, "Telecommunications", Algorith 	n, London, 200 terfaces and I	03. Management,				
Quality assurance methods that ensure the acquisition of exit competences	Feedback from students via surveysSelf-evaluation of teachersInstitutional and non-institutional evaluations	Evaluation of results in accordance with the above learning outcomes Feedback from students via surveys Self-evaluation of teachers					
Other (as the proposer wishes to add)	/						

NAME OF THE COURSE BIOELECTROMAGNETICS							
Code	FELJ24	ELJ24 Year of study 1.					
Course teacher	Antonio Šarolić, Ph.D., Full Professor	Credits (ECTS)	5				
A '- (- (Niko Ištuk, Teaching	Type of instruction	L	S	AE	LE	DE
Associate teachers	Assistant	(number of hours)				30	
Status of the course	Elective	Percentage of application of e-learning	0				
COURSE DESCRIPTION							
Course objectives Training students for: - understanding the human electrophysiology							

	acquiring knowledge on therapeuapplication of specialized interdis	<u> </u>		onlications			
Course enrolment requirements and entry competences required for the course	None.	opiniary knowledge in sien	ediodi u _l	phoduone			
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	apply the electrophysiology know functionanalyze the electric activity of hea	describe the cell structure describe the electrophysiology of excitable cells and tissues apply the electrophysiology knowledge for understanding the brain and function analyze the electric activity of heart and brain with applications in diagn link the electrophysiology principles to the function of other bodily organ					
	Course content		L hours	AE hours			
	Introduction and history.		2	0			
	Structure of neuron and muscle cells.		2	0			
	Membrane potential.			0			
	Axon as transmission line (cable).			0			
Course content	Membrane activation.			0			
broken down in	Synapses, receptors and brain.		2	0			
class schedule (syllabus)	Heart.		2	0			
	Volume source. Volume conductor.		2	0			
	Electrocardiography (ECG).		2	0			
	Electroencephalograhpy (EEG).			0			
	Electrophysiology of the eye. Electroo	2	0				
	Other diagnostic and therapeutic methods based on applied electromagnetics. Magnetic resonance imaging (MRI).			0			
	Visit to Medical School of the University of Split. Visit to companies related to the course topics.			0			
	List of laboratory or design exercises			LE hours			
	Membrane potential.			4			
	Axon as transmission line (cable).			2			
	Membrane activation.			4			
	Synapses, receptors and brain.			2			
	Electrocardiography (ECG).			2			
	Electroencephalograhpy (EEG).			2			
	Electrodermal reaction.						
	Other diagnostic and therapeutic methods based on applied						
	electromagnetics. Magnetic resonance imaging (MRI). Visit to Medical School of the University of Split. Visit to companies related to the course topics.						
	☑ lectures	☐ independent assignmen	te				
	□ lectures □ seminars and workshops □	☐ multimedia	เอ				
Format of instruction	⊠ exercises	InditiffediaIaboratory					
Tomat or mondone	☐ on line in entirety	□ work with mentor					
	□ partial e-learning □ work with mentor □ (other)						
	1 — 1	` ,					

	⊠ field work							
Student responsibilities	least 70% of the sch the amount of 100%	Student is required to attend the lectures and auditory exercises in the amount of at least 70% of the schedule. Student is required to attend the laboratory exercises in the amount of 100% of the schedule and to complete all tasks associated with laboratory exercises.						
Screening student work (name the	Class attendance	1	Research	1		Practical traini	ng	
proportion of ECTS	Experimental work	0,5	Report			Laboratory exe	ercises	0,5
credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)	Essay		Seminar essay	1		Individual work	<	1
	Mid-exam	0,5	Oral exan	n		(Other)		
	Written exam	0,5	Project			(Other)		
Grading and evaluating student work in class and at the final exam	At the first exam term, students may choose to take the exam containing half of the material that they haven't passed at mid-exams. At all other exam terms, students must take the whole exam, containing all the material. Approaching the exams is subject to fulfilling the requirements on responsibilities. The overall point percentage defining the overall grade is calculated as the of points earned in all exam questions, corrected by the result of oral verifice. Percentage -> Grade 50% - 62,4% -> sufficient (2) 62,5% - 74,9% -> good (3) 75% - 87,4% -> very good (4) 87,5% - 100% -> excellent (5) Final grade can be supplemented by performing practical project work individual and experimental work, in agreement with the teacher. Exam terms: according to the academic year calendar Number of					art of the and min. material must be material art of the dered to oth midonly that e course student average ation:		
Required literature (available in the library and via other media)	Jaakko Malmivuo Bioelectromagne Applications of B Fields, Oxford Un 1995.	etism - P Bioelectr	ert Plonse Principles a ic and Bior	nd nagnetic		copies in the library		media

