S V E U Č I L I Š T E U S P L I T U

FACULTY OF ELECTRICAL ENGINEERING, MECHANICAL ENGINEERING AND NAVAL ARCHITECTURE

DETAILED PROPOSAL OF THE STUDY PROGRAMME

UNDERGRADUATE UNIVERSITY STUDY IN COMPUTING

SPLIT, May 2025

1.1. List of mandatory and elective courses

List of courses								
Year of study: 1.								
Semester: I.								
STATUS	CODE	COURSE	HOURS IN SEMESTER*					ECTS
			L	S	AE	LE	DE	
Mandatory	FEMX01	Mathematics 1	45	0	45	0	0	7
	FEOB03	English language 1	0	30	0	0	0	2
	FENB01	Electrical engineering	45	0	30	0	0	7
	Total		180	30	105	30	0	30
	* L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise							

List of courses								
Year of study: 1.								
Semester: II.								
STATUS	CODE	COURSE	HOURS IN SEMESTER*					ECTS
			L	S	AE	LE	DE	
Mandatory	FEMX02	Mathematics 2	45	0	45	0	0	7
	* L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise							

List of courses								
Year of study: 2.								
Semester: III.								
STATUS	CODE	COURSE	HOURS IN SEMESTER*					ECTS
			L	S	AE	LE	DE	
Mandatory	FEMB02	Discrete mathematics	30	0	30	0	0	6
	FELB02	Object oriented programming	45	0	0	30	0	7
	FELB03	Data Structures	30	0	0	30	0	6
	FENB02	Practicum	0	0	0	45	0	2
	* L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise							

List of courses								
Year of study: 2.								
Semester: IV.								
STATUS	CODE	COURSE	HOURS IN SEMESTER*					ECTS
			L	S	AE	LE	DE	
	FELB05	Computer architectures	45	0	0	30	0	7
	FELB09	Signals and systems	30	0	15	15	0	5
	* L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise							

List of courses								
Year of study: 3.								
Semester: V.								
STATUS	CODE	COURSE	HOURS IN SEMESTER*					ECTS
			L	S	AE	LE	DE	
Mandatory	FELB10	Operating systems	45	0	0	30	0	7
	FELB11	Computer networks	45	0	0	30	0	6
	FELB12	Software Engineering	45	0	0	30	0	7
	FELB18	Computer and data security	30	0	0	15	0	4
* L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise								

POPIS PREDMETA								
Year of study: 3.								
Semester: VI.								
STATUS	CODE	COURSE	HOURS IN SEMESTER*					ECTS
			L	S	AE	LE	DE	
Mandatory	FELB14	System analysis and design	30	0	0	30	0	5
	FETB01	Business Informatics	30	0	0	15	0	4
* L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise								

1.1. List of mandatory and elective courses

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">MATHEMATICS 1</td></tr>
<tr><td>Code</td><td>FEMX01</td><td>Year of study</td><td colspan="5">1</td></tr>
<tr><td>Course teacher</td><td>Ivan Slapničar, Ph.D., Full Professor, Anita Matković, Ph.D., Associate Professor,
Josipa Barić, Ph.D., Assistant Professor</td><td>Credits (ECTS)</td><td colspan="5">7</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Ph.D. Nevena Jakovčević Stor, Irena Bego, Anita Carević, Marija Čatipović, Lea Dujić, Ivana Grgić, Lana Periša, Marina Mandić, Dajana Radišić, Mirjana Strukan, Stjepan Vedran Vukasović, Vanja Županović.</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>45</td><td></td><td>45</td><td></td><td></td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">10</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:
- application of mathematical concepts and tools from the area of linear algebra, vector calculus, analytic geometry, diferential calculus, analysis of real functions of real variable, sequences and series of numbers and functions, to solving engineering problems.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">Good knowledge of High School mathematics and passed State Exam in Mathematics.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:
- state definitions and theorems from the enitre course,
- reproduce proofs of basic theorems,
- illustrate theorems with examples,
- solve systems of linear equations,
- apply vector calculus to analytical geometry of space,
- interpret derivatives mathematically, geometrically and physically,
- analyse functions of one variable,
- test convergence of sequences and series of numbers and functions.</td></tr>
<tr><td rowspan="6">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td colspan="5">1. Introduction. Relations. Functions. Sets of numbers, complex numbers, trigonometric form of complex number, Moivre formulas.</td><td>3</td><td>3</td></tr>
<tr><td colspan="5">2. Matrices. Basic operations with matrices. Matrix formulation of system of linear equations. Gaussian elimination. Linear independence and rank of a matrix. Kronecker-Capelli theorem.</td><td>3</td><td>3</td></tr>
<tr><td colspan="5">3. Inverse matrix. Determinants. Submatrices and subdeterminants. Laplace expansion of a determinant. Cramer's rule.</td><td>3</td><td>3</td></tr>
<tr><td colspan="5">4. Vectors. Basic operations with vectors. Coordinate system. Unit vector and cosines of directions. Linear independence of vectors and basis of a space. Scalar (dot) product, vector product and mixed product.</td><td>3</td><td>3</td></tr>
<tr><td colspan="5">5. Equations of a line. Equations of a plane. Applications of analytic geometry.</td><td>3</td><td>3</td></tr>
</table>

	6. Functions of a real variable: defining function, classification of functions. Limits and continuity. Asymptotes. Review of elementary functions.	3	3
	7. Derivatives. Tangent and normal. Differential and approximate computation.	3	3
	8. Higher derivatives and differentials. Derivatve of a parametric function. Theorems of differential calculus (Fermat, Rolle, Cauchy, Lagrange). L'Hospital's rule and limits of undetermined forms.	3	3
	9. Monotonicity. Necessary and sufficient conditions for extrema. Geometrical extrema.	3	3
	10. Curvature. Sufficient condition for convexity and concavity. Necessary and sufficient conditions for inflection points. Examining functions and drawing graphs.	3	3
	11. Sequences of real numbers. Basic inequality of convergence. Accumulation point and sub-sequence. Boundedness, monotonicity and convergence. Properties of limits. Cauchy series. Some important limits.	3	3
	12. Series of real numbers. Sufficient condition for convergence. Convergence criteria. Absolute convergence. Alternating series.	3	3
	13. Sequences of functions. Series of functions. Power series and convergence radius. Differentiating series of functions. Taylor series and applications.	3	3
	List of laboratory or design exercises		LE or DE hours

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ independent assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☐ (other)
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)*	Class attendance	3	Research		Practical training	
	Experimental work		Report		Self study	3.6
	Essay		Seminar essay		(Other)	
	Tests	0.2	Oral exam		(Other)	
	Written exam	0.2	Project		(Other)	

Grading and evaluating student work in class and at the final exam	During semester two mid-term exams are held. The first exam is scheduled after 7 weeks of lectures, and the second in the week following the lectures. At each mid-term exam students can get 40 points, while the remaining 20 points are attained through assignements during lectures and excercises. The condition for passing the course is minimum 20 points on each mid-term exams and a total of at least 50 points. After semester, two final exams and a correction exam are held. Students which did not pass one mid-term exam, can take only this part of the exam during final exams. Student which did not pass any mid-term exam, take the final exam with comprehensive course content. In that case, masimum numbers of available points is 80. The condition for passing the course is minimum 40 points in the final exam and a total of at least 50 points. The grade is formed after the second final exam according to article 75 of the Statute of FESB: 15% of the best students get the mark excellent (5),

<table>
<tr><td></td><td colspan="3">next 35% students get the mark very good (4),
next 35% students get the mark good (3), and
the last 15% students get thet mark sufficient (2).

Students who did not pass the course after final exams, and have obtained total of at leat 10 points, can attend the correction exam. On the correction exam maximal number of points is 100, and the minimum requirement for a passing grade is 50 points.

