University of Rijeka
Faculty of Engineering

CURRICULUM
UNDERGRADUATE UNIVERSITY STUDY OF COMPUTING

Rijeka, April 2021

1. CURRICULUM DESCRIPTION

1.1. The list of compulsory and elective courses with the number of active classes required for their performance and ECTS credits

1. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Mathematics I	3	3			6	7
	Introduction to Physics	2	2			4	4
	Electrical Engineering CE	2	1	1		4	7
	Programming I	2		2		4	6
	Computer Skills	1		1		2	3
	English Language I	1	2			3	3
	TOTAL					**23**	**30**

L - lectures, aT – auditory tutorials, lT – laboratory tutorials, dT – design tutorials,

2. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Mathematics II	3	3			6	7
	Electronics	3		1		4	7
	Programming II	2	1	2		5	7
	Digital Logic	2	2			4	6
	English Language II	1	2			3	3
	TOTAL					**22**	**30**

3. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Mathematics for Engineers C	2	2			4	5
	Algorithms and Data Structures	2	1	2		5	7
	Computer Architecture	2	2			4	6
	Signals and Systems	3	1			4	6
	Introduction to Object Oriented Programming	2		2		4	6
	TOTAL					**21**	**30**

4. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Operating Systems	2		2		4	7
	Computer Networks	2	1	1		4	7
	Computer Graphics	2		2		4	7
	Elective Subject I					3	4
	Professional Practice I						5
	TOTAL					**15**	**30**

Elective Subject I							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Modelling of Process Information Systems	2			1	3	4
	Computer Simulations in Engineering	1			2	3	4

5. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Embedded Systems	3		2		5	7
	Database Systems	2		2		4	6
	Web Application Development	2		2		4	7
	Elective Subject II					4	5
	Elective Project [1]				3	3	5
	TOTAL					**20**	**30**

[1] election from list of offered projects: Algorithms and Data Structures, Computer Aided Measurements, Computer Architecture, Computer Graphics, Computer Networks, Computer Skills, Database Systems, Digital Logic, Embedded Systems, Introduction to Object Oriented Programming, Operating Systems, Programming I, Programming II, Web Application Development

Elective Subject II							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Computer Aided Measurements	2		2		4	5
	Computational Methods	2		2		4	5

6. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Software Engineering	3		2		5	7
	Organization of Business Systems	2	1			3	4
	Introduction to Artificial Intelligence	2		2		4	5
	Free Elective Subject[2]					3	4
	Final Work						10
	TOTAL					**15**	**30**

[2] election from list of offered subjects

Free Elective Subjects							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Computer Simulations in Engineering	1			2	3	4
	Introduction into Finite Element Method	1		2		3	4
	Energy Sources	3				3	4
	Processes of Heat Treatment	2		1		3	4
	Small Craft Building and Maintenance UN	2	1			3	4
	Basic Ship Dynamics	2	1			3	4
	Energy Systems	2	2			4	4
	Quality Assurance	2	1			3	4
	Introduction to Guidance and Control of Marine Vehicles	2		1		3	4
	Environment Protection	3				3	4
	Automation	2	1			3	4
	Modelling of Process Information Systems	2			1	3	4

UNDERGRADUATE UNIVERSITY STUDY OF COMPUTING TOTAL	Hours	ECTS
	116	**180**

Basic description		
Course title	**Algorithms and Data Structures**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	30+45+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Acquiring basic knowledge and understanding of simple and abstract data types, algorithm complexity analysis, sort and search algorithms. Developing the capability of solving complex programming problems.							
1.2. Course enrolment requirements							
Programming II.							
1.3. Expected course learning outcomes							
Upon a completion of the course, students will be able to: understand simple and abstract data types; describe an algorithm using natural language or pseudo code; analyse algorithm complexity; use elementary data structures; use and apply sorting and searching algorithms; use available programming libraries.							
1.4. Course content							
Introduction: problem solving, algorithm, pseudo code, data types, time complexity of algorithms. Abstract data type. List. Stack. Queue. Recursion and iteration. Sorting and searching algorithms. Trees. Graphs. Hash tables.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Class attendance, homework, studying.							
1.8. Evaluation of student's work							
Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	3	Report		Practice	
Portfolio							
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							
Midterm exams, sustained knowledge check, written exam.							

1.10. Assigned reading (at the time of the submission of study programme proposal)

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1.11. Optional / additional reading (at the time of proposing study programme)

Thomas H. Cormen Charles E. Leiserson Ronald L. Rivest Clifford Stein: Introduction to Algorithms Third Edition

Mark Allen Weiss: Data structures and algorithm analysis in C++ / Edition:3rd ed. Publication:Boston : Pearson, Addison Wesley, 2006

Robert Sedgewick: Algorithms in C, Parts 1-5: Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms, Addison-Wesley Professional, 2001.

Wikibooks: Data structures <http://en.wikibooks.org/wiki/Data_Structures>, Algorithms <http://en.wikibooks.org/wiki/Algorithms>

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality insurance system.

Basic description		
Course title	**Automation**	
Study programme	**Undergraduate University Study of Computing**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Understanding the basic principles of automation and its impact on economic and social development.							
1.2. Course enrolment requirements							
Mathematics I and Mathematics II.							
1.3. Expected course learning outcomes							
Describe the historical development of automation, define the reasons for the introduction of automation and describe the advantages and disadvantages of automation. Define the level of automation and explain the means of automation of manufacturing and service activities. Describe the methods and strategies of automation. Define a methodology for analysis and synthesis of flexible and intelligence systems. Describe the self-organizing system, explain the structure, function, advantages and disadvantages, and describe the evolution of automated devices, machines and systems. Describe case studies of automated devices, machines and systems and define scenarios and strategies of leadership. Describe the current status and development trends of automation and describe barriers to development and forecasting.							
1.4. Course content							
Historical review of the automatic circuits, devices and machines. Ancient and medieval automata. Five levels of automation: assembly, device, machine, system and plant. Automation of manufacturing and service activities. Modern means of automation of production: digital computers, manipulators, robots. Automation strategy. Leading ideas and methodology of synthesis of flexible and intelligent systems. Artificial Intelligence. Self-organizing and autonomous systems. Economic and social aspects of automation of human activities. Selected examples of modern automated machines and systems. Current scientific research projects. Present status and development trends of automation.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Attendance, activities in the classroom, homework and self-study.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	1	Oral exam	0.5	Essay		Research	
Project	1	Sustained knowledge check		Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, activities in the classroom, homework, two control written exam and final oral and written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Nikolić, G.: Pneumatics And Hydraulics: Part 1, Pneumatics, Školske novine, Zagreb, 2010. (in Croatian)
Croser, P., Ebel, F.: Pneumatics, Festo Didactic GmbH & Co. 2002.
B. Katalinic, Industrieroboter und Flexible Systeme für Drehteile, VDI Verlag, Düsseldorf, 1990.
B. Katalinic, Intelligent Manufacturing Systems, skripta, Technische Universität Wien.

1.11. Optional / additional reading (at the time of proposing study programme)

Katalinic, B., Bionic Assembly Systems: Selforganizing Complex Flexible Assembly System, Acta Mechanica Slovaca, Vol. 6, No. 2/2002, pp. 15-20, ISSN: 1335-2393.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Nikolić, G.: Pneumatics And Hydraulics: Part 1, Pneumatics, Školske novine, Zagreb, 2010. (in Croatian)	1	
Croser, P., Ebel, F.: Pneumatics, Festo Didactic GmbH & Co. 2002.	1	
B. Katalinic, Industrieroboter und Flexible Systeme für Drehteile, VDI Verlag, Düsseldorf, 1990.	0	
B. Katalinic, Intelligent Manufacturing Systems, skripta, Technische Universität Wien	0	

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through a structured quality assurance system of the Faculty.

Basic description		
Course title	**Basic Ship Dynamics**	
Study programme	**Undergraduate University Study of Computing**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Introduction to basic methods of dynamic analysis of the ship. Understanding stochastic processes and their application in the ship dynamics. Developing the ability to work in small groups (teamwork).							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Specify the methods of dynamic analysis of the ship. Properly explain, and interpret the basic parameters of the waves as a random process and make a simple statistical analysis of random processes. Explain the energy spectrum and the autocorrelation function and describe the application of Fourier series in the analysis of stochastic dynamic response. Define and solve linear oscillating model of rigid floating bodies motion with one degree of freedom on the sea waves. Itemize and explain the consequences of excessive motion of the ship. Define the types and causes of ship vibrations.							
1.4. Course content							
Introduction to dynamic analysis of ship structures. Single and multi-degree of freedom models. Free oscillations. Forced steady state response. Fourier series: application to frequency response. Introduction to random processes and application in linear systems. Rigid floating body motion in one degree of freedom. Sea wave excitation. Hydrodynamic added mass and damping.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, activity, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	0.5	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio		Homework					

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, seminar paper, activity, continuous knowledge testing (three mid-term exams), written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Prpić-Oršić J.: Basic ship Dynamics, Faculty of Engineering University of Rijeka, Fintrade &Tours, 2009. (in Croatian)
Vorus W.: Vibration, The Principle of Naval Architecture Series: Vibration, SNAME, 2010.

1.11. Optional / additional reading (at the time of proposing study programme)

Prpić-Oršić J., Čorić V.: Seakeeping, Zigo, University of Rijeka, 2006. (in Croatian)
Senjanović, I.: Ship vibrations I, University of Zagreb, 1974. (in Croatian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Prpić-Oršić J.: Basic ship dynamics, Faculty of Engineering University of Rijeka, Fintrade &Tours, 2009. (in Croatian)	10	8

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Computational Methods**	
Study programme	**Undergraduate University Study of Computing**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Recognize computational problems in mechanical engineering. Understand and apply basic numerical methods. Basic knowledge of MatLab or C programming language. Independent ly write shorter program code and use existing software for numerical problem solving.							
1.2. Course enrolment requirements							
Mathematics I.							
1.3. Expected course learning outcomes							
Recognize appropriate computational methods for given simpler mathematical formulations of engineering problems. Correctly explain fundamental idea of particular computational methods. Correctly explain advantages and disadvantages of particular computational methods. Compare computational methods applicable to the same type of problem. Apply existing software to simpler problems. Write simple computer programs for particular computational methods by following instructions. Evaluate results of computational methods.							
1.4. Course content							
Mechanical engineering examples for nonlinear equations with one unknown. Applicable numerical methods and their comparison. Convergence criteria in iterative methods. Computer programs in C or MatLab. Mechanical engineering examples for systems of nonlinear equations. Applicable exact and numerical methods and their comparison. Round-off error. Computer programs in C or MatLab. Mechanical engineering examples for curve fitting. Regression, interpolation, and spline curves in computer graphics. Computer programs in C or MatLab. Mechanical engineering examples for definite integral. Applicable numerical methods. Increase in computational accuracy vs. round-off error accumulation. Computer programs in C or MatLab. Mechanical engineering examples for ordinary differential equations. Applicable numerical methods. Local and global errors. Computer programs in C or MatLab.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, mid-term exams, computer knowledge checks.							
1.8. Evaluation of student's work							
Course	2	Activity/Participation		Seminar paper		Experimental	

attendance						work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, mid-term exams, computer knowledge checks, written and/or oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Chapra, S. C., Channale, R. P., Numerical methods for engineers, McGrowHill Inc., 1988
Press, W., et al: Numerical Recipes for C/C++/Pascal/Fortran, Cambridge University Press, 1992