	Handbook of biological effects of electromagnetic fields (third edition): Bioengineering and Biophysical Aspects of Electromagnetic Fields, Ed. Frank S. Barnes and Ben Greenebaum, CRC Press, 2007.
	Handbook of biological effects of electromagnetic fields (third edition): Biological and Medical Aspects of Electromagnetic Fields, Ed. Frank S. Barnes and Ben Greenebaum, CRC Press, 2007.
Optional literature (at the time of submission of study programme proposal)	 Šantić, A: Biomedicinska elektronika, Školska knjiga, Zagreb, 1995. The Biomedical Engineering Handbook (Second Edition), Ed. Joseph D. Bronzino, CRC Press, 2000.
Quality assurance methods that ensure the acquisition of exit competences	Surveys providing student feedback
Other (as the proposer wishes to add)	

NAME OF THE COURSE	MEDICAL ELECTRONIC	DEVICES								
Code	FELH41 Year of study 2.									
Course teacher	Antonio Šarolić, Ph.D., Full Professor Ivan Marinović, Ph.D., Full Professor 5									
A	NPI Visit vi	Type of instruction	L	S	ΑE	LE	DE			
Associate teachers	Niko Ištuk, mag. ing. el.	(number of hours)	30			30				
Status of the course	Elective Percentage of application of e-learning 0									
	COURSE	DESCRIPTION								
Course objectives	electronic/communication - knowledge on therapeu - understanding the special electronic devices	electronic/communication/information technology in medical domain knowledge on therapeutic, diagnostic and control medical electronic devices understanding the specifics of functional and safety requirements for medical electronic devices understanding and application of success criteria for medical device innovation								
Course enrolment requirements and entry competences required for the course	None.									
Learning outcomes expected at the level	Students will be able to:									

of the course (4 to 10 learning	 employ their knowledge on electronic/communication/information technology for analysis and development of medical devices 									
outcomes)	- use the knowledge of human physiology, especially electrophysiology, for									
	 analysis and development of medical devices analyze the components of medical electronic devices and their interaction with 									
	human body medical electronic devices									
		- conceive the electronic circuits for application in a medical device								
		 characterize a medical electronic device from the aspect of safety critically assess the success of innovation and development of a medical device 								
	-						L	AE		
	Course content						hours	hours		
	Basics of human ele				trophysi	ology	2	0		
	Measurement medic						2	0		
	Diagnostic medical						2	0		
	Therapeutic medical				ما مامريام		6	0		
	Electronic circuits an						6	0		
	Circuits and devices frequencies						2	0		
	Circuits and devices						2	0		
	Electrical safety asp aspects of medical e				c compa	atibility	2	0		
	Control and auxiliary									
Course content	Theranostic medical therapeutics and dia		2	0						
broken down in	methods									
detail by weekly class schedule	Translational resaer									
(syllabus)	from lab to clinics (fr		2	0						
	Assessment of clinic technology (Health 1									
	Clinical studies: prin					nical trials	2	0		
	of medical devices									
	List of laboratory or						I	_E hours		
	Basics of human elec	ctrophys	iology					2		
	Amplifier circuits	**-						4		
	Electrostimulator circ		ooolon in	alaatra	برمام مامیر	iooo		4		
	Noise and disturband			electro	nic dev	ices		2		
	Electromagnetic compatibility testing Electrical safety testing							2		
	Measurements of dielectric properties of tissues							2		
	Measurement, diagnostic and therapeutic medical electronic device									
	field trip (visit to med							8		
	⊠ lectures			□inda	nender	nt assignmen	ite			
	⊠ seminars and wo	rkshops			epender timedia	n assiyiiiieli	113			
Format of instruction	⊠ exercises									
Tomat of instruction	☐ <i>on line</i> in entirety			⊠ labo	ratory k with n	nentor				
	☐ partial e-learning			□ woi	othe)					
	⊠ field work				(Otile	οι <i>)</i>				
Student responsibilities	Student is required t least 70% of the sch		the lectu	ires and	d audito	ry exercises	in the amo	ount of at		
Screening student	Class attendance	1	Researc			Practical tra	ining			
work (name the proportion of ECTS	Experimental work	0,5	Report Laboratory e							
credits for each	Exponimental work		Semina			,				