Mid-term exams, final exams and correction exams are held according to the exam schedule.</td></tr>
<tr><td rowspan="6">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>I. Slapničar, Matematika 1, FESB, Split, 2002.</td><td>20</td><td>http://www.fesb.unist.hr/mat1</td></tr>
<tr><td>I. Slapničar, J. Barić, M. Ninčević, Matematika 1 – zbirka zadataka, FESB, Split, 2010.</td><td>20</td><td>http://www.fesb.unist.hr/mat1</td></tr>
<tr><td>Lecture materials on FESB e-learning portal.</td><td></td><td>httpd://elearning.fesb.unist.hr</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">- Petar Javor, Matematička analiza 1, Element, Zagreb, 2001.
- Luka Krnić i Zvonimir Šikić, Račun diferencijalni i integralni, I. dio, Školska knjiga, Zagreb, 1993.
- S. Pavasović i ostali, Matematika - riješeni zadaci, Građevinski fakultet, Split, 1999.
- B. P. Demidovič, Zadaci i riješeni primjeri iz više matematike s primjenom na tehničke nauke, Tehnička knjiga, Zagreb, 1995.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">- homework
- short tests
- quizzes
- mid-term exams
- final exam
- student questionnaires</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
</table>

NAME OF THE COURSE	ENGLISH LANGUAGE 1						
Code	FEOB03	Year of study	1				
Course teacher	Daniela Matić, Ph.D., Assistant Professor	Credits (ECTS)	2				
Associate teachers	/	Type of instruction (number of hours)	L	S	AE	LE	DE
			0	30	0	0	0
Status of the course	Mandatory	Percentage of application of e-learning	0%				

COURSE DESCRIPTION

Course objectives	Training students for: - developing communicative and social skills necessary in information and communications technologies, primarily in everyday situations and those beyond the limits of their future professional life; - acquiring and enhancing knowledge on foreign language structures; - improving English for special purposes knowledge at receptive level (written and oral reception) depending on the course of studies; - raising awareness of students' own responsibility in learning process.		
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: - recognize various text types, textual patterns and language activities; - identify and explain professional vocabulary; - recognize key ideas, words and sentences; - find and eventually use grammar structures typical for professional and scientific texts; - apply various reading and listening methods in order to comprehend the context of authentic general English and professional texts; - present various topics orally and in written form; - analyze various professional materials and present them within professional communication procedures.		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	S hours	AE hours
	1. Introduction to the course and requirements; introduction to Instructions and Presentation guide on the e-learning portal Unit 1 – Living in a digital age	2	
	2. Unit 2 - Computer Essentials Unit 3 - Inside the system	2	
	3. Unit 4 - Buying a computer	2	
	4. Unit 5 - Type, click and talk!	2	
	5. Unit 6 - Capture your favourite image	2	
	6. Unit 7 - Display screen and ergonomics	2	
	7. Unit 8 - Choosing a printer	2	
	8. Mid-term exam	2	
	9. Unit 9 - Devices for the disabled	2	
	10. Unit 10 - Magnetic storage	2	
	11. Unit 11 - Optical storage	2	
	12. Unit 12 - Flash memory	2	
	13. Unit 13 - The operating system (OS)	2	
	14. Unit 14 - Word processing (WP) Unit 15 - Spreadsheets and databases	2	
	15. End-of-term exam	2	
Format of instruction	☐ lectures	☒ independent assignments	

	☒ seminars and workshops ☐ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ multimedia ☐ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	In order to take an exam and eventually obtain a grade, each student has to fulfill the following requirements: - minimum class attendance of 70%; - delivered and positively graded presentation in English before other students during regular classes.	

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)*						
	Class attendance	1	Research	0.25	Practical training	
	Experimental work	/	Report	0.25	(Other)	
	Essay	/	Seminar essay		(Other)	
	Tests	0.5	Oral exam	/	(Other)	
	Written exam		Project	/	(Other)	

Grading and evaluating student work in class and at the final exam	During regular classes students are supposed to prepare and deliver a presentation on a topic of their choice, which will be graded. During the semester, students will be continuously assessed as they will take two exams, a mid-term and an end-of term exam. The former will be held in week 8 and the latter in week 15. Both exams will test their knowledge of English ICT lexis from the textbooks and grammar structures specific for their profession. If they fail at either of these exams or do not sit for them, they have to take the final exam scheduled in the examination period after the classes have finished. The final grade is calculated as follows: - written exam (mean of mid-term and end-of term exam positive results, or final exam) – 70% - positively graded presentation – 20% - regular attendance – 5% - written assignments (homework) – 5% All exams are scheduled according to the current academic year calendar.

	Title	**Number of copies in the library**	**Availability via other media**
Required literature (available in the library and via other media)	• Esteras, Santiago Remacha (2008). *Infotech-English for computer users*, fourth edition. Cambridge: Cambridge University Press.	•	•
	• Fitzgerald, P. et al. (2011). *English for ICT Studies in Higher Education Studies*. Garnet Education: Reading.	•	•
Optional literature (at the time of submission of study programme proposal)	• Glendinning, Eric H., McEwan, J. (2006). *Oxford English for Information Technology*. Oxford:OUP.		

Quality assurance methods that ensure the acquisition of exit competences	- Regular class attendance records - Tutorials - 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	ELECTRICAL ENGINEERING						
Code	FENB01	Year of study	1.				
Course teacher	Slavko Vujević, Ph.D., Full Professor	Credits (ECTS)	7				
Associate teachers	Dino Lovrić, Ph.D., Research Assistant	Type of instruction (number of hours)	L	S	AE	LE	DE
			45	0	30	0	0
Status of the course	Obligatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Training students for: - understanding and application of basic principles and laws of electrical engineering, - defining and solving of simple electrical systems, - acquiring and deepening the knowledge in the field of electrical engineering.		
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: - define the fundamental phenomena, physical quantities and laws of electrical engineering, - apply the fundamental laws of electrical engineering in solving of electromagnetic problems, - apply the methods and techniques for analysing of linear electric circuits, - mathematically describe simple DC and AC electrical networks, - analyse simple magnetic circuits, - measure basic electrical quantities (current, voltage, resistance).		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	Basic terms. **Electrostatics:** Coulomb law; electrostatic field; Gauss law; electrical potential and voltage; matter in electrostatic field; electric capacitance and capacitors; electrostatic energy; static electricity.	9	6
	Direct currents: electric circuit; Ohm law, serial and parallel resistors; Kirchhoff laws; electrical energy and power; methods for analysis of direct current circuits.	9	6
	Magnetostatics: basic terms; magnetic circuit; Ampere law, Biot-Savart law; self and mutual inductance; electromagnetic induction; forces in magnetostatic field; magnetostatic energy.	9	6
	Alternating currents: basic terms; phasor representation of time-harmonic voltages and currents; impedance; analysis of linear AC circuits using symbolic method; power and energy; resonance; three-phase systems.	12	8
	Two midterm exams		
Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☒ multimedia ☐ laboratory ☐ work with mentor ☐ (other)	
Student responsibilities	Attendance on lectures in the amount of at least 70 % of the times scheduled.		

Screening student work *(name the proportion of ECTS*						
	Class attendance	3	Research		Practical training	
	Experimental work		Report		Individual work	3.7

credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)	Essay		Seminar essay		Laboratory exercises	
	Tests	0.2	Oral exam		Preparation for laboratory exercises	
	Written exam	0.1	Project		(Other)	

Grading and evaluating student work in class and at the final exam	There are two midterm exams. After two midterm exams, student can pass the entire exam. In the two final exams students take course parts that they did not pass in the preliminary exams. If in the first final exam student passes one of the two course parts, that course part the student does not have to take in the second final exam. The requirement for a positive evaluation of the course part is that the student has completed at least 50 % points from that course part, with the additional condition that the theoretical and numerical parts are passed with at least 20 % points. Theoretical and numerical part of the course parts both contribute 50 % points. After the second final exam, the final grade (in percentage) can be calculated using the formula: Grade (%) = (G1 + G2) / 2 where activities in percentage are: G1 - points from the first course part, G2 - points from the second course part. The final numerical grade is determined after the second final exam, applying the relative ECTS grading system in accordance with the Rules of Study and Study System of the University of Split. Group of students who passed the exam is divided into four sub-groups: the best 15 % are graded excellent (5), next 35 % very good (4), next 35 % good (3) and the last 15 % pass (2). Students who did not pass the entire exam after two final exams can pass the exam in an additional exam. In this exam students take the whole course. The requirement for a positive assessment of the additional exam is that the student has completed at least 50 % points from the entire course, with the additional condition that the theoretical and numerical parts are passed with at least 20 % points. Theoretical and numerical part of the entire course both contribute 50 % points. In accordance with the relative ECTS system of grading, student who passes the exam on the additional examination period gets a positive grade pass (2). Each of the midterm exams consists of ten theoretical questions and two numerical problems. Two final exams and additional exam consist of twenty theoretical questions and four numerical problems.

	Title	**Number of copies in the library**	**Availability via other media**
Required literature (available in the library and via other media)	Vujević, S., "Predavanja iz Elektrotehnike (120)", Sveučilište u Splitu, FESB, Split, 2014. (lecture notes – electronic version)		e-learning portal
	Jurić-Grgić, I. i Vujević, S., "Auditorne vježbe iz Elektrotehnike (120)", Sveučilište u Splitu, FESB, Split, 2014. (lecture notes – electronic version)		e-learning portal
	Maletić, A., "Osnove elektrotehnike", ELMAP, Split, 1993.	5	
Optional literature (at the time of submission of study programme proposal)	• Pinter, V., "Osnove elektrotehnike - knjiga prva", Tehnička knjiga, Zagreb, 1978. • Pinter, V., "Osnove elektrotehnike - knjiga druga", Tehnička knjiga, Zagreb, 1978.		