1.11. Optional / additional reading (at the time of proposing study programme)

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1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Chapra, S. C., Channale, R. P., Numerical methods for engineers, McGrowHill Inc., 1988	6	100
Press, W., et al: Numerical Recipes for C/C++/Pascal/fortran, Cambridge University Press, 1992	6	100

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Computer Aided Measurements**	
Study programme	**Undergraduate University Study of Computing**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Computer Aided Measurements enable students to understand advantages and possibilities of electronic measurement instruments, to independently analyze measurement problem and to realize virtual instrumentation.		
1.2. Course enrolment requirements		
Electrical Engineering CE.		
1.3. Expected course learning outcomes		
After passing the exam, student is able to do following: 1. Interpret and explain measurement uncertainty 2. Apply the model of measurement uncertainty at simple examples 3. Describe the working principles of measurement amplifiers 4. Describe how noise and interference influence measurement results and methods how to reduce them 5. Describe transfer function of A/D and D/A converters 6. Describe working principles of different types of A/D converters 7. Select the appropriate type of A/D converter for different measurement problems 8. Describe the working principles of user interfaces 9. Implement virtual instrument 10. Analyze characteristics of automated instrumentation		
1.4. Course content		
Introduction to the measurement science. The international system of units. Measurement errors. Measurement uncertainty. Noise and interference. Measurement amplifiers. Analog-digital converters. Digital-analog converters. Oscilloscopes. Automated measurements. Microprocessors and microcontrollers in computerized instrumentation. Examples of computer aided measurements: 3D multisensor coordinate measuring machines and systems for 3D scanning-digitalization-measurements. Communication with measurement equipment. Basic configurations of computerized measurement systems. Virtual instrumentation. Software for development of measurement applications.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		
Course and laboratory practice attendance, seminar paper, activity during course lectures, studying.		

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper	1	Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	0.5
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Assessment and evaluation of student's work will be based on sustained knowledge checks, laboratory practice and based on seminar paper or final exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Vujević, D., Ferković, B.: Basics of Electrical Engineering Measurements, I. i II. part, Školska knjiga, Zagreb, 1996. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Šantić, A.: Electronic Instrumentation, 3rd Edition, Školska knjiga, Zagreb, 1993. (in Croatian)
Coombs, C.F.Jr.: Electronic Instrument Handbook, McGraw-Hill, 2nd Edition, 1999.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Vujević, D., Ferković, B.: Basics of Electrical Engineering Measurements, I. i II. part, Školska knjiga, Zagreb, 1996. (in Croatian)	8	40

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Computer Architecture**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Obtaining basic knowledge of computer hardware.							
1.2. Course enrolment requirements							
Programming I							
1.3. Expected course learning outcomes							
Define and classify Computer Architecture. Understand work and basement of a Turing machine. Understand basic elements of computer systems. Understand basics of von Neumann Architecture. Understand work of arithmetic-logical unit in a computer. Understand execution of microprocessor instructions. Understand pipeline architecture of microprocessors. Understand hierarchy of memory in computer system. Understand programs written in assembler code.							
1.4. Course content							
Computer Architecture definition and classification. Historical overview of computer development. Turing machine. Coding data and operations in a computer. Model of von Neumann Computer Architecture. Control unit. Simple microprocessor model instruction execution. RICS and CISC architecture. Pipeline architecture of microprocessor. Computer Buses. Computer memory system and Cache memory. Memory organization and virtual memory system. Input/output control system. Interrupt handling techniques. Overview of 8, 16, 32 and 64 bits computer architecture.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity, homework, studying.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	2.5	Report		Practice	

Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, homework, continuous knowledge testing (two mid-term exams), written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Ribarić, S.: Computer Architecture, Architecture and Organisation of Computer Systems, Algebra d.o.o. 2011 (in Croatian).
Ribarić, S.: Computer Architecture RISC i CISC, Školska knjiga, Zagreb, 1996 (in Croatian).
Ribarić, S.: Advanced Microprocessor Architectures, Školska knjiga, Zagreb, 1997 (in Croatian).

1.11. Optional / additional reading (at the time of proposing study programme)

Ribarić, S.: Arhitektura mikroprocesora, Tehnička knjiga, Zagreb, 1988.
Peruško, U., Glavinić, V.: Digitalni sustavi, Školska knjiga Zagreb, 2005.
Hennessey, J.L., Patterson D.A.: Computer Organization and Design : The Hardware/Software Interface, Morgan Kauf. Pub., San Mateo, 2013.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Ribarić, S.: Computer Architecture, Architecture and Organisation of Computer Systems, Algebra d.o.o. 2011 (in Croatian).	2	50
Ribarić, S.: Computer Architecture RISC i CISC, Školska knjiga, Zagreb, 1996 (in Croatian).	1	50
Ribarić, S.: Advanced Microprocessor Architectures, Školska knjiga, Zagreb, 1997 (in Croatian).	5	50

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution’s quality assurance system.

Basic description		
Course title	**Computer Graphics**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
An overview of the basics in computer graphics. Understanding of existing and capability to develop smaller computer graphics software.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Proper interpretation ot principles of projective geometry. To classify and name basic traits of curves and surfaces in use in computer graphics. To develop computer programs using OpenGL and/or similar libraries. To develop computer programs which display 2d and 3d objects, curves and surfaces, light, color and material assignement to objects.		
1.4. Course content		
Review the basics of computer graphics. Ortographic and perspective transformations. Graphic primitives and transformations. Parametric display of curves and surfaces. Elemental differential geometry. Bikubic presentation of the surface. Modeling body geometry. Network display. Visualization with basic bodies. Models and procedures of shading, shading. Set objects in a 3d scene. Light, materials, animation.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		
Course attendace, individual assignements and exercises.		
1.8. Evaluation of student's work		

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	2.5	Report		Practice	
Portfolio		Exercises	1				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, homework, sustained knowledge check (two partial exams), oral and written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

M. Čupić, Ž. Mihajlović, Interactive Computer Graphics through Examples in OpenGL, Zagreb, 2011 (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Penna M. A., Patterson R. R., Projective geometry and its applications to computer graphics, Prentice-Hall, Englewood Cliffs, New Yersey
Yamagochy F., Curves and surfaces in computer aided geometric design, Springer-Verlag 1988.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
M. Čupić, Ž. Mihajlović, Interactive Computer Graphics through Examples in OpenGL, Zagreb, 2011 (in Croatian)	30	27

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Computer Network**s	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Description and classification of computer networks and communication services structure and architecture. Computer networks working principles. Understanding and usage of basic network communication protocols and Internet services.		
1.2. Course enrolment requirements		
There are no formal requirements, however, for successful course completion, a good programming skills are necessary.		
1.3. Expected course learning outcomes		
After the course completion, students should be able to: • Define OSI reference model of computer networks architecture • Describe purpose of each layer of the OSI model • Compare OSI reference model to other network architectures (TCP/IP, hybrid) • Describe important services and protocols on each network layer • Analyse well known Internet protocols • Describe problems in designing secure computer networks • Apply Internet application layer protocols using specific solutions • Implement simple network protocols • Perform basic network devices configuration		
1.4. Course content		
Computer networks organization. OSI reference model. Physical layer: theoretical foundation, media. Physical layer implementation, cabling. Data link layer. Error detection and correction, protocol examples, Internet data link layer. Media access control (MAC) sub-layer, transmission channel contention. IEEE 802 LAN standards. Network layer. Routing algorithms and congestion control algorithms. Connecting networks. Internet network layer. Transport layer services, transport protocol functioning. Internet transport layer. Application layer. Internet applications and protocols. Computer networks applications. Computer networks security.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		
Course attendance, activity, homework, studying.		

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	2.5
Project		Sustained knowledge check	2.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Lab quizzes and skills exams, mid-term exams, final exam

1.10. Assigned reading (at the time of the submission of study programme proposal)

Kurose, J.F., Ross K.W.: Computer Networking: A Top-Down Approach, 6th Edition, Pearson Education, 2012
Radovan, M.: Computer Networks (1), Rijeka, Digital point tiskara, 2010. (in Croatian)
Radovan, M.: Computer Networks (2), Rijeka, Digital point tiskara, 2011. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Peterson, L., Davie, B.:Computer Networks, Fifth Edition: A Systems Approach, Morgan Kaufmann, 2011
Tanenbaum, A.S.: Computer Networks, 5th Edition. Prentice Hall, 2010.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Computer networks	1	65

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Computer Simulations in Engineering**	
Study programme	**Undergraduate University Study of Computing**	
Course status	optional	
Year	**2.or 3.**	
ECTS credits and teaching	ECTS student's workload coefficient	4
	Number of hours (L+E+S)	15+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
General knowledge of computer simulation technology. Understanding the basis of mathematical modeling. Knowing capabilities and limitations of computer simulations. Identifying methods for solving engineering problems using computer simulations.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Correctly explain the methodology of mathematical modeling. Classify mathematical models typical of technical systems. Identify basic types of numerical network. Classify commercial software for numerical modeling. Explain the entire process of applying computer simulation in solving engineering problems. Perform a simulation of a simple problem of mechanical design, in available software.							
1.4. Course content							
Review of existing CAE systems. The process of mathematical modeling. Using finite-element model of solid body mechanics. Using computational fluid dynamics. Modeling of heat transfer. Introduction to commercial software and I-DEAS, CATIA, FLUENT. Structured and unstructured mesh, boundary condition definitions. Understanding the entire process of application of computer simulation for solving engineering problems.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments	-						
1.7. Student's obligations							
Attendance, class participation, individual assignment.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	2	Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Sustained knowledge check	0.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam
Course attendance, activity, continuous knowledge testing, seminar paper.
1.10. Assigned reading (at the time of the submission of study programme proposal)
I-DEAS, CATIA, FLUENT User Manuals.
1.11. Optional / additional reading (at the time of proposing study programme)
-
1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
I-DEAS, CATIA, FLUENT User Manuals.	online copies	50

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences
Through the Institution's quality assurance system.

Basic description		
Course title	**Computer Skills**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	3
	Number of hours (L+E+S)	15+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Learning programming environments for scientific computation, professional processing of text and bibliography, and computer code storing and version control. Getting acquainted with typical elements of project proposal preparation and software solutions that support it.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Use tools for scientific computation and professional processing of text and bibliography. Be familiar with the principles of computer code storing and version control. Prepare a project structure with a schedule of the project activities (the Gantt chart). Create the project work plan and the financial plan. Get acquainted with modern computer tools for team collaboration and communication.							
1.4. Course content							
Software for scientific computation, and processing of text and bibliography. Computer tools and platforms for program code storage and version control. Computational support for creating a project structure with a schedule of activities, work plan, and the financial plan. Computer tools for team collaboration and communication.							
1.5. Teaching methods	☒ lectures ☒ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance and activity (lectures, exercises), studying, exams, final exam.							
1.8. Evaluation of student's work							
Course attendance	1	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project	2	Sustained knowledge check		Report		Practice	
Portfolio		Constructive work					

1.9. Procedure and examples of learning outcome assessment in class and at the final exam
Course attendance and activity (lectures, exercises), exams, writen exam.
1.10. Assigned reading (at the time of the submission of study programme proposal)
Course notes. *Various product manuals and tutorials.*
1.11. Optional / additional reading (at the time of proposing study programme)
The course instruction will suggest adequate materials for the given course cycle.
1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Manuals for commercial and open-source software	Publicly available literature	70

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences
Through the Institution´s quality assurance system.