total number of ECTS credits is	Mid-exam		(Other)						
equal to the ECTS value of the course)	Written exam	0,5	Project		(Other)	(Other)			
Grading and evaluating student work in class and at the final exam	Marinović (1/3 of led	Lectures are given in collaboration of prof. Šarolić (2/3 of lecture hours) and prof. Marinović (1/3 of lecture hours). Exam: presentation and defense of the seminar essay							
De avire d'Hanatine		Title	e		Number of copies in the library	Availabi other n			
Required literature (available in the library and via other	Ante Šantić: Biomed knjiga, Zagreb, 1995								
media)	Jaakko Malmivuo & Bioelectromagnetisr of Bioelectric and Bi University Press, Ne	n - Princ omagne							
Optional literature (at the time of submission of study programme proposal)	 Handbook of biological effects of electromagnetic fields (third edition): Bioengineering and Biophysical Aspects of Electromagnetic Fields, Ed. Frank S. Barnes and Ben Greenebaum, CRC Press, 2007. Handbook of biological effects of electromagnetic fields (third edition): Biological and Medical Aspects of Electromagnetic Fields, Ed. Frank S. Barnes and Ben Greenebaum, CRC Press, 2007. The Biomedical Engineering Handbook (Second Edition), Ed. Joseph D. Bronzino, CRC Press, 2000. 								
Quality assurance methods that ensure the acquisition of exit competences	Surveys providing student feedback								
Other (as the proposer wishes to add)									

NAME OF THE COURSE	MULTIMEDIA SYSTEMS								
Code	FELJ20	Year of study 2.							
Course teacher	Mladen Russo, Ph.D., Assistant Professor	Credits (ECTS)	5						
	Jelena Čulić, Teaching			S	ΑE	LE	DE		
Associate teachers	Assistant Martina Bašić, Teaching Assistant	Type of instruction (number of hours)	30	0	0	30	0		
Status of the course	Obligatory: 242 Elective: 241	Percentage of application of e-learning	0	0					
COURSE DESCRIPTION									
Training students for: - understanding of multimedia systems and virtual reality - knowledge of the properties and methods for generating speech, audio, image and video signals (including 3D images and video)									

	understanding of the most important algorithms for compressimage and video signals	sing spee	ch, audio,
Course enrolment requirements and entry competences required for the course	None.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - describe the basic principles of human speech, hearing and - explain the basic principles of psychoacoustics and their approximate compression of audio signals - demonstrate the frequency masking effect - define the most important algorithms for compression of spendard video signals - demonstrate the basic mechanisms of JPEG compression	plication i	
	Course content	L hours	AE hours
	Introduction. History of multimedia systems. Basic terms. Overview of multimedia software tools. Design of multimedia applications.	2	0
	Audio signal. How humans hear and speak. Speech modelling.	2	0
	Generic compression techniques for audio signals. Audio specific algorithms (mp3).	2	0
	Speech specific algorithms (LPC, CELP, RELP, MPE, RPE) and applications in mobile telephony. Review of standards for encoding speech and audio signals.		0
	Color in images and video signal. The perception of color (how people perceive electromagnetic radiation). Theory of mixing colors.	2	0
Course content broken down in detail by weekly	Color models for image signal (RGB, CMY, CMYK). Color models for video signal (YUV, YIQ, YCbCr). Software-oriented color models (HSB, HLS, HSV). Gamma correction. Image signal (resolution, depth, memory requirements). Image formats (gif, tiff, jfif, ps, bmp).		0
class schedule (syllabus)	Basics of video and television. Analog television and video. Digital television and video. Video formats and memory requirements.	2	0
	Image compression. JPEG modes.	2	0
	Video compression: H.261. H.263.	2	0
	Video compression: MPEG-1. MPEG -2.	2	0
	Video compression: MPEG-4.	2	0
	Video compression: H.264.	2	0
	Fundamentals of virtual reality. History. Stereoscopic (3D) vision. Software and hardware for virtual reality.	2	0
	Sound recording. Searching of voiced and unvoiced speech. Pito	ch period	LE hours
	Speech specific algorithms (LPC)	poriou.	2
	Frequency masking		2
	3D sound		2
	Image compression (JPEG)		2
	Image compression (JPEG)		2
	image compression (ar EG)		