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	**MATHEMATICS 2**						
Code	FEMX02	Year of study	1				
Course teacher	Ivan Slapničar, Ph.D., Full Professor Anita Matković, Ph.D., Associate Professor Josipa Barić, Ph.D., Assistant Professor	Credits (ECTS)	7				
Associate teachers	Ph.D. Nevena Jakovčević Stor, Irena Bego, Anita Carević, Marija Čatipović, Lea Dujić, Ivana Grgić, Lana Periša, Marina Mandić, Dajana Radišić, Mirjana Strukan, Stjepan Vedran Vukasović, Vanja Županović.	Type of instruction (number of hours)	L	S	AE	LE	DE
			45		45		
Status of the course	obligatory	Percentage of application of e-learning	10				

COURSE DESCRIPTION			
Course objectives	Training students for: - application of mathematical concepts and tools from the area of integral calculus, ordinary differential equations, functions of several variables and multiple integrals, to analyze and solve engineering problems.		
Course enrolment requirements and entry competences required for the course	Good knowledge of High School mathematics and passed State Exam in Mathematics.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - state definitions and theorems from the enitre course, - reproduce proofs of basic theorems, - illustrate theorems with examples, - identify integrals which are elementary integrable and solve them. - solve ordinary differential equations and systems of differential equations. - apply differential equations to model population growth, heat conduction, the oscillator and the predator-prey system. - identify quadratic surfaces - analyze the extrema of real functions of several variables. - apply a single and multiple definite integrals to computation of area, curve length, volume and center of gravity in the standard coordinate systems.		
Course content broken down in	Course content	L or S hours	AE hours

detail by weekly class schedule (syllabus)	1. Indefinite integrals. Definition and basic properties. Table of basic integrals. Basic techniques of integration.	3	3
	2. Integration of rational functions. Integration of trigonometric functions. Recursive formulae.	3	3
	3. Integration of some irrational functions. Integrating a series of functions. Application of integrals to free fall with air resistance problem.	3	3
	4. Definite integrals. Definition and basic properties. Newton-Leibnitz formulae. Techniques of integration. Improper integrals.	3	3
	5. Application of definite integrals - the length of arc planar curve, volume and surface area of the rotating body. Numerical integration – trapezoid rule, Simpson's rule, Richardson extrapolation.	3	3
	6. The functions of several variables. Definition and basic properties. Domain of the function. Limits and continuity. Quadratic surfaces.	3	3
	7. Partial derivatives. Differentiability. Tangent plane. Extrema of functions of several variables. Conditional extrema.	3	3
	8. Multiple integrals. Basic concepts and definitions. Double integral. Double integral in polar coordinates. Applications of double integral.	3	3
	9. Triple integral. Triple integral in cylindrical and spherical coordinates. Change of variables in multiple integrals.	3	3
	10. Introduction to Differential Equations. Basic concepts and definitions. Examples: modeling population growth, logistic equation, equation of heat conduction, Hooke's law. Equations with separable variables.	3	3
	11. Homogeneous differential equations. Exact differential equations. Integration factor. Linear differential equations of the first order.	3	3
	12. Bernoulli differential equation. Euler method as numerical procedure for solving linear differential equations. Differential equations of second order.	3	3
	13. Linear differential equations of second order with constant coefficients. Example: electronic circuits - harmonic oscillator. Systems of differential equations. Lotka-Volterra equations for predator-prey system.	3	3
	List of laboratory or design exercises		LE hours

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ independent assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☐ (other)
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)*	Class attendance	3	Research		Practical training	
	Experimental work		Report		Self study	3.6
	Essay		Seminar essay		(Other)	
	Tests	0.2	Oral exam		(Other)	
	Written exam	0.2	Project		(Other)	

Grading and evaluating student	During semester two mid-term exams are held. The first exam is scheduled after 7 weeks of lectures, and the second in the week following the lectures. At each mid-term exam students can get 40 points, while the remaining 20 points are attained

<table>
<tr><td>work in class and at the final exam</td><td colspan="3">through assignements during lectures and excercises. The condition for passing the course is minimum 20 points on each mid-term exams and a total of at least 50 points.
After semester, two final exams and a correction exam are held.
Students which did not pass one mid-term exam, can take only this part of the exam during final exams.

Student which did not pass any mid-term exam, take the final exam with comprehensive course content. In that case, maximum numbers of available points is 80. The condition for passing the course is minimum 40 points in the final exam and a total of at least 50 points. The grade is formed after the second final exam according to article 75 of the Statute of FESB:
15% of the best students get the mark excellent (5),
next 35% students get the mark very good (4),
next 35% students get the mark good (3), and
the last 15% students get thet mark sufficient (2).

Students who did not pass the course after final exams, and have obtained total of at least 10 points, can attend the correction exam. On the correction exam maximal number of points is 100, and the minimum requirement for a passing grade is 50 points.

Mid-term exams, final exams and correction exams are held according to the exam schedule.</td></tr>
<tr><td rowspan="6">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>I. Slapničar, Matematika 2, skripta, FESB, Split</td><td></td><td>http://www.fesb.unist.hr/mat2</td></tr>
<tr><td>Lecture materials on FESB e-learning portal.</td><td></td><td>https://elearning.fesb.unist.hr</td></tr>
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<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">- Petar Javor, Matematička analiza 2, Element, Zagreb, 2000.
- Luka Krnić i Zvonimir Šikić, Račun diferencijalni i integralni, I. dio, Školska knjiga, Zagreb, 1993.
- B. P. Demidovič, Zadaci i riješeni primjeri iz više matematike s primjenom na tehničke nauke, Tehnička knjiga, Zagreb, 1995.
- Dž. Lugić, Matematika II: metodički riješeni zadaci i kratki pregled definicija i teorema, FESB, 1999.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">- homework
- short tests
- quizzes
- mid-term exams
- final exam
- student questionnaires</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
</table>

NAME OF THE COURSE	DISCRETE MATHEMATICS							
Code	FEMB02	Year of study	2					
Course teacher	Josipa Barić, Ph.D., Assistant Professor	Credits (ECTS)	6					
Associate teachers	Ivana Grgić, Lea Dujić	Type of instruction (number of hours)	L	S	AE	LE	DE	
			30		30			
Status of the course	Obligatory	Percentage of application of e-learning	10					

COURSE DESCRIPTION

Course objectives	Training students for: - application of mathematical concepts and tools from the area of mathematics logic, set theory, number theory and combinatorics.
Course enrolment requirements and entry competences required for the course	Good knowledge of High School mathematics, passed State Exam in Mathematics and passed exam in Mathematics 1.
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - state definitions and theorems from the enitre course, - reproduce proofs of basic theorems, - illustrate theorems with examples, - prove relations between sets, - apply basic rules of concluding, - analyse properties of binary relations, - use Division theorem, the Euclidean algorithm and fundamental theorem of arithmetics in proving different properties of integers and prime numbers - apply congruence relation on simple tasks with integers - solve combinatory problems counting permutations, combinations and partitions - solve linear homogeneous and non-homogenous recurrence relations

Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	1. Mathematical induction. Sets and set operations. Cardinal number. Countable and uncountable sets.	3	3
	2. Mathematical logic. Basic definitions and notations.	3	3
	3. Tautology and its properties	3	3
	4. Boolean algebra. Conjunctive and disjunctive normal forms.	3	3
	5. Binary relations and basic properties. Equivalence relations and equivalence classes.	3	3
	6. Partial order and partially ordered sets.	3	3
	7. Integers. Euclidean algorithm, Division theorem, Diophantine equation.	3	3
	8. Prime numbers. Fundamental theorem of arithmetics.	3	3
	9. Congruence relation. Euler function.		
	10. Combinatorics: Permutations, combinations and partitions	3	3
	11. Binomial and multinomial theorem.	3	3
	12. Inclusion–exclusion principle. Dirichlet's principle	3	3
	13. Homogeneous and non-homogenous recurrence relations. Fibonacci sequence.	3	3

	List of laboratory or design exercises	LE hours

	☒ lectures	☒ independent assignments

<table>
<tr><td>Format of instruction</td><td colspan="3">☐ seminars and workshops
☒ exercises
☐ on line in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☐ multimedia
☐ laboratory
☐ work with mentor
☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Regular attendence to and active participation in lectures and excercises.</td></tr>
<tr><td rowspan="5">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)</td><td>Class attendance</td><td>2</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Self study</td><td>3.6</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>0.2</td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>0.2</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">During semester two mid-term exams are held. The first exam is scheduled after 7 weeks of lectures, and the second in the week following the lectures. At each mid-term exam students can get 40 points, while the remaining 20 points are attained through assignements during lectures and excercises. The condition for passing the course is minimum 20 points on each mid-term exams and a total of at least 50 points. After semester, two final exams and a correction exam are held.

Students which did not pass one mid-term exam, can take only this part of the exam during final exams.

Student which did not pass any mid-term exam, take the final exam with comprehensive course content. In that case, masimum numbers of available points is 80. The condition for passing the course is minimum 40 points in the final exam and a total of at least 50 points. The grade is formed after the second final exam according to article 75 of the Statute of FESB:
15% of the best students get the mark excellent (5),
next 35% students get the mark very good (4),
next 35% students get the mark good (3), and
the last 15% students get thet mark sufficient (2).

Students who did not pass the course after final exams, and have obtained total of at leat 10 points, can attend the correction exam. On the correction exam maximal number of points is 100, and the minimum requirement for a passing grade is 50 points.