Basic description		
Course title	**Database Systems**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Understanding database management systems. Database design. Defining relational databases and handling data. Enforcing data integrity and data protection. Using software tools for designing and building databases, and for data management.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Describe the basic concepts of data and information. Describe the database management system. Describe the concept of relational, network and hierarchical databases. Design an entity-relationship model. Design a relational model. Determine functional dependencies. Apply the normalization procedure. Apply Structured Query Language (SQL). Implement a physical and application model. Analyze the database integrity enforcement.							
1.4. Course content							
Basic concepts of database and database management systems. Data models. Relational algebra and relational model. Logical design of databases. Entity-relationship model. Transforming entity-relationship model into relations. Functional dependencies and normalization. Structured Query Language (SQL). Data integrity and security. Transactions.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Class attendance, attending tests, solving tasks independently							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	2.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Tests, laboratory exercises, written exam

1.10. Assigned reading (at the time of the submission of study programme proposal)

Thomas M. Connolly, Carolyn E. Begg: Database Systems – A Practical Approach to Design, Implementation and Management (6th Edition), Pearson Education, 2015.

Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: Database Systems – The Complete Book (2nd Edition), Pearson Education, 2009.

1.11. Optional / additional reading (at the time of proposing study programme)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Thomas M. Connolly, Carolyn E. Begg: Database Systems – A Practical Approach to Design, Implementation and Management (6th Edition), Pearson Education, 2015.	1	-
Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: Database Systems – The Complete Book (2nd Edition), Pearson Education, 2009.	1	-

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the quality assurance system of the Faculty of Engineering.

Basic description		
Course title	**Digital Logic**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Understanding basic concepts of digital logic and operation of logic circuits. Understanding basic methods for analysing and designing combinational and sequential digital circuits and systems. Developing the ability of analysing, synthesizing and solving problems in the field of digital logic.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Defining logical levels and basic characteristics of digitals signals. Applying various number systems. Using various codes to express digital data. Defining the Boolean algebra axioms and basic theorems. Minimizing logical functions. Distinguishing AND-OR, AND-OR complement, XOR and NOR logic. Using various combinational logic circuits and functions. Explaining operational principles and applications of sequential logic circuits.							
1.4. Course content							
Basic digital concepts: digital and analog quantities, logic levels, digital signals, digital systems. Number systems and operations: decimal, binary, octal and hexadecimal system, complement of number. Error detection and correction codes; weighted and unweighted codes, Hamming code. Boolean Algebra; axioms and theorems, Boolean functions, standard form of function, truth table. Minimization of logic functions: Karnaugh map, Quine–McCluskey algorithm. Combinational logic circuits; AND-OR, AND-OR complement, XOR and exclusive NOR. Universal properties of NAND and NOR logic gates. Functions of combinational logic; adders, comparators, coders, decoders, multiplexors, demultiplexors. Latches: S-R latch, J-K latch and edge triggered flip-flops, applications. Counters; asynchronous, synchronous, design of counters, applications. Shift registers; basic and bidirectional registers, applications.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, project assignment, individual studying.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation	1.5	Seminar paper		Experimental work	

Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on final exam

Sustained knowledge check (two tests), project, written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

A. P. Godse and D. A. Godse: Digital Logic Circuits, Technical Publications, 2011.
U. Peruško i V. Glavinić: Digital Systems, Školska knjiga, 2005. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

T. L. Floyd: Digital Fundamentals, 10/E, Prentice Hall, 2009.
M. M. Mano and M. D. Ciletti: Digital Design, 4/E, Prentice Hall, 2007.
W. Kleitz: Digital Electronics with VHDL, Prentice Hall, 2006.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
A. P. Godse and D. A. Godse: Digital Logic Circuits, Technical Publications, 2011.	1	60
U. Peruško i V. Glavinić: Digital Systems, Školska knjiga, 2005. (in Croatian)	5	60

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Elective Project**	
Study programme	**Undergraduate University Study of Computing**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	0+45+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Application of acquired knowledge and skills to solve practical problems in the field of associated course from which the project is elected.							
1.2. Course enrolment requirements							
Enrolled course from which the project is elected.							
1.3. Expected course learning outcomes							
Apply the knowledge and skills from professional content of the associated course. Solve practical task. Acquire competence for individually solving specific professional tasks.							
1.4. Course content							
Chosen chapter of associated course from which the project was elected.							
1.5. Teaching methods	☐ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Attending the consultation, individually solving task and writing the project report.							
1.8. Evaluation of student's work							
Course attendance		Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project	2	Sustained knowledge check		Report		Practice	
Portfolio		Individual task solving	3				
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							
Assesses and evaluates the accuracy and completeness of the project task solution and its presentation.							
1.10. Assigned reading (at the time of the submission of study programme proposal)							
References listed for the associated course from which the project is elected.							

1.11. Optional / additional reading (at the time of proposing study programme)

References listed for the associated course from which the project is elected.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Electrical Engineering CE**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Mastering basic concepts, postulates and methods of electrostatics, magnetostatics and electrical circuits. Describing behavior of electromagnetic circuits' main components and analysis of electrical circuits.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Describe and apply basic laws of electrostatics. Define and use basic electric quantities. Apply fundamental laws and methods of DC circuits. Describe and apply basic laws of magnetostatics. Analyse AC circuits. Organize and conduct electric measurements.							
1.4. Course content							
Electrostatics - basic concepts and laws. Dielectric materials. Basic concepts and laws of DC circuits. DC circuit analysis - methods and theorems. Magnetostatics - basic concepts and laws. Magnetic materials and circuits. Basic concepts and laws of AC circuits.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity, studying.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	2	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	0.5
Portfolio							
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							
Course attendance, activity, continuous knowledge testing (two mid-term exams), laboratory exercises, written and oral exam.							

1.10. Assigned reading (at the time of the submission of study programme proposal)

Pinter, V.: Fundamentals of electrical engineering – part I, Tehnička knjiga, Zagreb,1989, (in Croatian)
Pinter, V.: Fundamentals of electrical engineering – part II, Tehnička knjiga, Zagreb,1989, (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Đurović, G.: Electrical engineerging I, Školska knjiga, Zagreb, 2004. , (in Croatian)
Đurović, G.: Electrical engineerging II, Školska knjiga, Zagreb, 2004. , (in Croatian)
Felja, I., Koračin, D.: A collection of assignments and solved examples from fundamentals of electrical engineering, part 1., Školska knjiga, Zagreb, 1991. (in Croatian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Pinter, V.: Fundamentals of electrical engineering – part I, Tehnička knjiga, Zagreb, 1989. (in Croatian)	5	82
Pinter, V.: Fundamentals of electrical engineering – part I, Tehnička knjiga, Zagreb, 1989. (in Croatian)	5	82

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Electronics**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Student is able to understand and describe physical characteristics of semiconductor components and then use their appropriate models for analysis and design of basic electronic digital circuits.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Describe the properties of semiconductors: type, charge carriers, the life time of charge carriers, generation-recombination processes, quasi-neutrality and thermal equilibrium. Describe and analyze the physical events and the working principles, describe and analyze models of electronic elements for small signals. Apply recombination and optical generation processes when describing the work of optoelectronic components: LEDs, photodiodes. Define parameters of incremental linearized models of electronic elements (pn diode, bipolar transistor, field-effect transistors JFET and MOSFET) for small signals in dependence on the known structure, the dimensions and the applied voltage. Differentiate incremental linearized models of electronic elements for small signals at low and high frequencies. Describe the voltage and current gains of bipolar and MOSFET transistors. Apply pn diode and field-effect transistor in digital circuits.							
1.4. Course content							
The electrical properties of semiconductors. Physical and electrical properties of semiconductor PN junctions, diodes, bipolar transistors, unipolar transistors. Correlation between electrical properties of semiconductor devices with physical processes in them. Development of incremental models of semiconductor components and understanding the uses and limitations of various models. The use of incremental models of semiconductor devices in the analysis and design of bipolar transistors and field-effect transistors, with an emphasis on MOS devices. Use of incremental models for analysis and design of digital circuits, linear differential amplifiers and other integrated circuits.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☒ long distance education ☐ fieldwork			☒ individual assignment ☒ multimedia and network ☒ laboratories ☐ mentorship ☐ other			
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, activity, homework, studying.							
1.8. Evaluation of student's work							
Course	2	Activity/Participation	0.5	Seminar paper	1	Experimental	1

attendance						work	
Written exam	1	Oral exam		Essay		Research	
Project	0.5	Sustained knowledge check	1	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, project work, continuous knowledge testing (two mid-term exams), written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

P.Biljanović, Semiconductor Electronics' Elements, Školska knjiga Zagreb, 2004. (in Croatian)
J. Šribar, J. Divković-Pukšec, Electronics' Elements, problem collection, I i II part, Element, Zagreb, 1996. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

S.M.Sze, Physics of Semiconductor Devices, New Jersey: J. Wiley &Sons, Inc. Publication, 2007.
A.S.Sedra, K.C. Smith, Microelectronic Circuits, 5th edit, N. York, Oxford, Uni. Press, 2004.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
P.Biljanović, Semiconductor Electronics' Elements, Školska knjiga Zagreb, 2004. (in Croatian)	10	60
J. Šribar, J. Divković-Pukšec, Electronics' Elements, problem collection, I i II part, Element, Zagreb, 1996. (in Croatian)	1	60
S.M.Sze, Physics of Semiconductor Devices, New Jersey: J. Wiley &Sons, Inc. Publication, 2007.	1	60
A.S.Sedra, K.C. Smith, Microelectronic Circuits, 5th edit, N. York, Oxford, Uni. Press, 2004.	1	60

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution’s quality assurance system.

Basic description		
Course title	**Embedded Systems**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Understanding of microcontroller architecture and applications. Understanding of embedded systems programming principles and concepts. Practical skills and experience in implementation of hardware and software embedded systems components.							
1.2. Course enrolment requirements							
Computer Architecture, Digital Logic.							
1.3. Expected course learning outcomes							
After the course completion, students should be able to: • Compare and describe embedded systems applications • Define and describe basic on-chip building blocks • Describe and use microcontroller peripheral units • Define and determine embedded systems key parameters • Apply procedures and use tools for embedded systems programming and adjusting • Implement and inspect various algorithms for specific problems solving in embedded systems applications							
1.4. Course content							
Overview of embedded systems applications. Embedded systems processors architecture. Chip building blocks: CPU core, internal and external bus, specific and general purpose I/O, timers/counters, A/D and D/A converters, serial communication units. Units for system operation inspection. Embedded systems programming. External and internal interrupts. Characteristics and problems of embedded systems hardware and firmware development. Practice labs for development of skills in working with software and hardware tools for embedded systems programming and debugging.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity, homework, studying, team project.							
1.8. Evaluation of student's work							
Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	

Written exam		Oral exam		Essay		Research	1.5
Project	1	Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Lab quizzes, mid-term exams, final project

1.10. Assigned reading (at the time of the submission of study programme proposal)

Catsoulis J.: Designing Embedded Hardware, O'Reilly Media; Second Edition edition (May 1, 2005)

Datasheet for used microcontrollers and electronic components

Lecture notes

1.11. Optional / additional reading (at the time of proposing study programme)

Ball S.: Embedded Microprocessor Systems: Real World Design, Newnes; 3 edition (December 2, 2002)

Williams T.: The Circuit Designer's Companion, Second Edition (EDN Series for Design Engineers), Newnes; 2 edition (January 4, 2005)

Horowitz P., Hill W.: The Art of Electronics, Cambridge University Press; 2 edition (July 28, 1989)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Designing Embedded Hardware	0	25

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution’s quality assurance system.