	Image compression (JPEG)							2
	MPEG – influence of	I, P, B 1	frames o	n video	quality			2
	Multimedia systems	on mobi	le device	s (Andr	oid prog	ramming)		2
	Multimedia systems	on mobi	le device	s (Andr	oid prog	ramming)		2
	Multimedia systems	on mobi	le device	s (Andr	oid prog	ramming)		2
	3D images							2
	CAVE system							2
	⊠ lectures			□inde	nenden	t assignments		
	☐ seminars and wo	rkshops			timedia	assignments		
Format of instruction	⊠ exercises			⊠ labo				
	□ on line in entirety				k with m	entor		
	☐ partial e-learning				(other			
	☐ field work							
Studentresponsibiliti es	The presence on lec Performed all require				t least 70	0 % of the time	s sched	uled.
Screening student work (name the	Class attendance	3	Researc	ch		Practical traini	ng	
proportion of ECTS credits for	Experimental work		Report			Individual work	(1,7
eachactivity so that the total number of	Essay		Seminal essay	r		(Other)		
ECTS credits is equal to the ECTS	Tests	0,2	Oral exa	am		(Other)		
value of the course)	Written exam	0,1	Project			(Other)		
Grading and evaluating student work in class and at the final exam	During a semester thare held according to from the complete of take the midterm that students take the test The requirement for exam. Grade (in performance) = 0,5*M1+The final grade is despercentage Grade 50% to 61% sufficient 62% to 74% good (75% to 87% very gas 88% to 100% excelled	o the cal course if lat they st from t passing centage -0,5*M2 stermine ent (2) (3) ood (4)	endar of they do did not he comply grade is b) is forme ; M1, M2	classes not hav pass. A lete cou 50% po ed acco – midte	. At the five a pos at the mainse. oints on rding to	inal exam stude itive grade on ake-up and co	ents take the mid ommissio	e the test terms or on exam
Required literature (available in the library and via other		Title)			Number of copies in the library	other	oility via media
media)	H. Dujmić: Multin	nedijskis	sustavi, ir	nternal	script	1	e-lea port	arning al
Optional literature (at the time of submission of study programme proposal)	 Steinmetz, Nahrs Processing", Pre Rao, Bojkovic, M StandardsandNe 	ntice Ha ilovano	all, 2002 vic: "Mult	imedia (Commur			
Quality assurance methods that ensure the acquisition of exit competences	- Feedback from s	students	- Evaluation of results in accordance with the above learning outcomes					

	- Institutional and non-institutional evaluations
Other (as the proposer wishes to add)	

NAME OF THE COURSE	MEASUREMENTS IN WI	RELESS SYSTEMS						
Code	FELJ22	Year of study	2					
Course teacher	Zoran Blažević, Ph.D., Full Professor	Credits (ECTS)	5					
Associate teachers	Maja Škiljo, Ph.D.	Type of instruction (number of hours)	S 0	AE 15	LE 15	DE 0		
Status of the course	Obligatory: 241 Elective: 242	Percentage of application of e-learning	0					
	COURSI	E DESCRIPTION						
Course objectives	Training students for: - radio-channel measurements and analysis, - statistical modelling of radio propagation in different environments and for various radio systems, - applying empirical and statistical models for radio-channel characterization.						۱.	
Course enrolment requirements and entry competences required for the course	Finished the undergraduate study of Communications and Information Technology							
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - calculate radio-channel parameters, - perform measurements and analysis of fixed and mobile radio systems parameters - statistically characterize radio propagation of arbitrary radio-systems on the base of measurements, - Apply various channel models							
	Course content				L hours		AE ours	
Course content	Introduction to Measureme	ents in Wireless Systems.			1		1	
broken down in	Fixed radio-links channel parameters. Fading						1	
detail by weekly class schedule	Ground radio links planning and measurements						2	
(syllabus)	Fading in mobile radio channels.						1	
	Mobile radio channel parameters.						1	
	Propagation path-loss mod	dels. Hata-Okumura model			3		1	