Mid-term exams, final exams and correction exams are held according to the exam schedule.</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="3">• D. Žubrinić: Diskretna matematika, Element, Zagreb, 2001.</td><td>20</td><td></td></tr>
<tr><td colspan="3">• Dž. Lugić, Diskretna matematika, zbirka zadataka, FESB, Split, 2005.</td><td>20</td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">• D. Veljan, Kombinatorna i diskretna matematika, Algoritam, Zagreb, 2001.
• D. Žubrinić, Uvod u diskretnu matematiku, Element, Zagreb, 2009.
• B. Dakić, N. Elezović, Matematika 4, udžbenik i zbirka zadataka za 4. razred prirodoslovne gimnazije, Element, Zagreb, 2003.</td></tr>
<tr><td>Quality assurance methods that ensure the</td><td colspan="6">- homework
- short tests
- quizzes
- mid-term exams</td></tr>
</table>

acquisition of exit competences	- final exam - student questionnaires
Other (as the proposer wishes to add)	

NAME OF THE COURSE	**OBJECT ORIENTED PROGRAMMING**						
Code	FELB02	Year of study	2				
Course teacher	Ivo Mateljan, Ph.D., Full Professor Marjan Sikora, Ph.D., Assistant Professor	Credits (ECTS)	7				
Associate teachers		Type of instruction (number of hours)	L	S	AE	LE	DE
			45			30	
Status of the course	Obligatory	Percentage of application of e-learning	30				

COURSE DESCRIPTION			
Course objectives	Training students for: - programming with C++ language, - understanding the principles of object oriented programming		
Course enrolment requirements and entry competences required for the course	Competences from the first year of study.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	On completion of the course, students should, regarding C++ language, be able to: - explain the concept of namespace, scope and lifetime - explain difference between object based and object oriented programming - explain the polymorphism - use fundamental STL classes: string, vector, list - use the facilities in the "iostream" to provide user and file i/o in programs - use the exception handling mechanism - use Microsoft Visual Studio, to make programs with GUI, with MFC classes		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	Introduction to class. Object based and object oriented programming.	3	
	Structural programming, functions and primitive data types. Pointers and references.	3	
	Operators, type conversion, variable scope and lifetime.	3	
	Classes and objects.	3	
	Class abstraction, interface and implementation.	3	
	Recapitulation and preparation for mid-term.	3	
	Operator overloading.	3	
	Streams and file operations.	3	
	Generic programming and templates. Strings.	3	
	Inheritance and STL library.	3	

	Polymorphism.	3	
	Exception handling. Multithreading.	3	
	Recapitulation and preparation for exam	3	
	List of laboratory or design exercises		LE hours
	Compilation, debugging, functions		2
	Overloaded functions, pointers and references.		2
	Operators, type conversion, scope and lifetime of memory objects.		2
	Classes an objects I		2
	Classes an objects II		2
	Dynamic memory allocation, operator overloading		2
	Streams and file operations		2
	Strings		2
	Templates		2
	Inheritance		2
	Polymorphism		2

Format of instruction	☒ lectures ☒ seminars and workshops ☒ exercises ☐ *on line* in entirety ☒ partial e-learning ☐ field work	☐ independent assignments ☐ multimedia ☒ laboratory ☒ work with mentor ☐ (other)
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)*	Class attendance	3	Research	1	Practical training	
	Experimental work		Report		Team work	
	Essay		Seminar essay		(Other)	
	Tests	1	Oral exam		(Other)	
	Written exam		Project	2	(Other)	

Grading and evaluating student work in class and at the final exam	Grade (%) = 0,15L + 0,15P + 0,35(M1 + M2) Two mid-term exams (M); Laboratory (L); Project (P)

	Title	**Number of copies in the library**	**Availability via other media**
Required literature (available in the library and via other media)	• Ivo Mateljan: OOP, lecture notes, FESB, 2001.		
	• Stroustrup, B., The C++ programming Language, Adison Wesley, 1986.		

Optional literature (at the time of submission of study programme proposal)	• Owen L. Astrachan, Computer Science Tapestry, McGrawHill 2000.
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	DATA STRUCTURES						
Code	FELB03	Year of study	2.				
Course teacher	Linda Vicković, Ph.D., Associate Professor	Credits (ECTS)	6				
Associate teachers	Ivica Crnjac, Teaching Assistant	Type of instruction (number of hours)	L	S	AE	LE	DE
			30	0	0	30	
Status of the course	Obligatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Cbegišićourse objectives	Training students for: - understanding and appliance of basic algorithm analysis principles, - permanent adoption and deepening of knowledge form the area of dynamic memory allocation, as well as management of abstract data types like stacks, queues and different kind of trees, - understanding and appliance of hashing and heaps.		
Course enrolment requirements and entry competences required for the course	Students have to pass Introduction to computing and Programming from the first year of study.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - define basic terms related to algorithm analysis, - describe and perform adding, deleting, searching, of elements in single and double linked lists, - create functions for adding and deleting of stack and queue elements, - recognise appliance of abstract data types in problem solving, - describe steps of adding, deleting and searching of elements in binary search trees, - using basic AVL rotations to reach a balance condition, - apply different kind of hash functions, - describe basic working principles of heaps.		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	Introduction to the course. Review of basic elements of C programming language (recursive functions, data structures, pointers, dynamic memory allocation, file handling).	2	
	Algorithm analyses mathematical background and running time calculation of algorithm.	2	
	Abstract data types, simple implementation of linked lists and its basic operations.	2	
	Doubly linked lists, circularly linked lists.	2	
	Stack and its applications (stack frames, balancing symbols), queue.	2	
	Binary trees.	2	
	Basic operations on binary search trees.	2	
	AVL trees.	2	
	Splay and B trees.	2	
	Hashing principles.	2	
	Separate chaining and open addressing.	2	
	Rehashing and extensible hashing	2	
	Heaps	2	
	List of laboratory or design exercises		LE hours
	Basic operations in the array of structures.		2
	Adding new element at the end and beginning of linked list as well as Printing and deleting elements.		2

	Adding new element behind and in front of the specified element in linked list. Sorting of elements in list, reading list elements from file and writing list elements in file.	2
	Using linked lists for polynomial adding and multiplying.	2
	Union and cross section of two linked lists.	2
	Stack and queue implementation of linked lists.	2
	Using stack for postfix expression.	2
	Tree usage for directory structure presentation and implementation of DOS commands md, cd, cd.. adn dir on that tree.	2
	Binary search tree.	2
	Binary expression tree.	2
	AVL tree	2

Format of instruction	☒ lectures ☐ seminars and workshops ☐ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☒ multimedia ☒ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	The presence on lectures in the amount of at least 70 % of the times scheduled. 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)*	Class attendance	1,5	Research		Practical training	
	Experimental work		Report		Individual work	1,8
	Essay		Seminar essay		Laboratory exercises	1,7
	Tests	0,2	Oral exam		Preparation for laboratory exercises	0,7
	Written exam	0,1	Project		(Other)	

Grading and evaluating student work in class and at the final exam	There are two parts of the exam, theoretical and laboratory part. Laboratory part of exam is held on computers at the end of all laboratory exercises, and after that on final exams. Theoretical part of exam is written and 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 consists of 5 questions some practical and some theoretical. The requirement for passing grade is the positive grade of laboratory part of exam and 50 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula: Grade = 0,5 LV + 0,5 T where: • LV – grade from laboratory part of exam, • T – grade from the theoretical part of exam.

	Title	**Number of copies in the library**	**Availability via other media**
Required literature (available in the library and via other media)	• Vicković, L. Strukture podataka, prezentacije s predavanja.		e-learning portal
	• Weiss, M., Data Structures and Algorithm Analysis in C (sections 1-6), Addison-Wesley, 1997.		
	• Sedgewick, R. Algorithms in C, Addison-Wesley, 1990.		