Basic description		
Course title	**Energy Sources**	
Study programme	**Undergraduate University Study of Computing**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	45+0+0

1. COURSE DESCRIPTION

1.1. Course objectives

Obtaining theoretical knowledge in the field of energy engineering. Acquiring the basic knowledge required for attending lectures in the field of thermal and energy engineering.

1.2. Course enrolment requirements

Basic knowledge of thermodynamics.

1.3. Expected course learning outcomes

Describe the energy conversion and compare conventional energy sources. Describe ways of electricity production. Describe the use of nuclear energy and interpret the operation of nuclear power station. Define and describe the types of renewable energy sources. Describe the basic characteristics of hydro power usage. Describe the basic characteristics and ways to use the solar energy. Describe the basic characteristics of wind energy. Describe the basic characteristics of geothermal energy and biomass energy. Describe and compare ways of using environmental heat by heat pumps. Describe how to obtain and utilize the hydrogen as an energy source. Define and describe the basic principles of energy planning and energy policy.

1.4. Course content

World energy consumption. Conventional energy sources: coal, oil, natural gas. Energy conversion. Electrical energy. Nuclear power. Renewable energy sources. Energy from water: rivers and lakes, wave power. Solar energy: solar thermal energy, photovoltaic. Wind power. Geothermal energy. Biomass. Heat of environment - heat pumps as renewable energy systems. Hydrogen and fuel cells: technology and usage. Energy planning. Energy policy.

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☒ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		

1.7. Student's obligations

Course and fieldwork attendance, seminar work, studying.

1.8. Evaluation of student's work

Course attendance	1.5	Activity/Participation		Seminar paper	0.5	Experimental work	
Written exam		Oral exam	1	Essay		Research	
Project		Sustained knowledge	1	Report		Practice	

		check					
Portfolio		Homework					

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course and fieldwork attendance, continuous knowledge testing (two mid-term exams), seminar work, written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Udovičić, B.: Energy Engineering, Školska knjiga Zagreb, 1993. (in Croatian)
Knapp, V.: New Energy Sources, Školska knjiga Zagreb, 1993. (in Cropatian)
Several authors: Renewable Energy Sources, Energetika marketing, Zagreb, 2002. (in Croatian)
World Energy Council – World Energy Resources – 2016, www.worldenergy.org/wp-content/uploads/2016/10/World-Energy-Resources-Full-report-2016.10.03.pdf" i „El-Vakil, M.: Power plant technology, Mc Graw Hill Book Company, 1988.

1.11. Optional / additional reading (at the time of proposing study programme)

Duffie, J.A., Beckmann, W.A.: Solar Engineering of Thermal Processes, John Wiley & Sons, NY, 1991.
Granić, G., ... : National Energy Programme, EIHP, Zagreb, 1998. (in Croatian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Udovičić, B.: Energy Engineering, Školska knjiga Zagreb, 1993. (in Croatian)	1	62
Knapp, V.: New Energy Sources, Školska knjiga Zagreb, 1993. (in Cropatian)	1	62
Several authors: Renewable Energy Sources, Energetika marketing, Zagreb, 2002. (in Croatian)	0	62
World Energy Council – World Energy Resources – 2016, www.worldenergy.org/wp-content/uploads/2016/10/World-Energy-Resources-Full-report-2016.10.03.pdf" i „El-Vakil, M.: Power plant technology, Mc Graw Hill Book Company, 1988.		62

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Energy Systems**	
Study programme	**Undergraduate University Study of Computing**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION		
1.1. Course objectives		
Acquisition of theoretical knowledge and develop the skills needed to solve technical problems in the design phase, construction and management of energy systems. Developing competencies for project management in the energy sector.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Describe the changes of the working fluid states in energy processes. Draw diagrams of state changes in energy processes. Define and analyze energy and exergy losses in energy processes. Calculate the energy losses and efficiency of the process. Calculate the size of the main energy processes. Develop a basic scheme of energy systems. Define the basic operating parameters and sizes of power systems. Analyze and explain the influential parameters of energy processes. Calculate and explain the operating costs of power plants. Describe ways of increasing the efficiency of energy systems. Describe the sources and ways to reduce environmental pollution in energy plants.		
1.4. Course content		
Thermodynamic fundamental of energy systems. Main characteristics of heat energy. Main characteristics of electrical energy. Efficiency of energy processes. Energy conversion efficiency. Energy systems with the steam process (Clausius – Rankine). Influencing factors on efficiency of steam energy systems. Processes in nuclear power plants. Main parts of nuclear power plant. Types of nuclear power plants. Comparison of nuclear and conventional power plant. Energy systems with gas-turbine process (Joule - Brayton). Efficiency of Joule-Brayton's process. Efficiency improving of gas-turbine process. Combined energy systems. Gas-turbine systems for aero-jet driving. Cogeneration energy plants. Energy system with MHD generator. Energy systems with fuel cells. Techno-economical analysis and comparison of cogeneration systems. Economical analysis of energy plants. Auxiliary systems of energy plants. Environment protection in energy plants. Economic production and rational use of energy.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		

Course attendance, activity, homework, studying.

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.75	Oral exam		Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio		Homework	0.25				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, continuous knowledge testing (2 mid-term exams), written or oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Prelec, Z.: Energetics in process industry (book), Školska knjiga Zagreb, 1994. (in Croatian language)

1.11. Optional / additional reading (at the time of proposing study programme)

El-Vakil, M.: Power Plant Technology, Mc Graw Hill Book Company, 2002.
Reay, D., Wright, A.: Inovation for Energy Efficiency, Pergamon Press, 2013.
Nag, P.K.: Power Plant Engineering 4e, Mc Graw Hill Education, 2014.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Prelec, Z.: Energetics in process industry (book), Školska knjiga Zagreb, 1994. (in Croatian language)	10	150

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's system of quality assurance.

Basic description		
Course title	**English Language I**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	3
	Number of hours (L+E+S)	15+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Students should be able to use general purpose English as well as technical jargon at the elementary level according to the Common European Framework of Reference for Languages (up to B1 level).							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Students should be able to use general English as well as technical English at the elementary level according to the Common European Framework of Reference for Languages (up to B1 level). They should be able to compare general with technical English on the basis of selected texts and topics. Recognize and explain grammatical structures and principles typical of the professional jargon from selected texts/examples. Implement grammatical structures and aspects in written and oral exercises. Recognize terminology, key words and/or information in selected texts as well as differentiate and analyse relevant elements in them. Describe and interpret accurately simple diagrams, charts, figures and mathematical formulae. Present the advantages and disadvantages in covered units (e.g. engineering profession, information age, etc.). Orally define and explain professional terms covered in texts.							
1.4. Course content							
Topics: Engineering profession. Mathematical expressions and formulae. Information age. The role of the computer. Computer architecture. Types of computers. Buying a computer. Operating Systems. Graphical User Interface. Application Programmes. Presentation skills. Grammatical and language structures: Tenses. Passive. Modals. Articles. Structures for giving advice. Conditional clauses. Signposting phrases.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☒ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Attendance, activity in class, independent learning.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation	0.25	Seminar paper	0.25	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	

Project		Sustained knowledge check	0.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, activity in class, continuous evaluation of knowledge (two tests), seminar paper, written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Velčić Janjetić, E. & Badurina Filipin, A.: *Radni materijal za engleski jezik I* – Računarstvo. 2019.

1.11. Optional / additional reading (at the time of proposing study programme)

Esteras, S. R. & Fabré, E. M.: *Professional English in Use. ICT for Computers and the Internet.* Cambridge University Press 2018.
Esteras, S. R.: *Infotech. English for Computer Users*. Cambridge University Press 2008.
Hill, D.: *English for Information Technology 2*. Pearson Education Limited 2017.
Glendinning E./McEwan J.: *Oxford English for Information Technology* (2. izdanje) Oxford University Press 2006.
Paterson, K. & Wedge, R.: *Oxford Grammar for EAP*. Oxford University Press 2013.
McCarthy, M. & O'Dell, F.: *Academic Vocabulary in Use*. Cambridge University Press 2013.
Powell, M.: *Dynamic Presentations.* Cambridge University Press 2011.

Dignen, B.: *Fifty ways to improve your Presentation skills in English*. Summertown Publishing Limited 2007.

Vince M: *Intermediate Language Practice*, Heinemann Elt, Oxford 1998.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Velčić Janjetić, E. & Badurina Filipin, A.: *Radni materijal za engleski jezik I – Računarstvo*. 2019.	72	72

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution`s Quality Assurance System.

Basic description		
Course title	**English Language II**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	3
	Number of hours (L+E+S)	15+30+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Students should be able to use professional jargon independently, namely communicate with other experts in the field of the engineering profession and in an international environment, at the B2 level of the Common European Framework of Reference for Languages.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Students should be able to use autonomously general English as well as technical English according to the Common European Framework of Reference for Languages (up to B2 level). They should be able to compare general with technical English on the basis of selected texts and topics. Recognize and explain grammatical structures and principles typical of the professional jargon from selected texts/examples. Implement grammatical structures and aspects in written and oral exercises. Recognize terminology, key words and/or information in selected texts as well as differentiate and analyse relevant elements in them. Describe and interpret accurately more complex diagrams, charts and figures. Present the advantages and disadvantages in covered units (e.g. globalisation, electronic communication, etc.). Express one's point of view in oral and written form and evaluate solutions of given problems.		
1.4. Course content		
Topics: Networks. The Internet. Electronic communication. Netiquette. Choosing an Internet service provider. Globalisation. The World Wide Web. Websites and webpages. Technology and its influence on society. Communications Systems. Data Security. Electronics and automation. People in Computing. Recent Developments in IT. Presentation skills. Grammatical and language structures: Tense Revision and Sequence of Tenses. Relative clauses. Present and Past Participle. Adjectives and comparison of adjectives. Gerund/to + Infinitive. Prefixes and suffixes. Word Formation. Discourse markers and expressions of transition.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☒ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		
Attendance, activity in class, independent learning.		
1.8. Evaluation of student's work		

Course attendance	1.5	Activity/Participation	0.25	Seminar paper	0.25	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	0.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, activity in class, continuous evaluation of knowledge (two tests), seminar paper, written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Velčić Janjetić, E. & Badurina Filipin, A.: *Radni materijal za engleski jezik II* – Računarstvo. 2020.