	ı				1		-
	First midterm exam						
	Statistical channel m with Maxwell theory		•	f ground networks comparison nodel.			1
	Satellite radio-channe measurements (Loo				ı	4	1
	Wide-band channel	ements.	4	3			
	Wide-band channel	models	based or	n measurement	S.	2	1
	Wide-band indoor ra	dio cha	nnel mod	lelling.		3	1
	Second midterm exa	am					
	List of laboratory exe	ercises			<u>.</u>		LE hours
	Antenna measureme Measurements calibr		ector Ne	twork Analyser	measuremer	ts.	3
	Narrow-band channe	l measu	irements	at various frequ	uencies.		3
	Wide-band channel r	neasure	ments				3
	Wide-band indoor ch	annel m	easurem	ents			3
	Radio-links planning	by using	g measur	ed data and so	ftware.		3
Format of instruction	 ☑ lectures ☐ seminars and workshops ☑ exercises ☐ on line in entirety ☐ partial e-learning ☑ field work ☐ independent ☐ multimedia ☒ laboratory ☐ work with me ☐ (other 				nentor		
Student	The presence on lec				0 % of the tim	nes sche	eduled.
responsibilities	Performed all labora			·	Described took		
Screening student work (name the	Class attendance	2,0	Researd	n	Practical training		
proportion of ECTS	Experimental work		Report		Individual wo	rk	1.5
credits for each activity so that the total number of	Essay		Seminar essay		Laboratory exercises		0,8
ECTS credits is equal to the ECTS	Tests	0,5	Oral exa	am	Preparation for laboratory exercises		0,2
value of the course)	Written exam		Project		(Othe	·)	
Grading and evaluating student work in class and at the final exam	There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test and final tests consists of theoretical questions and numerical. The students that did not pass the midterm exams take part In the final exams. The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises and 40 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula: Grade(%) = 0,1 NP + 0,1 LV + 0,4 (M1 + M2) the activities in percentage: NP - attendance at lectures, LV - laboratory assessment, M1, M2 - test results.						at and final d not pass exams are e positive
Required literature (available in the		Title)		Number of copies in the library	Avail	ability via er media
library and via other media)	Z. Blažević; Mjer predavanja	enja u b	ežičnim	sustavima,			earning oortal

	M. Patzold: "Mobile Fading Channels", Wiley, 2002.	1					
	Doble, J.: "Introduction to Radio Propagation for Fixed and Mobile Communications", Artech House Boston - London, GB, 1996.	ixed and Mobile Communications", Artech					
Optional literature (at the time of submission of study programme proposal)	· · · · · · · · · · · · · · · · · · ·	G. H. Bryant: "Principles of Microwave Measurements", IEE Publishing, 1993. Zentner, E.: Antene i radiosustavi, Graphis Zagreb, 2001.					
Quality assurance methods that ensure the acquisition of exit competences	 Evaluation of results in accordance with the above Feedback from students via surveys Self-evaluation of teachers Institutional and non-institutional evaluations 	e learning out	comes				
Other (as the proposer wishes to add)							

NAME OF THE COURSE	SYSTEMS FOR WIRELESS TRANSMISSION OF ENERGY								
Code	FELJ36	Year of study	2						
Course teacher	Zoran Blažević, Ph.D., Full Professor	Credits (ECTS)	5						
Associate teachers	Maja Škiljo, Ph.D.	Type of instruction	L	S	AE	LE	DE		
Associate teachers	iviaja Oklijo, i II.D.	(number of hours)	30	0	0	30	0		
Status of the course	Elective	Percentage of application of e-learning	0						
	COURSE DESCRIPTION								
Course objectives	Training students for: understanding of basic principles of and problemacy of systems for wireless transmission of energy, designing of radio system for near-field transmission of energy design of radio system for far-field power transmission calculation and analysis of wireless energy systems parameters								
Course enrolment requirements and entry competences required for the course	Finished the undergraduate study of Communications and Information Technology.								
Learning outcomes expected at the level of the course (4 to	Students will be able to: - analyse power and energy transmission techniques, - calculate and estimate wireless energy transmission system parameters, - designing basic transmission system schemes for given service								