Optional literature (at the time of submission of study programme proposal)	- Neapolitan, R., Naimipour, K. Foundations of Algorithms, Jones & Barlett Learning, 2015.
Quality assurance methods that ensure	- Evaluation of results in accordance with the above learning outcomes - Feedback from students via surveys

the acquisition of exit competences	- Self-evaluation of teachers - Institutional and non-institutional evaluations
Other (as the proposer wishes to add)	

NAME OF THE COURSE	**PRACTICUM**							
Code	FENB02	Year of study	2.					
Course teacher	M.Sc. Spomenka Bovan	Credits (ECTS)	2					
Associate teachers		Type of instruction (number of hours)	L	S	AE	LE	DE	
						45		
Status of the course	Obligatory	Percentage of application of e-learning						

COURSE DESCRIPTION		
Course objectives	Training students for: - applying of electrical measuring instruments and measuring methods - using the signal generator - using the oscilloscope - understanding the main properties and operating principles of basic electronic devices and basic electronic circuits	
Course enrolment requirements and entry competences required for the course	Completed courses: Physics 1, Electrical Engineering, Basic Electronics	
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - measure voltage, current and resistance in simple electrical circuits with multimeter - adjust the desired waveform from signal generator - measure electrical signals with oscilloscope - measure the main parameters of basic electronic devices - measure the main parameters of basic amplifier circuits - measure the main parameters of simple operational amplifier circuits	
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours
	List of laboratory exercises	LE hours
	Introduction. Basic equipment for measuring electrical signals. Measuring voltage, current and resistance in simple electrical circuits with multimeter.	3
	Series and parallel resistor circuits.	3
	Measurement of electrical quantities with oscilloscope.	3
	Adjustment of desired waveforms from signal generator.	3
	Semiconductor diode. LED diode.	3
	Zener diode.	3
	Bipolar junction transistor (BJT).	3
	Junction field effect transistor (JFET).	3
	Common emitter amplifier.	3
	Common base and common collector amplifier.	3

	Common source JFET amplifier.	3
	Operational amplifier – Inverting and non-inverting amplifier.	3
	Operational amplifier as summing amplifier. Dynamic behaviour of the operational amplifier.	3
	☐ lectures ☐ seminars and workshops ☐ exercises ☐ on line in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☐ multimedia ☒ laboratory ☐ work with mentor ☐ (other)

Student responsibilities	Students must complete all 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)*	Class attendance		Research		Practical training	
	Experimental work		Report		Individual work	
	Essay		Seminar essay		Laboratory exercises	1.5
	Tests	0.15	Oral exam	0.1	Preparation for laboratory exercises	0.25
	Written exam		Project		(Other)	

Grading and evaluating student work in class and at the final exam	Each exercise is separately graded. The first midterm exam is after 7 weeks of lecturing (first 7 laboratory exercises), and the second one is after the next 6 weeks (next 6 exercises). Each midterm test and final exam consists of two parts: practical skill exam (measurements) and oral part in which the students will comment written reports of the exercises and the obtained measurement results. The requirement for passing grade is the positive grade of each laboratory exercise. The final grade is based on the average of each exercise grade. In the final exams students that did not pass the midterm exams take part.		
Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	• S. Bovan: Upute za laboratorijske vježbe iz kolegija PRAKTIKUM, autorizirana skripta, FESB, Split	•	•
Optional literature (at the time of submission of study programme proposal)	• I Zulim, S. Gotovac: Osnovni poluvodički elektronički elementi, FESB Split, 1998. • P. Biljanović: Poluvodički elektronički elementi, Školska knjiga, Zagreb, 2004. • P. Biljanović: Elektronički sklopovi, Školska knjiga, Zagreb, 2005.		
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	COMPUTER ARCHITECTURES							
Code	FELB05	Year of study	2					
Course teacher	Sven Gotovac, Ph.D., Full Professor	Credits (ECTS)	7					
Associate teachers	Dunja Gotovac, Teaching Assistant	Type of instruction (number of hours)	L	S	AE	LE	DE	
			45			30		
Status of the course	Obligatory	Percentage of application of e-learning	0					

COURSE DESCRIPTION

Course objectives	Training students for: 1. Understand digital computer architecture. 2. Define difference between different computer architecture on assembler level. 3. Understand computer architecture on the digital circuits level. 4. Understand and apply different computer architecture according to the application problem.		
Course enrolment requirements and entry competences required for the course	C programming language Digital electronics and circuits		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: 1. Understand difference between computer architecture from the Instruction Set Point of view (ISA) 2. Identify the properties and performance of different architectures at the level of logic circuits 3. Select and apply the appropriate computer architecture according to the problem being solved. 4. Evaluate the impact of architecture on a software solution (advantages and disadvantages).		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	Introduction. Different views on the computer.	3	
	Data and instructions. Classification of Computers and Their Instructions, Instruction set. Instruction format. Addressing Modes. CISC. RISC.	3	
	Instruction level processor design (Instruction Set Architecture)	3	
	Arithmetical and Logical instructions, Instruction for Data Transfer.	3	
	Flow control instructions, Translation from C to assembler and then to binary code.	3	
	Processor design on digital circuits level. Single bus microarchitecture.	3	
	Data Path Implementation, Logic Design for the 1-Bus Microarchitecture.	3	
	Control Unit design, 2-Bus and 3-Bus Microarchitecture	3	
	Pipeline architecture.	3	
	Instruction-Level Parallelism – Problems and Solutions	3	
	Memory System Design, Memory System Components, Two-Level Memory Hierarchy.	3	
	Cache, Associative cache, Direct Mapped Cache, 2-way Cache.	3	
	U/I system design.	3	
	List of laboratory or design exercises		LE hours
	ARM Architecture - Introduction.		2

	ARM Instruction Set Architecture, Registers, Memory, Stack.	2
	Atmel Studio IDE. Program Structure	2
	Instruction Set, Arithmetical and Logical Instructions, Dana Transfer Instructions, Branch Control Instructions	8
	Procedures	2
	Program Examples	10
	Problems for Exercise and Test	4

Format of instruction	☒ lectures ☐ seminars and workshops ☐ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ independent assignments ☒ multimedia ☒ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	The presence on lectures in the amount of at least 70 % of the times scheduled. 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)*						
	Class attendance	1,5	Research		Practical training	
	Experimental work		Report		Laboratory exercises	1
	Essay		Seminar essay		Preparation for laboratory exercises	1,5
	Tests		Oral exam		Self-study	**3**
	Written exam		Project			

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 lasts 60 minutes and consists of 5 to 7 theoretical questions and numerical problems and final tests consist of 6 theoretical questions and numerical problems. 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: Grade(%) = 0,33 LV + 0,33 (M1 + M2) the activities in percentage: • LV – laboratory assessment, • M1, M2 – test results. The final grade will be determined after the first test term by applying a relative ECTS grading system in accordance with the Regulations on the study and study system of the University of Split. The group of students who passed the exam is divided into four groups: 15% of the best gets the grade A (excellent), 35% of the following B (very good), the next 35% rating C (good), and the last 15% rating D, E). A group of students who did not pass the exam gains FX score (additional work is required), or F (significant additional work is required). In accordance with the Rulebook for Exam, only two exam periods are organized in the exam period after the completion of classes. According to Article 65 of the Statute of the Faculty, the student is obliged to participate in all forms of teaching and attend: lectures at least 70% of teaching hours and laboratory exercises 100% of teaching hours. If you do not meet these conditions, the student will not be able to access the exam

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Heuring, V.P., Joredan, H.F.: Computer Systems Design and Architecture, 2rd edition, AddisonWesley, 2003	2	Electronic copy On e-learning

	S.Gotovac Authorized lectures from the Digital Computer Architecture		On e-learning
Optional literature (at the time of submission of study programme proposal)	Hennesy & Patterson, "Computer Architecture: A Quantitative Approach", 5rd edition, Morgan Kaufmann, 2011		
Quality assurance methods that ensure the acquisition of exit competences	1. Class attendance records. 2. Evaluation of results in accordance with the above learning outcomes 3. Feedback from students via surveys 4. Self-evaluation of teachers 5. Feedback from students who have already graduated. 6. Institutional and non-institutional evaluations		
Other (as the proposer wishes to add)			

NAME OF THE COURSE	**SIGNALS AND SYSTEMS**						
Code	FELB09	Year of study	2.				
Course teacher	Tamara Grujić, Ph.D., Full Professor	Credits (ECTS)	5				
Associate teachers	-	Type of instruction (number of hours)	L	S	AE	LE	DE
			30	0	15	15	0
Status of the course	Obligatory	Percentage of application of e-learning	0				
COURSE DESCRIPTION							
Course objectives	Training students for: - Understanding and application of fundamental concepts in the field of time-continuous and discrete signals and systems, - Mathematical modeling and simulation of continuous and discrete systems, computing system response to a given input (by convolution, solving differential equations and difference equations, and Laplace transform) - Acquiring programming skills in Matlab and Simulink						
Course enrolment requirements and entry competences required for the course	Basic knowledge of mathematics and computer programming						
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - Define the basic concepts related to time-continuous and discrete signals and systems - Mathematical model (formulate) a continuous and discrete systems and present them by block diagrams						