1.11. Optional / additional reading (at the time of proposing study programme)

Esteras, S. R. & Fabré, E. M.: *Professional English in Use. ICT for Computers and the Internet.* Cambridge University Press 2018.
Esteras, S. R.: *Infotech. English for Computer Users*. Cambridge University Press 2008.
Hill, D.: *English for Information Technology 2*. Pearson Education Limited 2017.
Glendinning E./McEwan J.: *Oxford English for Information Technology* (2. izdanje) Oxford University Press 2006.
Paterson, K. & Wedge, R.: *Oxford Grammar for EAP*. Oxford University Press 2013.
McCarthy, M. & O'Dell, F.: *Academic Vocabulary in Use*. Cambridge University Press 2013.
Powell, M.: *Dynamic Presentations.* Cambridge University Press 2011.

Dignen, B.: *Fifty ways to improve your Presentation skills in English*. Summertown Publishing Limited 2007.
Vince M: *Intermediate Language Practice*, Heinemann Elt, Oxford 1998.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Velčić Janjetić, E. & Badurina Filipin, A.: *Radni materijal za engleski jezik II – Računarstvo*. 2020.	72	72

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution`s Quality Assurance System.

Basic description		
Course title	**Environment Protection**	
Study programme	**Undergraduate University Study of Computing**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	45+0+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Define the basic concepts of ecology and environmental protection. To analyze the impact of the technological aspects of the environment. Describe the processes that affect pollution. Compare technologies and their impact. Distinguish the development of sustainable development. Argue the importance of sustainable development. Describe the current problems of global pollution. Distinguishing the basic concepts of ecology and environmental protection. Understanding the impact of technology on the environment.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Analyzing the impact of the different engineering aspects of the environment based on research. Developing the ability to work within an interdisciplinary team and communicating with experts in other fields. Developing the ability to create and project management in the field of environmental protection.							
1.4. Course content							
Introduction to the environment, the subject of ecology. Soil, atmosphere, water and sea. Interaction with the environment. Monitoring of the environment, particularly in the marine environment. Sampling from the environment. Measurement methods of analytical chemistry. Physical methods of measurement. Fluorescent methods. Basics of modeling processes in the environment. Environmental protection. Improving the environment. Ocean Engineering. Marine technology objects and its interaction with the environment. International conventions and norms.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☒ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Attendance, activity, class participation, research and search the literature sources, making self-employment, consulting, independent learning, presentation of work.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	0.5	Oral exam	1	Essay		Research	1
Project		Sustained knowledge check		Report		Practice	
Portfolio		Homework					

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, continuous knowledge testing, written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Briški, F.: Zaštita okoliša, Fakultet kemijskog inženjerstva i tehnologije, Zagreb, 2016.
Črnjar, M.: Ekonomika i politika zaštite okoliša, Ekonomski fakultet, Rijeka, 2002.

1.11. Optional / additional reading (at the time of proposing study programme)

Dobrinić, J., Bonato, J.: Physics, Pomorski fakultet, Rijeka, 2009. (in Croatian)
Reible, D. D.: Fundamentals of Envirenmental Engineering, Springer, London, 1999.
Matas, M., Simonić, V., Šobot, S.: Protection of the Environment today for tomorrow, Školska knjiga, Zagreb, 1989. (in Croatian)
Pandey, G. N., Carney, G. C.: Envirenmental Engineering, Tata McGraw-Hill, New Delhi, 1989

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Briški, F.: Zaštita okoliša, Fakultet kemijskog inženjerstva i tehnologije, Zagreb, 2016.	1	
Črnjar, M.: Economics and Environmental Policy, Ekonomski fakultet, Rijeka, 2002. (in Croatian)	1	

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Final Work**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	10
	Number of hours (L+E+S)	-

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
The Final Work is an individual assignment and verification of student expertises, which should show the appropriate level of engineering skills for individually solving specific professional task.							
1.2. Course enrolment requirements							
Enrolled course from which the Final Work is selected.							
1.3. Expected course learning outcomes							
Apply acquired knowledge, expertises and skills of the content of Final Work associated course. Solve practical task. Acquire competence for individually solving specific professional task.							
1.4. Course content							
The content of the Final Work is based on the application of acquired knowledge from educational programs at the undergraduate university studies. Final thesis can be specified from a particular course specific professional content and exceptionally from course that belongs to the group of shared content, when it represents a broader entity with a particular course specific content of the studies. Student enrollers the Final Work by enrolling the last semester. Thesis of the Final Work is establishes by Commission for Final Works, based on suggestion of teacher who will mentor the Final Work.							
1.5. Teaching methods	☐ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Attending the consultation, individually solving task and writing the Final Work report.							
1.8. Evaluation of student's work							
Course attendance		Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio		Individual task solving	8	Final work in written form	2		
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

Assesses and evaluates the accuracy and completeness of a given task solving process, the Final Work written report, and its oral presentation		
1.10. Assigned reading (at the time of the submission of study programme proposal)		
1.11. Optional / additional reading (at the time of proposing study programme)		
1.12. Number of assigned reading copies with regard to the number of students currently attending the course		
Title	*Number of copies*	*Number of students*
1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences		
Through the Institution's quality assurance system.		

Basic description		
Course title	**Introduction into Finite Element Method**	
Study programme	**Undergraduate University Study of Computing**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	15+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Obtaining theoretical knowledge and develop skills to solve practical problems with the finite element analysis of solids.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define stiffness matrix, load vector and finite element equation for basic types of finite elements. To assembly global stiffness matrix, displacement vector and load vector. To apply boundary conditions on the global stiffness matrix. Discretize structure for practical problems. Using finite element method calculate displacement and stress fields for linear structures, planar structures and solids. To asses validity of obtained results.							
1.4. Course content							
Introduction. Application of FEM in solid mechanics. Introduction to the forming of finite element stiffness matrix, load vector and finite element equation. Local and global coordinate systems. Boundary conditions. Structure equation. Basic application in rods, beams, trusses, frames, plates and bodies.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other			
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, activity, homework, seminar paper, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	1	Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio		Homework	0.5				
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

Course attendance, activity, homework, seminar paper), written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Brnić, J., Čanađija, M.: "Finite element analysis of solids", Fintrade, Rijeka, 2009. (in Croatian)
Brnić, J.: "Elastomechanics and plastomechanics", Školska knjiga, Zagreb, 1996. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Bathe, K. J.: "Finite Element Procedures", Prentice Hall, Englewood Cliffs, 1996.
Zienkiewicz, O. C., Taylor, R. L.: "The Finite Element Method", Vol. 1, Butterworth-Heinemann, 2000.
Cook, R. D., Malkus, D. S., Plesha, M. E., Witt, R. J.: "Concepts and Applications of Finite Element Analysis", John Wiley & Sons, 2001.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Brnić, J., Čanađija, M.: "Finite element analysis of solids", Fintrade, Rijeka, 2009. (in Croatian)	10	1
Brnić, J.: "Elastomechanics and plastomechanics ", Školska knjiga, Zagreb, 1996. (in Croatian)	13	1

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Introduction to Artificial Intelligence**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Obtaining theoretical knowledge and developing skills to solve practical problems in the field of artificial intelligence. Acquiring the knowledge required for independent use of computing systems and software packages for solving common problems.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Recognise a problem that can be solved using artificial intelligence techniques and apply them for this purpose. Be acquainted with state space search, decision making under (un)certainty and graphical models.

1.4. Course content

Introduction to artificial intelligence and application examples. State space search, informed search and adversarial search. Markov decision process. Reinforcement learning. Probability and inference. Bayesian network. Markov model and hidden Markov model.

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		

1.7. Student's obligations

Course attendance, activity in class, studying.

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, midterm exams, exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Russell, S.J., Norvig P., Artificial Intelligence: A Modern Approach, 3rd ed., Pearson Education Limited, 2016
1.11. Optional / additional reading (at the time of proposing study programme)
Sutton, Richard S., and Andrew G. Barto. Reinforcement learning: An introduction. MIT press, 2018. Poole, David L., and Alan K. Mackworth. Artificial Intelligence: foundations of computational agents. Cambridge University Press, 2010.
1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Russell, S.J., Norvig P., Artificial Intelligence: A Modern Approach, 3rd ed., Pearson Education Limited, 2016	3	60

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences
Through the Institution's quality assurance system.

Basic description		
Course title	**Introduction to Guidance and Control of Marine Vehicles**	
Study programme	**Undergraduate University Study of Computing**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Mastering the methods and techniques of mathematical modelling and computer simulation of various technical processes. Modelling and simulation for guidance and control of marine vehicles.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
To adopt the basic principles of creating mathematical models of various dynamic systems. To master basic use of Matlab & Simulink simulation software for model creation, simulation and system analysis. To model the system using differential equations and transfer functions. To transform the mathematical model of the system into a graphical representation using block diagrams. To transform the system using the state space representation. To linearize nonlinear systems. To distinguish reference frames for marine vehicle control. To model kinematics and dynamics of marine vehicles. To model environmental loads. To model thrusters for control purposes. To explain principles of guidance, navigation and control of marine vehicles. Do design simple controllers and observers. To simulate created models and interpret the results.							
1.4. Course content							
Introduction to modelling. The types and properties of models. Methods of determining the mathematical models of the systems. Time and frequency domain. First principle system modelling with differential equations. Transfer functions. State space representation. Simulation and system response. Numerical integration methods for systems' simulations. Data driven modelling and empirical models. Types of marine vehicles from a modelling and control point of view. Degrees of freedom. Reference frames. Kinematics and dynamics of marine vehicles. Environmental loads. Thrusters. Guidance and control systems. Sensors. Filtering and estimation. Autopilots. Dynamic positioning systems.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, work on laboratory exercises, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, work on laboratory exercises, continuous knowledge testing (three mid-term exams), written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

D.J. Cloud: Applied Modelling and Simulation: An Integrated Approach to Development and Operation, McGraw-Hill, 1998.
N.M.Karayanakis: Advanced System Modelling and Simulation With Block Diagram Languages, CRS Press, 1995.
Kluever, C.A. (2016). Dynamic Systems: Modeling, Simulation, and Control. John Wiley & Sons, Ltd., UK.
Fossen, T.I. (2011). Handbook of Marine Craft Hydrodynamics and Motion Control. John Wiley & Sons, Ltd., UK.

1.11. Optional / additional reading (at the time of proposing study programme)

A.Cavallo, R. Sctola, F. Vasca: Using Matlab, Simulink and Control System Tool Box: A Practical Approach, Prentice Hall, 1996.
de Silva, C.W. (2018). Modeling of Dynamic Systems with Engineering Applications. CRC Press, USA.
Klee, H., Allen, R. (2017). Simulation of Dynamic Systems with MATLAB and Simulink. 3rd Ed. CRC Press, USA.
Perez, T. (2005). Ship Motion Control - Course Keeping and Roll Stabilisation Using Rudder and Fins. Springer, Germany.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
D.J. Cloud: Applied Modelling and Simulation: An Integrated Approach to Development and Operation	-	20
N.M.Karayanakis: Advanced System Modelling and Simulation With Block Diagram Languages	-	20
Kluever, C.A. (2016). Dynamic Systems: Modeling, Simulation, and Control. John Wiley & Sons, Ltd., UK.	1	20
Fossen, T.I. (2011). Handbook of Marine Craft Hydrodynamics and Motion Control. John Wiley & Sons, Ltd., UK.	1	20

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Introduction to Object Oriented Programming**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Basic knowledge and skills for object oriented programming.							
1.2. Course enrolment requirements							
Programming I, Programming II.							
1.3. Expected course learning outcomes							
Understand principles of object oriented paradigm and the concepts of class, object, interface and exceptions. Apply the concepts of abstraction, encapsulation of data, inheritance and polymorphism for software development, software documentation, debugging and error fixing based on object oriented design principles and usage of integrated development frameworks.							
1.4. Course content							
Object oriented programming using Java. Basic principles of object oriented programming, class and object, access control, inheritance and polymorphism, abstraction and interfaces, exceptions, input-output data streams, testing, memory, documentation.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity, studying, exercising.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	2.5	Report		Practice	
Portfolio							
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							
Course attendance, continuous knowledge testing, written exam.							