10 learning outcomes)								
	Course content							AE hours
	Introduction. Histori transmission.	ess	2					
	Principles and technology Transformers and re electrically small an	esonant					4	
Course content	Antenna scattering Spherical Mode The transmission of ene		4					
Course content broken down in	Rectennas.						2	
detail by weekly class schedule	Near-field energy attransformer.	nd powe	er transm	ission. I	Resonant		4	
(syllabus)	Far-field power tran	sfer.					4	
	Ground energy tran	sfer by	far-field s	ystems	concept		3	
	Satellite energy tran	nsfer sy	stem con	cept			3	
	Norms and standard standard.	ds for w	ireless er	nergy tr	ansfer. Qi		2	
	Electromagnetic Compatibility of wireless energy transfer systems.							
	Interference probler and radio systems f	systems	2					
	Midterm exam							
	List of laboratory exe							_E hours
	Measurements and a antennas	adjustme	ents of ind	ductivel	ly fed elec	trically sma	all	8
	Measurements of tra Oscilloscope	nsfer pe	erformand	es by S	Spectrum /	Analyser, a	and by	8
	Measurements of tra	nsfer pe	rformand	es by ∖	ector Net	work Analy	/ser	6
	Tesla Coil Measurem	nents.						8
	⊠ lectures			⊠ inde	anandant s	assignmen	te	
	$\hfill\Box$ seminars and wor	kshops			timedia	13		
Format of instruction	□ exercises			_	☐ Inditifiedia ☐ laboratory			
2.0.2.0	☐ <i>on line</i> in entirety			□ work with mentor				
	□ partial e-learning				(other)			
Otrodont	☑ field work	4	41					la la l
Student responsibilities	The presence on lec Performed all labora					% of the til	nes sched	iulea.
Screening student	Class attendance	1.5	Researc	:h	P	ractical tra	ining	
proportion of Lord	Experimental work		Report		Ir	ndividual w	ork	2
proportion of ECTS								
proportion of ECTS credits for each activity so that the	Essay		Seminai essay	•	L	aboratory e	exercises	0,8
proportion of ECTS credits for each		0,5			Р	aboratory or reparation aboratory e	for	0,8

Grading and evaluating student work in class and at the final exam	There are one midterm and one final exam. Both mid of theoretical questions and numerical problems. The midterm exams take part In the final exams. The midte out as written tests. The requirement for passing grad laboratory exercises, 40 % points on the midterm exams to the grade depends on the seminary work presepercentage) is formed according to the formula: Grade(%) = 0,1 NP + 0,1 LV + 0 the activities in percentage: NP - attendance at lectures, NP - attendance at lectures, LV - laboratory assessment, M - test results., S - seminary work results and presentation	e students that erm and final e le is the positiv kam or the fina ented by the s	did not pass the xams are carried re assessment of al exam, and the			
	Title	Number of copies in the library	Availability via other media			
Required literature (available in the library and via other media)	 Ki Young Kim (editor), "Wireless Power Transfer-Principles and Engineering Explorations", InTech, January 2012. 		e-learning portal			
	 Volakis J., C. C. Chen and K. Fujimoto, "Small antennas: miniaturization techniques and applications", New York, McGraw-Hill, 2010. 		e-learning portal			
	Special issue "Solar Power Satellite and Wireless Power Transmission", IEEE Microwave Magazine, Vol. 3, No. 4, December 2002.	1				
Optional literature (at the time of submission of study programme proposal)	 Lee J. and S. Nam, "Fundamental aspects of near-field coupling small antennas for wireless power transfer", IEEE Trans. Antennas Propag., Vol. 58, No. 12, 3442-3449, 2010. P. Sample, D. T. Meyer, J. R. Smith: Analysis, experimental results, and range adaptation of magnetically coupled resonators for wireless power transfer, IEEE Transactions on Industrial Electronics, Vol. 58, No. 2, 2010, p.p 544-554. N. Tesla, A. Marinčić: Colorado Springs Notes, Nolit, Beograd, 1978. Carol Gray Montgomery, Robert Henry Dicke and Edward M. Purcell, "Principles of microwave circuits", McGraw-Hill Book Company, Inc.,USA, 1948. 					
Quality assurance methods that ensure	Evaluation of results in accordance with the abovFeedback from students via surveys	e learning out	comes			
the acquisition of exit competences	- Self-evaluation of teachers - Institutional and non-institutional evaluations					
Other (as the proposer wishes to add)						