<table>
<tr><td></td><td colspan="3">- Analyze the properties of the system
- Calculate the time response of the system described by impulse response, using the convolution in discrete and continuous time domain
- Describe continuous systems by transfer functions (in Laplace domain) and calculate the system response
- Programming in Matlab and model and simulate systems in Simulink</td></tr>
<tr><td rowspan="20">Course content broken down in detail by weekly class schedule (syllabus)</td><td>Course content</td><td>L hours</td><td>AE hours</td></tr>
<tr><td>Introduction to signals and systems, system definitions, examples of technical systems, linear, time-invariant (LTI) systems, time continuous and discrete systems</td><td>2</td><td>1</td></tr>
<tr><td>Definition and mathematical formulation of signals (continuous and discrete time and digital signals), AD conversion, mathematical modeling of systems, MIMO and SISO systems, signal energy and power</td><td>2</td><td>1</td></tr>
<tr><td>Transformation of the independent variable in the signal (time shift, time reversal, time-scaling), periodic signals, even and odd signals</td><td>2</td><td>1</td></tr>
<tr><td>Time continuous and discrete exponential and sinusoidal signals (real exponential signals, periodical complex and sine signals, the general complex exponential signals); Periodicity of discrete complex exponential signals (the condition of periodicity)</td><td>2</td><td>1</td></tr>
<tr><td>Discrete and continuous unit impulse and unit step signal and their relationship; Continuous and discrete systems; Interconnections of systems (serial, parallel and feedback)</td><td>2</td><td>1</td></tr>
<tr><td>The basic properties of the system: systems with and without memory, invertibility and inverse systems, causality, stability, time invariance, linearity</td><td>2</td><td>1</td></tr>
<tr><td>Discrete LTI systems: The representation of discrete time signals in terms of impulses; The discrete-time LTI system unit impulse response and the convolution-sum representation of LTI systems</td><td>2</td><td>1</td></tr>
<tr><td>First midterm exam</td><td></td><td></td></tr>
<tr><td>Continuous LTI systems: The representation of continuous time signals in terms of impulses; The continuous-time LTI system unit impulse response and the convolution-integral representation of LTI systems; properties of LTI systems expressed by convolution</td><td>2</td><td>1</td></tr>
<tr><td>The unit step response of an LTI system; Description of causal LTI systems by differential equations (continuous-time systems) and difference equations (discrete-time systems); Equations solving; Presentation of systems by block diagrams</td><td>2</td><td>1</td></tr>
<tr><td>Laplace transform (definition, properties, theorems), the inverse Laplace transform, solving differential equations that describe the continuous LTI systems using Laplace transform</td><td>2</td><td>1</td></tr>
<tr><td>Transfer function of continuous LTI systems; The stability of the system described by transfer function</td><td>2</td><td>1</td></tr>
<tr><td>Block algebra (rules of block algebra and applications)</td><td>2</td><td>1</td></tr>
<tr><td>Modeling of electrical and mechanical systems by transfer function and calculation of the time response of electrical and mechanical systems</td><td>2</td><td>1</td></tr>
<tr><td>Second midterm exam</td><td></td><td></td></tr>
<tr><td colspan="2">List of laboratory exercises</td><td>LE hours</td></tr>
<tr><td colspan="2">Programming in Matlab - introduction</td><td>3</td></tr>
<tr><td colspan="2">The signal properties (formulation and display of continuous and discrete signals in Matlab, transformation of independent variables, periodicity and parity of continuous and discrete signals, computing power and energy of signals), Matlab programming</td><td>3</td></tr>
</table>

	Introduction to Simulink. System properties. Modeling and simulation of continuous and discrete systems in Simulink and checking the properties of given system (linearity, time invariance, stability, invertibility), serial and parallel connection of systems, computing convolution of discrete signals, working in Matlab and Simulink	3
	Time responses of continuous LTI systems described by differential equations and discrete LTI systems described by difference equations, working in Matlab	3
	Description of continuous systems by transfer functions. Modeling and simulation of electrical and mechanical systems by transfer functions and calculating the time response in Matlab and Simulink	3

Format of instruction	☒ lectures ☒ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ independent assignments ☒ multimedia ☒ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	The presence on lectures in the amount of at least 70 % of the times scheduled. Performed and positively assessed 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)*						
	Class attendance	2	Research		Practical training	
	Experimental work		Report		Individual work	1
	Essay		Seminar essay		Laboratory exercises	1
	Tests	0,25	Oral exam		Preparation for laboratory exercises	0,5
	Written exam	0,25	Project		(Other)	

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 consists of 8 theoretical questions and numerical problems and final tests consist of 10 theoretical questions and numerical problems. 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:

$$\text{Grade}(\%) = 0{,}1\ LV + 0{,}45\ (M1 + M2)$$

the activities in percentage:

- LV – laboratory assessment,
- M1, M2 – test results.

The final grade is determined as follows:

Percentage:	Grade:
50% do 61,9%	2
62% do 74,9%	3
75% do 89,9%	4
90% do 100%	5

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Tamara Grujić: "Osnove signala i sustava – Predavanja sa zadacima", Interna skripta, FESB		e-learning portal
	Tamara Grujić: "Upute za laboratorijske vježbe iz kolegija Signali i sustavi", interna skripta, FESB		e-learning portal

Optional literature (at the time of submission of study	• A.V. Oppenheim, A.S. Willsky, S.H. Nawab, "Signals and Systems", Second Edition, Prentice-Hall, 1997.

programme proposal)	• S.T. Karris, "Signals and Systems With Matlab Applications", Second Edition, Orchard Publications, 2003.
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 - Keeping records of lectures attendance - Keeping records of the presence of the laboratory exercises and a review and assessment of submitted reports
Other (as the proposer wishes to add)	

NAME OF THE COURSE	**OPERATING SYSTEMS**						
Code	FELB10	Year of study	3				
Course teacher	Sven Gotovac, Ph.D., Full Professor	Credits (ECTS)	7				
Associate teachers	Petra Lončar, Teaching Assistant	Type of instruction (number of hours)	L	S	AE	LE	DE
			45			30	
Status of the course	Obligatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION			
Course objectives	Training students for: 1. Understand the architecture, complexity and functionality of the operating system. 2. Understand the methodology of implementing operating system functionalities. 3. Apply and use the functionality of the operating systems in their solutions. 4. Estimate which solutions are appropriate for particular applications.		
Course enrolment requirements and entry competences required for the course	Computer Architecture Data Structures Algorithms		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: 1. Understand and explain the operating system architecture and functionality. 2. Distinguish the functionality of the operating system 3. Understand and explain how individual functionalities are solved. 4. Evaluate the performance of individual solutions 5. Choose appropriate solutions for a particular application 6. Use appropriate solutions in their own applications		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	Introduction to the course, Brief description of topics to be considered, Operating system tasks.	3	
	Process Management, Process Definition, Process Descriptor Block, Process States, Context Switch.	3	

	Implementation of Process Management Systems, Process State Management, CPU Scheduling Algorithms.	3	
	Cooperating Processes, Process Synchronization. Producer-Consumer Problem.	3	
	Test&Set Instruction, Mutex, Semaphores. Producer-Consumer Problem Solution by Semaphores.	3	
	Deadlock Problem. Possible Solutions.	3	
	Memory management system – Introduction to topic.	3	
	Logical vs. Physical Address Space. Logical Address Space Creation.	3	
	Paging	3	
	Virtual Memory.	3	
	I/O Subsystem Architecture	3	
	Interrupt Driven I/O. DMA.	3	
	File Subsystem.	3	
	Disk Block Allocation.	3	
	Real Time Operating Systems.	3	
	List of laboratory or design exercises		LE hours
	Introduction to Linux OS		2
	Linux OS Processes		2
	Linux Processes - Fork Command		2
	Linux processes - communication with pipelines		2
	Windows OS Multitasking		2
	Write multi-tasking programs for the Windows platform		2
	Write multi-threading programs for the Windows platform		2
	Time control of thread execution within the process		2
	Thread Sync Synchronization (Intro, Event)		2
	Synchronization of thread execution (mutex, semaphores)		2
	Java multithreading		2
	Windows interprocess communication		2
	OS on a virtual machine		2

Format of instruction	☒ lectures ☐ seminars and workshops ☐ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ independent assignments ☒ multimedia ☒ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	The presence on lectures in the amount of at least 70 % of the times scheduled. 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)*	Class attendance	1,5	Research		Practical training	
	Experimental work		Report		Laboratory exercises	1
	Essay		Seminar essay		Preparation for laboratory exercises	1,5
	Tests		Oral exam		Self-study	**3**
	Written exam		Project		(Other)	

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 lasts 60 minutes and consists of 5 to 7 theoretical questions and numerical problems and final tests consist of 6 theoretical questions and numerical problems. 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: Grade(%) = 0,33 LV + 0,33 (M1 + M2) the activities in percentage:

<table>
<tr><td></td><td colspan="3">

LV – laboratory assessment,
M1, M2 – test results.