1.10. Assigned reading (at the time of the submission of study programme proposal)

Herbert Schildt, Java: The Complete Reference, Tenth Edition, McGraw Hill Professional, 2017.
Java Tutorial
Java API

1.11. Optional / additional reading (at the time of proposing study programme)

Marko Čupić, Programiranje u Javi, FER, 2015
G. Booch, J. Rumbaugh, I. Jacobson, The Unified Modeling Languague User Guide, Addison – Wesley, 1998.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Java Tutorial, available at http://docs.oracle.com/javase/tutorial/index.html	Free access	
Java documentation, available at https://docs.oracle.com/javase/8/	Free access	

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Introduction to Physics**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Students should gain the theoretical knowledge in general physics and develop an ability to differentiate the concepts of classical and modern physics. They should be able to properly comprehend important physical phenomena in mechanical and modern physics and their application in engineering field.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Expected course learning outcomes area to distinct the fields of classical and modern physics, define fundamental physical quantities and units of measure, and should learn how to develop and discuss simple physical problems. They should be able to identify principles of mechanics, electromagnetism, optics, wave-particle duality, radiation and its interaction with matter. Students should be able to apply gained knowledge to problem-solving tasks.							
1.4. Course content							
Kinematics. Dynamics. Work and energy. Oscillations. Mechanical waves. Electromagnetic oscillations. Electromagnetic waves. Geometric optics. Physical (wave) optics. Modern physics.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, activity, homework, studying.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio							
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

Course attendance, activity, continuous knowledge testing, written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Dobrinić, J.: Physics (waves, optics, structure of matter), Tehnički fakultet, Rijeka, 1998. (In Croatian)
Dobrinić, J.; Mandić, L.: Solved examples in Physics I, Tehnički fakultet, Rijeka, 2001. ili 2010. (in Croatian)
Glavan, N., Mandić, L., Dobrinić, J.: Solved examples in Physics II, Tehnički fakultet, Rijeka, 2004. (In Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Horvat, D.: Physics I – Meachanics and Heat, Hinus, 2005. (in Croatian)
Horvat, D.: Fizika II – Oscillations, Waves, Electromagnetism, Optics and Introduction to Modern Physics, Neodidakta, Zagreb, 2011. (in Croatian)
Henč-Bartolić, V. i sur.: Waves and Optics, Školska knjiga, Zagreb, 1998. . (in Croatian)
Dobrinić, J., Bonato, J.: Physics , Pomorski fakultet, Rijeka, 2010. . (in Croatian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Dobrinić, J.: Fizika (valovi, optika, struktura tvari), Tehnički fakultet, Rijeka, 1998. . (in Croatian)	12	72
Dobrinić, J.; Mandić, L.: Zbirka riješenih primjera iz Fizike I, Tehnički fakultet, Rijeka, 2001. ili 2010. . (in Croatian)	22	72
Glavan, N., Mandić, L., Dobrinić, J.: Zbirka riješenih primjera iz Fizike II, Tehnički fakultet, Rijeka, 2004. . (in Croatian)	13	72

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Mathematics for Engineers CE**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Acquiring basic knowledge and skills in Fourier analysis, Laplace transforms, and combinatorics. Understanding of recursive relations and the structure of their solutions. Acquiring basic notions from graph theory, understanding of the selected algorithms from the graph theory. Acquiring basic notions from probability and descriptive statistics and understanding of the application in practice.							
1.2. Course enrolment requirements							
Mathematics I, Mathematics II.							
1.3. Expected course learning outcomes							
Define and correctly interpret basic notions from Fourier analysis and Laplace transforms, specify basic properties of Fourier and Laplace transformations. Compute Fourier series, Fourier transforms and Laplace transforms of some functions, determine solutions of differential equations by using Laplace transforms. Define basic combinatorial structures and apply them in practical problems. Determine the solutions of recursive relations and understand their properties. Define basic notions from graph theory. Explain some selected algorithms from graph theory and apply them correctly to practical problems. Define basic concepts from descriptive statistics and analyze the collection of statistical data. Define and interpret the concept of random events, operations with events and the probability of random events. Calculating the probability of certain events. Express and understand Bayes' theorem and apply the Bayesian formula.							
1.4. Course content							
Fourier series. Fourier integral and Fourier transformation. Laplace transformation. Basic properties and application. Discrete mathematics: Introduction to combinatorics. Recursive relations. Basic notions from graph theory. Basics of probability: Descriptive statistics. Random events, probability of random events, Bayesian formula							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, activity, mid-term exams, tests.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	

Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, continuous knowledge testing (mid-term exams, quizzes, tests), written exam, oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Elezović, N.: Fourier series and integral, Laplace transform, (FER) Biblioteka Bolonja, Element, 2006. (in Croatian)
Žubrinić D.: Introduction to discrete mathematics, Biblioteka Bolonja, Element, Zagreb 2006. (in Croatian)
Pavčević M., Introduction to graph theory, Biblioteka Bolonja, Element, Zagreb 2006. (in Croatian)
Elezović, N.: Discrete probability, Element, Zagreb, 2008. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Črnjarić-Žic N.: Internal lecture notes about engineering statistics.
Kreyszig, E.: Advanced Engineering Mathematics, John Wiley & Sons, Inc., 1993.
Črnjarić-Žic N., Štefan Trubić M., Internal lecture notes about Laplace transforms.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Elezović, N.: Fourier series and integral, Laplace transform, (FER) Biblioteka Bolonja, Element, 2006. (in Croatian)	10	50
Žubrinić D.: Introduction to discrete mathematics, Biblioteka Bolonja, Element, Zagreb 2006. (in Croatian)	4	50
Pavčević M., Introduction to graph theory, Biblioteka Bolonja, Element, Zagreb 2006. (in Croatian)	4	50
Elezović, N.: Discrete probability, Element, Zagreb, 2008. (in Croatian)	8	50

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Mathematics I**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+45+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Acquiring basic knowledge and skills in linear algebra and calculus.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define and correctly interpret basic notions in linear algebra, single-variable functions, and single-variable calculus. State and correctly interpret basic results in linear algebra and single-variable calculus. Carry out basic computations with matrices, vectors, determinants; determine solutions of systems of linear equations. Apply vector operations to compute some areas, volumes; determine equations of planes and lines. Compute limit values and derivatives of single-variable functions. Apply integration rules and evaluate indefinite and definite integrals of some function.							
1.4. Course content							
Solving systems of linear equations. Matrices. Determinants. Vectors and analytical geometry in space. Single-variable functions. Limit values and continuous functions. Elementary functions. Derivatives. Indefinite and definite integrals.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments	**-**						
1.7. Student's obligations							
Course attendance, activity/participation, studying.							
1.8. Evaluation of student's work							
Course attendance	3	Activity/Participation		Seminar paper		Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	2.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity/participation, sustained knowledge check (mid-term exams, tests), and written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Slapničar I.: Mathematics 1, Sveučilište u Splitu FESB, Split 2002, online book (in Croatian)
Slapničar I.: Mathematics 1 – Workbook, Sveučilište u Splitu FESB, Split 2010, online book , (in Croatian)
Jurasić, K.-Dražić, I.: Mathematics I, Workbook, Tehnički fakultet, Rijeka, 2008. (in Croatian)
Štefan Trubić M., Sopta L., Črnjarić-Žic N., Maćešić S.: Mathematics, a collection of tasks: integrals, ordinary differential equations, functions of several variables, Rijeka 2012, (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Elezović N., Aglić A., Linear algebra - a collection of tasks, Element, Zagreb 1999 (in Croatian)
Zill D., Wright W., Calculus: early transendentals, 4th edition, Jones and Bartlett publishers, 2011.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Slapničar I.: Mathematics 1, Sveučilište u Splitu FESB, Split 2002, online book (in Croatian)	72	72
Slapničar I.: Mathematics 1 – Workbook, Sveučilište u Splitu FESB, Split 2010, online book , (in Croatian)	72	72
Jurasić, K.-Dražić, I.: Mathematics I, Workbook, Tehnički fakultet, Rijeka, 2008. (in Croatian)	18	72
Štefan Trubić M., Sopta L., Črnjarić-Žic N., Maćešić S.: Mathematics, a collection of tasks: integrals, ordinary differential equations, functions of several variables, Rijeka 2012, (in Croatian)	20	72

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Mathematics II**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+45+0

1. COURSE DESCRIPTION

1.1. Course objectives

Acquiring basic knowledge and skills in application of calculus for single-variable functions, calculus for multi-variable functions, and ordinary differential equations.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Correctly interpret and apply single-variable calculus. Define and correctly interpret basic notions of multi-variable calculus and ordinary differential equations (ODE). Compute derivatives and some integrals of multi-variable functions, and solutions of some ODE. Compute polynomial approximations; find local extremes of single-variable and multi-variable functions by applying differential calculus. Compute some lengths, areas, and volumes by applying integral calculus. Model vibrations in simple mechanical and electrical systems by applying ODE.

1.4. Course content

Applications of single-variable calculus.
Multi-variable functions. Partial derivatives, differential calculus for two-variable functions and applications (approximations, local extremes, optimal control problems).
Double integral and applications.
First order ODE. Higher order ODE.
Systems of ODE. Applications of ODE.

1.5. Teaching methods		
	☒ lectures	☐ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☒ exercises	☐ laboratories
	☐ long distance education	☐ mentorship
	☐ fieldwork	☐ other

1.6. Comments	-

1.7. Student's obligations

Course attendance, activity/participation, studying.