The final grade will be determined after the first test term by applying a relative ECTS grading system in accordance with the Regulations on the study and study system of the University of Split. The group of students who passed the exam is divided into four groups: 15% of the best gets the grade A (excellent), 35% of the following B (very good), the next 35% rating C (good), and the last 15% rating D, E). A group of students who did not pass the exam gains FX score (additional work is required), or F (significant additional work is required). In accordance with the Rulebook for Exam, only two exam periods are organized in the exam period after the completion of classes.
According to Article 65 of the Statute of the Faculty, the student is obliged to participate in all forms of teaching and attend: lectures at least 70% of teaching hours and laboratory exercises 100% of teaching hours. If you do not meet these conditions, the student will not be able to access the exam</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>• Tanenbaum, A.S.: Woodhull, A.S.: Operating Systems: Design and Implementation, (3rd Edition) Prentice Hall, 2006.</td><td>2</td><td>Electronic copy on e-learning</td></tr>
<tr><td>• S.Gotovac Autorizirana predavanja iz Operacijskih sustava</td><td></td><td>e-learning</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">Stalings, W.: Internals and Design Principles (7th Edition), 2011.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">1. Class attendance records.
2. Evaluation of results in accordance with the above learning outcomes
3. Feedback from students via surveys
4. Self-evaluation of teachers
5. Feedback from students who have already graduated.
6. Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
</table>

NAME OF THE COURSE	COMPUTER NETWORKS							
Code	FELB11	Year of study	3					
Course teacher	Julije Ožegović, Ph.D., Full Professor	Credits (ECTS)	6					
Associate teachers	Vesna Pekić,Ph.D. Ante Kristic, Ph.D.	Type of instruction (number of hours)	L	S	AE	LE	DE	
			45	0	0	30	0	
Status of the course	Obligatory	Percentage of application of e-learning	0					

COURSE DESCRIPTION

Course objectives	Training students for: - Course provides fundamental knowledge of computer networks as computer engineering core.
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: - argue fundamental terms and architecture of computer networks - present and compare ISO/OSI and TCP/IP protocol stacks - justify usage of TCP/IP protocol stack on application layer - evaluate usage of TCP and UDP protocols on transport layer - organize functionality of IP protocol, IP addressing and IP routing - plan LAN protocols and their functionality on physical and data layers - plan WAN protocols and their functionality on physical and data layers - organize addressing on physical, data, network and transport layers

Course content broken down in detail by weekly class schedule (syllabus)	Course content	L or S hours	AE hours
	Development of data communications networks. Basic characteristics. Switching methods.	3	0
	Importance of standardization. Open systems. Network elements. Channels, nodes, terminals.	3	0
	Computer and terminal network architecture. Hierarchical layered structures. ISO model.	3	0
	Protocols. Protocol mechanism: synchronization, addressing, flow control and error control.	3	0
	Quality of service. Traffic and congestion control, flow control.	3	0
	Physical level: DTE-DCE interface, RS232, X.24. Modem connections, intelligent modems. Signal codes.	3	0
	Local networks. Access methods. Ethernet.	3	0
	Wireless local networks. Digital subscriber networks: ISDN, xDSL. ATM.	3	0
	Data level: Error control. Cyclic codes.	3	0
	Character and bit oriented protocols. Frame-relay networks.	3	0
	Local networks: MAC, LLC. ATM networks. Ethernet. Wireless local networks.	3	0
	Network level: Packet networks. Traffic routing. Algorithms Bellman-Ford and Dijkstra.	3	0
	Internet. IP protocol (v4, v6), addressing, intranet, routing. Routing protocols OSPF and RIP	3	0
	Transport level: TCP and UDP Internet protocols. TCP protocol flow control.	3	0
	Queuing systems. M/M/1 system Little formula.	3	0
	List of laboratory or design exercises		LE or DE hours
	DTE DCE interface.		4

	Modem - data transfer using analogue telephone channel.	4
	Local network Ethenet.	4
	Connecting computer to Internet subnetwork.	4
	Connecting subnetwork to public Internet.	4
	Virtual local networks.	4
	Wireless local networks	4

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ independent assignments ☐ multimedia ☒ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	Attend all forms of teaching, pass ingress and egress tests, perform 100% laboratory exercises, pass preliminary exams or full exam (numeric and theory).	

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)*						
	Class attendance	1,5	Research		Practical training	1
	Experimental work		Report		Auditory exercises	
	Essay		Seminar essay		Individual learning	3,5
	Tests		Oral exam		(Other)	
	Written exam		Project		(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment: laboratory tests, practical tests, knowledge tests, preliminary exams. Exam: written and oral (numeric and theory) as unity.

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	1. Turk, S.: Računarske mreže, Školska knjiga, Zagreb, 1991..		
	2. Rožić, N.: Informacije i komunikacije: kodiranje s primjenama, Zagreb 1992.		

Optional literature (at the time of submission of study programme proposal)	- Ožegović, J. Računalne mreže, Veleučilište u Splitu, 2000 - Lecture notes: Ožegović, J., Računalne mreže, continuously upgraded - A. Kristić, V. Pekić: Upute za laboratorijske vježbe, Internet
Quality assurance methods that ensure the acquisition of exit competences	- Lecture attending evidence - Annual exam passing analysis - Student feedback with teacher evaluation - Teacher self-evaluation - Graduated students feedback
Other (as the proposer wishes to add)	

NAME OF THE COURSE	SOFTWARE ENGINEERING						
Code	FELB12	Year of study	3.				
Course teacher	Linda Vicković, Ph.D., Associate Professor	Credits (ECTS)	7				
Associate teachers		Type of instruction (number of hours)	L	S	AE	LE	DE
			45	0	0	30	
Status of the course	Obligatory	Percentage of application of e-learning					

COURSE DESCRIPTION

Course objectives	Training students for: - understanding and usage of engineering approach to software development, - how to write user requirements specification, software design specification and test plan documents in software development process, - applying acquired knowledge in the practical software development.
Course enrolment requirements and entry competences required for the course	Students have to pass Object oriented programming and Algorithms from the second year of study.
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - define fundamental terms of engineering approach in software development, - identify different steps in software development, - differ agile and classical software development methods, - provide required documents during software development process, - using UML diagrams for software architecture description, - recognize different architecture and design patterns, - describe different software verification and validation phases, - define importance of software evolution.

Course content broken down in detail by weekly class schedule (syllabus)

Course content	L hours	AE hours
Introduction in Software engineering.	3	0
Software processes and software process models.	3	0
Agile software development. Extreme programming..	3	0
Scrum and Scaling agile methods.	3	0
Software requirements.	3	0
The software requirements document. Requirements elicitation, analysis and validation.	3	0
System modelling. Introduction to UML.	3	0
Architectural design.	3	0
Architectural patterns.	3	0
Design and implementation. Design patterns.	3	0
Software testing.	3	0
Test driven development	3	0
Software maintenance and evolution.	3	0

List of laboratory or design exercises	LE hours
Advanced features of Microsoft Office for document formatting.	2
Using Microsoft Project in project management.	2
Using Microsoft Visio for system modelling (UML diagrams).	2
Using testing package in Microsoft Visual Studio.	2
Visiting lecture – Project management.	2
Visiting lecture – Estimation effort for software development product.	2
Visiting lecture – Scrum methodology for software development.	2

	Visiting lecture – Kanban methodology for software development.	2
	Visiting lecture – Software testing	2
	Visiting lecture – Software engineering in Ericsson Nikola Tesla – environment, market and evolution.	2

Format of instruction	☒ lectures ☐ seminars and workshops ☐ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ independent assignments ☒ multimedia ☒ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	The presence on lectures in the amount of at least 70 % of the times scheduled. 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)*	Class attendance	1,5	Research		Practical training	1
	Experimental work		Report		Individual work	3
	Essay		Seminar essay		Laboratory exercises	1
	Tests	0,2	Oral exam		Preparation for laboratory exercises	0,2
	Written exam	0,1	Project		(Other)	

Grading and evaluating student work in class and at the final exam	There are two parts of the exam, practical and theoretical. For practical part students have to make a software project and related documentations. It is done in groups from 3 to 5 students. Project is divided in three phases and each is graded. Finale project grade is counted as average. Theoretical part of exam is written and 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 consists of 10 theoretical questions. The requirement for passing grade is the positive grade from project part and 50 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula: Grade = 0,6 P + 0,4 T where: • P – project grade, • T – grade from the theoretical part of exam.

	Title	**Number of copies in the library**	**Availability via other media**
Required literature (available in the library and via other media)	• Vicković, L. Programsko inženjerstvo, prezentacije s predavanja.		e-learning portal
	• Somerville, I. Software engineering, Addison Wesley, 9 edition, 2011.		
	• Sach, S. Object Oriented Software Engineering, McGraw-HIll, 2008.		
	• Fowler, M. UML Distilled, Addison Wesley, third edition, 2003.		

Optional literature (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	**COMPUTER AND DATA SECURITY**						
Code	FELB18	Year of study	3.				
Course teacher	Mario Čagalj, Ph.D., Full Professor	Credits (ECTS)	4				
Associate teachers		Type of instruction (number of hours)	L	S	AE	LE	DE
			30	0	0	15	
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION			
Course objectives	Introduce students to: - fundamentals of computer and data security, - critical thinking on security issues in computer 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: - define the basic concepts of computer security such as authentication, access control, data confidentiality, system and data integrity - analyse vulnerabilities of password-based authentication systems, - suggest basic protection measures.		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	Introduction to computer security.	2	
	Basic cryptographic primitives (encryption and authentication)	4	
	User authentication (passwords, security tokens, biometry, attacks)	2	
	User authentication on Windows and Unix-like operating systems	2	
	Attacks on passwords (brute-force, dictionary, rainbow tables)	2	
	Access control (Windows, Unix-like OS)	4	
	First midterm exam		
	Malware (viruses, computer worms, botnets)	2	
	Protection against malware (AV software)	2	
	Denial-of-Service (DoS) and Distributed DoS (DDoS) attacks	2	
	Software security (buffer overflow attacks)	2	
	Risk assessment and management	2	
	Second midterm exam		
	List of laboratory exercises		LE hours
	Intro to computer security using Cryptool		2
	User authentication and access control		3

<table>
<tr><td></td><td colspan="5">Malicious software (keyloggers)</td><td>3</td></tr>
<tr><td></td><td colspan="5">Malicious software (man-in-the-browser attacks)</td><td>2</td></tr>
<tr><td></td><td colspan="5">DoS attacks</td><td>2</td></tr>
<tr><td></td><td colspan="5">Software security (buffer overflow attacks)</td><td>1</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☐ exercises
☐ on line in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia
☒ laboratory
☐ work with mentor
☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises.</td></tr>
<tr><td rowspan="5">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)</td><td>Class attendance</td><td>0,7</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>2</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Laboratory exercises</td><td>1</td></tr>
<tr><td>Tests</td><td>0,2</td><td>Oral exam</td><td></td><td></td><td></td></tr>
<tr><td>Written exam</td><td>0,1</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">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. Students are also required to submit a written report on their work on laboratory assignments; these are also graded.

The final grade is formed as follows:
Grade = Round[0,05 P + 0,15 LV + 0,35 M1 + 0,45 M2]
where:
• P – is a grade based on attendance at lectures,
• LV – a grade earned during laboratory exercises,
• M1, M2 – test results.

NOTE: If a student fails a given task (P, LV, M1, M2), the corresponding grade is set to 0 in the above formula.</td></tr>
<tr><td rowspan="2">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="3">Lecture notes and presentations</td><td></td><td>e-learning portal</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">• Stallings W., Borwn L.: Computer Security, Principles and Practice, Pearson Prentice Hall, 2008.
• Gollmann D.: Computer Security, 2nd Edition, Wiley, 2005.
• Pfleeger C. P., Pfleeger S. L. : Security in Computing, 4th Edition, Prentice Hall, 2006.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- Evaluation of results in accordance with the above learning outcomes
- Feedback from students via surveys
- Self-evaluation of teachers
- Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

NAME OF THE COURSE	SYSTEM ANALYSIS AND DESIGN						
Code	FELB14	Year of study	3				
Course teacher	Maja Štula, Ph.D., Full Professor	Credits (ECTS)	5				
Associate teachers		Type of instruction (number of hours)	L	S	AE	LE	DE
			30			30	
Status of the course	Obligatory	Percentage of application of e-learning	10%				

COURSE DESCRIPTION

Course objectives	Training students for: - Acquiring knowledge on methodologies and tools used for information system analysis and development - Understanding information system analysis and design processes - Acquiring basic knowledge necessary for defining, developing, managing and deployment of information 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: - Describe methods and techniques for information system analysis and design - Explain differences in IT systems development methodologies - Explain reasons for usage of formally defined methodologies - Use software tools for information system analysis and design		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	System analysis and design introduction, system development life cycle, software development methodologies	3	0
	Project initiation, identification, setting system request, feasibility study	2	0
	Project management, project size assessment, function point approach, project workplan, Gant, PERT diagrams, CASE tools	2	0
	System requirements identification, requirements analysis techniques, JAD (Joint Application Development)	2	0
	Use case analysis, elements	2	0
	Process modelling, Data Flow Diagram, process model definition, DFD hierarchy	2	0
	Data modelling, Entity-Relation diagram, data dictionary, ER diagram validation and normalization	2	0
	Developing system design from system request, system design strategies, strategy selection factors	2	0
	System architecture design, basic software architecture types, operational, security requirements, hardware and software specification	3	0
	User interface design, user experience, navigation, input, output design	2	0
	Program design, converting logical process model to physical, structure chart development, program specification	2	0
	Data storage design, files, databases, choosing format of storage, converting logical data model to physical, data storage optimization	2	0
	Information system implementation, programming tasks assignment, activities coordination, testing, documenting	2	0
	Information system introduction, maintenance and customers support	2	0
	List of laboratory or design exercises		LE hours
	GIT versioning system usage		4

	Project feasibility analysis, ROI, BEP for case study project	4
	Unit Test definition and execution	6
	Creating and maintaining workplan with gant diagram using software tools	4
	Use case definition for case study	4
	Data models and CRUD matrix creation	4
	System architecture design	4

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☐ multimedia ☒ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	The presence on lectures in the amount of at least 70 % of the times scheduled. Performed and uploaded on e-learning portal 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)*	Class attendance	3	Research		Practical training	
	Experimental work		Report		(Other)	
	Essay		Seminar essay		(Other)	
	Tests	1	Oral exam		(Other)	
	Written exam	1	Project		(Other)	

Grading and evaluating student work in class and at the final exam

There are two midterms and final exams duration of 90 minutes. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test consists of 10 theoretical questions and final tests consist of 10 theoretical questions (five from each midterm test). 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 50 % points on each midterm exam or the final exam and positive laboratory assessment. Grade (in percentage) is formed according to the formula:

$$\text{Grade}(\%) = (M1 + M2)/2$$

the activities in percentage:

- 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**
	M. Štula, Authorized lecture materials		e-learning portal

Optional literature (at the time of submission of study programme proposal)	- Dennis, Haley Wixom, M. Roth: Systems Analysis and Design, Fourth Edition, 2009. - Christian Dawson: Project in Computing and Information Systems: A Student's Guide, 2009.
Quality assurance methods that ensure the acquisition of exit competences	- Students' surveys for teacher evaluation - Students attendance track - Annual statistic on passed exam
Other (as the proposer wishes to add)	

NAME OF THE COURSE	BUSINESS INFORMATICS							
Code	FETB01	Year of study	3.					
Course teacher	Stipo Čelar, Ph.D., Associate Professor	Credits (ECTS)	4					
Associate teachers	Mili Turić, mag. comp.	Type of instruction (number of hours)	L	S	AE	LE	DE	
			30			15		
Status of the course	Obligatory	Percentage of application of e-learning	0					

COURSE DESCRIPTION

Course objectives	Training students for: - understanding of the role of ICT in the business environment, - understanding of the basic forms of intellectual property in ICT, - understanding of the principles of ICT projects organizing, - organization, start-up and financing of ICT companies, - basic understanding of standards and models for SW process improvement.		
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: - define the role of ICT in the business environment, - understand the benefits of knowledge-based companies, - understand the value of intellectual property and its importance for the modern economy, - apply general principles of project management to SW quality management, - understand the most common forms of today's companies, - understand basic models of SW process maturity and capability, - apply project approach in the finding of financing sources and in the project proposals preparation.		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	Introduction to Business Informatics. Architectural models (NIST model Zachman model)	2	
	Industrial revolution. The foundations of the new technological revolution	2	
	Knowledge. Competence. Education	2	
	Knowledge and business. The role of ICT	2	
	Intellectual property and innovation. Copyright and related rights	2	
	Patent. SW and Intellectual Property Rights (IPR)	2	
	Projects and Project Management	2	
	First midterm exam		
	Company model. The transition from the project to the company	2	
	Forms of companies (d.o.o, d.d, j.d.o.o, ….)	2	
	The processes generally and processes in ICT companies. Porter's process model. SWEBOK. ISO / IEC12207	2	
	The maturity and the capability of process. CMM and CMMI Model	2	
	Control - Assurance - Planning - Quality Management. Characteristics of SW quality. SW quality standards	2	
	Sources of financing. The project proposal. Logical Framework	2	
	Second midterm exam		
	List of laboratory exercises		LE hours

	Introduction to the work method. Defining of project teams and seminar topics selecting	2
	Weekly meetings with a mentor (professor / assistant)	10
	Seminar presentation (with colleagues)	3

Format of instruction	☒ lectures ☒ seminars and workshops ☐ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ independent assignments ☐ multimedia ☒ laboratory ☒ work with mentor ☐ (other)
Student responsibilities	The presence on lectures in the amount of at least 70 % of the times scheduled. Well made (written material) and personally presented seminar.	

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)*						
	Class attendance	1	Research	0,5	Practical training	
	Experimental work		Report		Individual work	1
	Essay		Seminar essay	0,5	Laboratory exercises	
	Tests	0,5	Oral exam	0,5	Preparation for laboratory exercises	
	Written exam		Project		(Other)	

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 of lecturing. Each midterm test consists of 5 to 10 theoretical questions. The final test consists of 7 to 10 theoretical questions. In the final exams students that did not pass the midterm exams take part. The midterms and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of seminar and 50 % points on each midterm exam or the final exam. After that the students take the oral exam. Grade (in percentage) is formed according to the formula: Grade(%) = 0,3 OE + 0,2 LE + 0,25 (M1 + M2) the activities in percentage: • OE – oral exam, • LE – laboratory assessment (seminar), • 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**
	• S. Čelar: Authorised lectures, FESB		e-learning portal
	• CMMI® for Development, Version 1.3, SEI, Technical Report, 2010		e-learning portal
	• S. Čelar: Authorised instructions for seminars, FESB		e-learning portal

Optional literature (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)	