1.8. Evaluation of student's work

Course attendance	3	Activity/Participation		Seminar paper		Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	2.5	Report		Practice	

Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity/participation, sustained knowledge check (mid-term exams, tests), and written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Slapničar I.: Mathematics 2, Sveučilište u Splitu FESB, Split 2002, online book, (in Croatian)
Štefan Trubić M., Sopta L., Črnjarić-Žic N., Maćešić S.: Mathematics, a collection of tasks: integrals, ordinary differential equations, functions of several variables, Rijeka 2012, (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Kreyszig E., Advanced Engineering Mathematics, John Wiley & Sons, Inc., 1993.
Zill D., Wright W., Calculus: early transendentals, 4th edition, Jones and Bartlett publishers, 2011.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Slapničar I.: Mathematics 2, Sveučilište u Splitu FESB, Split 2002, online book, (in Croatian)	72	72
Štefan Trubić M., Sopta L., Črnjarić-Žic N., Maćešić S.: Mathematics, a collection of tasks: integrals, ordinary differential equations, functions of several variables, Rijeka 2012, (in Croatian)	20	72

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Modelling of Process Information Systems**	
Study programme	**Undergraduate University Study of Computing**	
Course status	optional	
Year	**2. or 3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Acquisition of theoretical knowledge and developing skills for modeling of process information for complex technical systems and electric facilities.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Describe and explain the modular structure of technical systems. Analyze the structure of parameters in electric identification function. Define and distinguish between models of process information in real-time power system. Explain and interpret the sources of process information of technical systems. Describe and correctly interpret the structure of process information in long-distance communication. Design and create UML diagrams for different systems. Distinguish between a standard means of communication and connectivity of open systems. Correctly explain the importance of standardization and application in modeling of process information systems. Define and describe the application of the SCL language. Explain and justify the equipment and software in the control centers of power system.		
1.4. Course content		
The modular structure of technical systems. Structure of variables in the plant identification function. Display variables in multidimensional vector space. The application of object-oriented approach in modeling. Technological-functional model of process information. Device design of process information. The structure of process information in remote communication between the facilities and control centers. Application of the common data model (CIM). Abstract model of real devices in the facilities. Application program interface management system (EMS-API). Standardization of communication and process information of substation automation. Models of process information in an environment of new technologies and related standards. Open System Interconnection (OSI). Application of UML diagrams for modeling process information. Application of SCL language (based on XML) for configuring and parameterization of intelligent electronic devices (IED). The application of multi-agent system.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☒ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		
Course attendance, activity, preparation of seminar papers, studying.		

1.8. Evaluation of student's work

Course attendance	1.5	Activity/Participation		Seminar paper	1.5	Experimental work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, seminar paper, written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Šimunić, J.: Lectures, 2012. (in Croatian)
Shahidehpour M., Wang Y., Communication and Control in Electric Power Systems, Wiley & Sons, 2003..

1.11. Optional / additional reading (at the time of proposing study programme)

Strauss, C.: Practical Electrical Network Automation and Communication Systems, Elsevier, 2003.
Brand, K.P., Lohmann, V., Wimmer, W.: Substation Automation Handbook, UAC, 2003.
Rehtanz, C.: Autonomous systems and intelligent agents in power system control and operation, Springer; 1 ed, 2003.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Šimunić, J.: Lectures, 2012. (in Croatian)	1	14
Shahidehpour M., Wang Y., Communication and Control in Electric Power Systems, Wiley & Sons, 2003..	1	14

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Operating Systems**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**			
1.1. Course objectives			
Acquiring fundamental knowledge of modern operating systems.			
1.2. Course enrolment requirements			
None.			
1.3. Expected course learning outcomes			
Upon a completion of the course, students will: understand which are the basic operating system components and provided services; recognize concepts common to modern operating systems; describe the relation between the hardware and the operating system; understand process management; use inter-process communication techniques; describe memory management; discuss advantages and disadvantages of virtualization; use command-line interface to access operating system's services; understand basic threats to computer security and common defence practices.			
1.4. Course content			
Introduction to operating systems: history of operating systems, operating system structure, interaction between operating system and hardware. Process management: processes and threads, concurrent execution, scheduling, deadlocks, synchronization. Memory management. Virtual machines. Shells for working with operating systems and shell programming. Operating system security. Examples of installing and configuring operating systems.			
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☒ laboratories ☒ mentorship ☐ other	
1.6. Comments			
1.7. Student's obligations			
Class attendance, homework, studying.			
1.8. Evaluation of student's work			

Course attendance	2	Activity/Participation		Seminar paper	1	Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check	3	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Midterm exams (sustained knowledge check), written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

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1.11. Optional / additional reading (at the time of proposing study programme)

Silberschatz, Galvin, Gagne: Operating System Concepts, Wiley, 8th Ed.
Budin, Golub, Jakobović, Jelenković: Operating Systems (in Croatian)
Tanenbaum: Modern Operating Systems, Prentice Hall, 2008.
Stallings: Operating Systems: Internals and Design Principles, Prentice Hall, 6th Ed.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality insurance system.

Basic description		
Course title	**Organization of Business Systems**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Acquiring theoretical concepts and knowledge of the organization and business economics.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Explain the concept of a business system and raising the business system. Define the basic principles of organization. Define the manageability of systems and information in a business system. Distinguish organizational forms of business systems. Analyze the types of organizational structures. Analyze job evaluation. Distinguish ownership, management and leadership. Distinguish formal from the informal organization. Define the principles of management and leadership. Analyze teamwork. Define business policy. Describe the principles and methods of planning. Define long-term and short-term plans. Define the factory as an economic system. Analyze income and expenses. Know the basic financial statements. Define business effects. Explain the resources of the organization and analyze competitiveness.							
1.4. Course content							
Definition and evolution of business system organization. Organizational forms of business systems. Building a business system. Basic principles of organization. System manageability. Formal and informal organization. Information in the business system. The behavioural approach in organizational theory. Types of organizational structures. Designing a business system organization. Organizational changes. Job evaluation. Property. Management. Leadership. Teamwork. Business politics. Planning. Long-term and short-term business system plans. Factory as an economic system. Revenues and expenses. Profitability threshold. Finance reports. Business effects. Organizational resources and competitiveness.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Attendance, class participation, independent learning.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, class activity, continuous assessment, written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

T. Mikac, M. Ikonić.: Organizacija poslovnih sustava, Tehnički fakultet Sveučilišta u Rijeci, online script in Croatian, Rijeka, 2011.

1.11. Optional / additional reading (at the time of proposing study programme)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Processes of Heat Treatment**	
Study programme	**Undergraduate University Study of Computing**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Student will be familiar with the processes of heat treatment and surface engineering.							
1.2. Course enrolment requirements							
Attended course Materials II.							
1.3. Expected course learning outcomes							
Analyse the basic knowledge related to the heat treatment. Analyse the transformations and basic processes of heat treatment of steel. Analyse the basic processes of heat treatment of non-ferrous metals. Analyse the surface heat treatment processes of alloys. Analyse the processes of surface engineering. Define the processes of heat treatment and surface engineering on the basis of construction and technological requirements.							
1.4. Course content							
Heat treatment of steel: hardening, stress relief, tempering, normalizing. Surface hardening processes: induction (high frequency) hardening, flame hardening. Diffusion treatments: carburizing, nitriding, boronizing. Isothermal tempering of ductile iron. Heat treatment of non-ferrous metal alloys. Nitriding. Plasma carburising, ion carburising. Surface engineering processes. Chemical vapor deposition (CVD). Physical vapor deposition (PVD). Methods for the application of thin layers by spraying technologies: thermal, electric arc, plasma, explosion.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other			
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, homework preparation, preparation for participation in teaching, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	0.5	Experimental work	
Written exam	1	Oral exam		Essay		Research	

Project		Sustained knowledge check	1	Report		Practice	
Portfolio		Homework					

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, sustained knowledge check, preparation of seminars, written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Smoljan, B., Heat treatment of steel, gray and ductile iron castings, Zagreb: Hrvatsko društvo za toplinsku obradbu i inženjerstvo površina, Udžbenici Sveučilišta u Rijeci, 1999. (in Croatian)
Smoljan, B., Fundamentals of heat treatment of steel, Rijeka: Sveučilište u Rijeci, Pedagoški fakultet, 1997. (in Croatian)
Krumes, D., Heat treatment, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod 2000. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Heat Treating, ASM Handbook Vol. 4, ASM International, Materials Park, OH, 1991.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Smoljan, B., Heat treatment of steel, gray and ductile iron castings, Zagreb: Hrvatsko društvo za toplinsku obradbu i inženjerstvo površina, Udžbenici Sveučilišta u Rijeci, 1999. (in Croatian)	4	46
Smoljan, B., Fundamentals of heat treatment of steel, Rijeka: Sveučilište u Rijeci, Pedagoški fakultet, 1997. (in Croatian)	6	46
Krumes, D., Heat treatment, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod 2000. (in Croatian)	1	46

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Professional Practice I**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	-

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Student verifies and complements his own expertise, along with a comprehensive view of the work process.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Apply acquired knowledge and skills from studied courses professional content. Gain working process experience. Develop and further improve competence for solving specific professional engineering problems.		
1.4. Course content		
Industrial practice within Undergraduate University Study of Naval Architecture is carried out individually in work organization that is engaged in the student's field of study, and with activities in accordance with the Industrial Practice Rules and Study Program curriculum. Within such practice, student is familiarized with the corresponding jobs that are studied through programs of education, with the task of verifying and complementing their own expertise, along with a comprehensive view of the work process.		
1.5. Teaching methods	☐ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☒ fieldwork	☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		
Conducting professional practice in duration of 15 working days, or 120 hours, and writing the corresponding report.		
1.8. Evaluation of student's work		

Course attendance		Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Sustained knowledge check		Report	1	Practice	4
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Assesses and evaluates student work and dedication, and written report.		
1.10. Assigned reading (at the time of the submission of study programme proposal)		
1.11. Optional / additional reading (at the time of proposing study programme)		
1.12. Number of assigned reading copies with regard to the number of students currently attending the course		
Title	*Number of copies*	*Number of students*
1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences		
Through the Institution's quality assurance system.		

Basic description		
Course title	**Programming I**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Introduction to basics of hardware and software. Learning about the process of writing and debugging a program. Introduction to programming principles.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Basic use o f Windows and Linux operating system. Understand the software/hardware interface. Apply programming skills to write small programs.							
1.4. Course content							
Introduction to computer science. Information coding : number systems, formats and standards for number presentation. Computer architecture: model of a simple processor, instruction execution, process of program compilation. Introduction to operating systems Windows and Linux. Programming principles. Syntax of a programming language. Loops. Arrays. Functions.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity, homework, continuous knowledge testing , written exam.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	2.5	Report		Practice	
Portfolio							
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							
Lecturing with knowledge checking based on quizies, partial exams and homeworks. Exercises with problems solving and prepearing for final project.							

1.10. Assigned reading (at the time of the submission of study programme proposal)

Darko Grundler: Applied Computing, Graphis Zagreb 2000, ISBN: 953-6647- 03-6. (in Croatian)
Rajko Vulin: From Now we are Programming in C, Turbo C, Školska knjiga, Zagreb 1991. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Kernighan B. W., Ritchie D. M., The C Programming Language, Prentice Hall, Inc., 1988.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Darko Grundler: Applied Computing, Graphis Zagreb 2000, ISBN: 953-6647- 03-6. (in Croatian)	1	50
Rajko Vulin: From Now we are Programming in C, Turbo C, Školska knjiga, Zagreb 1991. (in Croatian)	1	50

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Programming II**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	30+45+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Software development in programming language C.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Apply programming skills to write small programs. Understand principles of software development. Understand the syntax of the C programming language. Understand data types and basic data structures. Apply pointers and dynamic memory allocation. Understand modular program design.							
1.4. Course content							
Program structure. Memory classes. Functions. Recursive functions. Function libraries. Pointers and arrays. Structures. Files.Command line arguments. Programmiing tools configure and make.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☒ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity, homework, continuous knowledge testing , written exam.							
1.8. Evaluation of student's work							
Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	1
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio							
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							
Lecturing with knowledge checking based on quizies, partial exams and homeworks. Exercises with problems solving and prepearing for final project.							
1.10. Assigned reading (at the time of the submission of study programme proposal)							

Rajko Vulin: From Now we are Programming in C, Turbo C, Školska knjiga, Zagreb 1991. (in Croatian)
Kernighan B. W., Ritchie D. M., The C Programming Language, Prentice Hall, Inc., 1988.

1.11. Optional / additional reading (at the time of proposing study programme)

Rajko Vulin: " A collection of solved tasks from C ", Školska knjiga, Zagreb 1995. (in Croatian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Rajko Vulin: From Now we are Programming in C, Turbo C, Školska knjiga, Zagreb 1991. (in Croatian)	1	50
Kernighan B. W., Ritchie D. M., The C Programming Language, Prentice Hall, Inc., 1988.	1	50

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution’s quality assurance system.

Basic description		
Course title	**Quality Assurance**	
Study programme	**Undergraduate University Study of Computing**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

2. **COURSE DESCRIPTION**							
1.1. Course objectives							
The course is designed to provide the student with basic knowledge in quality assurance topics. Through exercises students are introduced with practical application of several course objectives.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
To interpret the meaning and importance of quality assurance. Explain the basic concepts of quality assurance and quality control. Classify quality characteristics of products, processes and services. Quality cost analysis. Interpret basic requirements of ISO 9001 standard. Apply basic quality tools. Assess results of statistical process control. Analyse R%R of measurement system. Measure process reliability and select acceptance sampling.							
1.4. Course content							
Definitions of quality. Quality of products, processes and services. Quality costs. Economical level of quality. Optimal quality. Quality inspection. Quality assurance. International quality standards ISO 9000. Quality management. Total quality. Planning for quality. Quality improvement. Quality engineering. Method and tools for quality assurance and improvement. Cause-and-effect relationships. Causes of quality variability. Statistical process control methods. Common probability distributions. Control charts. Products and processes quality assessment methods. Quality of measurement system. Acceptance sampling. Reliability.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, active participation in the course, attendance at laboratory exercises and independent learning.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on final exam

Sustained knowledge check and final written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

1.11. Optional / additional reading (at the time of proposing study programme)

Juran, J. M., Gryna, F. M.: Planiranje i analiza kvalitete, Mate, Zagreb, 1999.
Montgomery, D.C., Jennings, C. L., Pfund, M. E.: Managing, controlling, and improving quality, John Wiley & Sons Wiley, 2011.
Bilić, B.: Kvaliteta-planiranje, analiza i upravljanje, FESB, 2016.
Kondić, Ž., Maglić, L., Pavletić, D.: Kvaliteta 1, 2, 3, Sveučilište Sjever, Strojarski fakultet Slavonski Brod, Tehnički fakultet Sveučilišta u Rijeci, 2018

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Signals and Systems**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	45+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Understanding time and frequency analysis and processing methods of continuous and discrete-time signals, as well as basic input-output relationships of linear time-invariant (LTI) systems. Development of analysis, synthesis, and problem solving skills.							
1.2. Course enrolment requirements							
Mathematics I and Mathematics II.							
1.3. Expected course learning outcomes							
Define both elementary signals and basic system properties. Define the response of LTI systems, convolution integral and sum. Use the convolution for the time-domain analysis of LTI systems. Define Fourier series and Fourier transform. Use different Fourier representations in spectral analysis of signals. Define the frequency response of LTI systems. Study LTI systems in the frequency domain. Describe signal sampling and reconstruction procedures.							
1.4. Course content							
Signals and systems; classification, elementary signals, signal models, operations on signals, system properties. Continuous and discrete LTI systems; zero-input response, zero-state response, convolution of signals, properties of LTI systems. Fourier series; line spectrum, systems with periodic inputs. Fourier transform; signal energy, system frequency response, ideal filters. Signal sampling; aliasing, reconstruction filter. Discrete Fourier Transform (DFT); signal spectral analysis.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, project work, individual studying.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project	1	Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on final exam
Sustained knowledge check (written tests), project report, final written exam.
1.10. Assigned reading (at the time of the submission of study programme proposal)
B. P. Lathi: Linear Systems and Signals, 2/E, Oxford University Press, 2004.
1.11. Optional / additional reading (at the time of proposing study programme)
H. P. Hsu: Signals and Systems, 3/E, McGraw-Hill, 2014. S. S. Soliman and M. D. Srinath: Continuous and Discrete Signals and Systems, 2/E, Prentice Hall, 1998. B. Jeren: Signali i sustavi, Školska knjiga, 2021.
1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
B. P. Lathi: Linear Systems and Signals, 2/E, Oxford University Press, 2004.	3	60

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences
Through the Institution's quality assurance system.

Basic description		
Course title	**Small Craft Building and Maintenance UN**	
Study programme	**Undergraduate University Study of Computing**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
The acquisition of specific competencies dealing with the small craft building and maintenance. Acquiring the skills of independent work and developing the ability to present the achieved results.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Distinguish materials for the building of small crafts. Describe the methods for building small crafts of wood and wooden materials, plastics and metals. Describe the installation of propulsion engine with associated systems. Describe the work on the interior and exterior outfitting of small crafts. Describe the works on maintenance and repair of small crafts. Describe the places for building, maintenance and winter storage of small crafts and facilities for retrieving, lifting/launching and hauling of small crafts.							
1.4. Course content							
Materials for building the small crafts: wood, wooden laminate, single-skin FRP laminate, cored FRP laminate, steel, aluminum alloys, other materials. Durability and protection of materials. Building of traditional wooden small crafts. Building of plywood small crafts. Building of small crafts using the WEST technique. Building of FRP small crafts. Building of steel small crafts. Building of aluminum small crafts. Building small crafts of other materials. Installation of engines and related systems. Small craft interior and exterior outfitting. Sailboat rigging. Maintenance and repair of small crafts. Places for building, maintenance and winter storage of small crafts. Facilities for retrieving, lifting/launching and hauling of small crafts.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☒ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Attendance at lectures, seminar work with presentation, self learning.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	2	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge		Report		Practice	

		check					
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance at lectures, seminar work with presentation, written examination.

1.10. Assigned reading (at the time of the submission of study programme proposal)

du Plessis, H.: Fibreglass Boats, International Marine, Camden, 1996.
..., The Gougeon Brothers on Boat Construction-Wood and WEST System Materials, The McKay Press, Inc., Midland, 1985.
Pollard, S.F., Boatbuilding with Aluminum, International Marine, Camden, 1993.

1.11. Optional / additional reading (at the time of proposing study programme)

Calder, N. *Boatowner's Mechanical and Electrical Manual*, International Marine, Camden, 1996.
Warren, N., *Metal Corrosion in Boats*, Adlard Coles Nautical, London, 1998.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
du Plessis, H.: Fibreglass Boats, International Marine, Camden, 1996.	1	19
..., The Gougeon Brothers on Boat Construction-Wood and WEST System Materials, The McKay Press, Inc., Midland, 1985.	1	19
Pollard, S.F., Boatbuilding with Aluminum, International Marine, Camden, 1993.	1	19

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution’s quality assurance system.

Basic description		
Course title	**Software Engineering**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+30+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Introduction to software engineering basics. Explore lifecycle phases, acquire knowledge and skills of software project management. Teamwork in software development projects.							
1.2. Course enrolment requirements							
Introduction to Object Oriented Programming.							
1.3. Expected course learning outcomes							
Explain main activities and purpose of software engineering discipline. Describe software lifecycle phases. Differentiate software development models and apply agile methodology. Select appropriate software development methods and tools. Explain elements and models of software engineering management in software engineering discipline. Explain software quality assurance techniques at module level and understand their application at system or organization level. Summarise the project and project results.							
1.4. Course content							
Introduction into software engineering discipline. Software lifecycle model, analysis, specification, design, implementation, and test of requirements. Methods and tools used in each software lifecycle phase. Software development lifecycle models, waterfall, spiral, iterative, incremental, and agile methods. Requirements engineering and software design. Object oriented analysis and design. Software measurements. Quality planning and control. Verification and validation. Management in software engineering discipline.							
1.5. Teaching methods	☒ lectures ☒ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☒ laboratories ☒ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity, seminar and homework, studying, project execution.							
1.8. Evaluation of student's work							
Course attendance	2.5	Activity/Participation	0.5	Seminar paper	0.5	Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project	1	Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam
Course attendance, laboratory exercises, homework, seminar paper, written exam.
1.10. Assigned reading (at the time of the submission of study programme proposal)
Vliet, H.v.: Software Engineering, Principles and Practice. John Wiley & Sons, Chichester, 2009
1.11. Optional / additional reading (at the time of proposing study programme)
Kerzner, H.: Project Management: A Systems Approach to Planning, Scheduling and Controlling, John Wiley & Sons, Hoboken, 2003 I. Sommerville, Software Engineering, 10th Edition, Pearson Education, 2016
1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Vliet, H.v.: Software Engineering, Principles and Practice. John Wiley & Sons, Chichester, 2009	1	59

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences
Through the Institution’s quality assurance system.

Basic description		
Course title	**Web Application Development**	
Study programme	**Undergraduate University Study of Computing**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**

1.1. Course objectives

This course prepares students to work in the area of web application development by teaching them basics of web systems design and implementation. It is expected to provide practical skills for development of dynamic and interactive web applications by introducing contemporary technologies, platforms, programming languages, and related development tools.

1.2. Course enrolment requirements

There are no formal prerequisites for course enrollment, but basic programming skills are expected.

1.3. Expected course learning outcomes

Upon a completion of the course, students will be able to: describe the basic principles of distributed systems and web-based protocols; explain the characteristics of the application models based on client-server paradigm; analyze the possibilities of different approaches to web application development; apply contemporary technologies for developing web system frontend and backend; develop dynamic web applications based on data resources.

1.4. Course content

The basic principles for building distributed, dynamic, and interactive information services for content management. Main concepts of the web programming. Design and implementation of web application frontend (HTML, CSS, JavaScript) and backend. Practical examples of dynamic web application development with the use of contemporary technologies. Web services (REST).

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other
1.6. Comments		

1.7. Student's obligations

Class attendance, participation in the student project team (group project assignment).

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project	2	Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam
Class attendance, midterm exams (continuous knowledge examination), laboratory exercises (individual assignments), and project assignment (participation in a team project).
1.10. Assigned reading (at the time of the submission of study programme proposal)
1. Douglas Crockford: JavaScript: The Good Parts, O'Reilly Media / Yahoo Press, 2008 2. Jon Ducket: HTML and CSS: Design and Build Websites, John Wiley & Sons, 2011
1.11. Optional / additional reading (at the time of proposing study programme)
1. Andy Budd, Emil Björklund: CSS Mastery, Apress, 2013 2. K. Scott Allen: What Every Web Developer Should Know About HTTP, OdeToCode LLC, 2012
1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Douglas Crockford: JavaScript: The Good Parts, O'Reilly Media / Yahoo Press, 2008	-	-
Jon Ducket: HTML and CSS: Design and Build Websites, John Wiley & Sons, 2011	-	-

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences
Through the institution’s quality assurance system.