Semester 1		
Undergraduate professional study in mechanical engineering obligatory courses		
P: Vesna Alić-Kostešić dipl.ing.stroj. P:mr.sc. Branimir Preprotić dipl. inž. stroj. A:mr.sc. Branimir Preprotić dipl. inž. stroj. S:mr.sc. Branimir Preprotić dipl. inž. stroj.		ECTS:6
P: Goran Sirovatka dipl. ing.,pred. P: Davor Šterc A: Davor Šterc A: Goran Sirovatka dipl. ing.,pred.		ECTS:6
P:dr.sc. Vlatko Mićković prof. A:dr.sc. Vlatko Mićković prof.		ECTS:6
P: Vesna Alić-Kostešić dipl.ing.stroj. S: Vesna Alić-Kostešić dipl.ing.stroj. A: Hrvoje Rakić , dipl.ing.stroj., pred.		ECTS:6
P:mr.sc. Ante Zaninović dipl.ing.brod. A:mr.sc. Ante Zaninović dipl.ing.brod.		ECTS:6

Semester 2		
Undergraduate professional study in mechanical engineering elective courses		
P:dr. sc. Branko Katana , mag. ing. mech. L:dr. sc. Branko Katana , mag. ing. mech.	Prototyping and reversible engineering	ECTS:6
P:Doc.dr.sc. Vlasta Zanki dipl.ing.stroj. A:Doc.dr.sc. Vlasta Zanki dipl.ing.stroj. S:Doc.dr.sc. Vlasta Zanki dipl.ing.stroj.	Renewable energy sources	ECTS:6
P: Mario Panjičko A: Mario Panjičko S: Mario Panjičko	Environmental protection	ECTS:6
P: Mario Panjičko L: Mario Panjičko S: Mario Panjičko	Waste treatment and recycling technologies and plants	ECTS:6
P: Mario Panjičko L: Mario Panjičko S: Mario Panjičko	Wastewater treatment technologies and plants	ECTS:6
Undergraduate professional study in mechanical engineering elective courses		
P: Vesna Alić-Kostešić dipl.ing.stroj. A: Vesna Alić-Kostešić dipl.ing.stroj. S: Vesna Alić-Kostešić dipl.ing.stroj.		ECTS:6
P:dr. sc. Branko Katana , mag. ing. mech. L:dr. sc. Branko Katana , mag. ing. mech.	Prototyping and reversible engineering	ECTS:6
P:Doc.dr.sc. Vlasta Zanki dipl.ing.stroj. A:Doc.dr.sc. Vlasta Zanki dipl.ing.stroj. S:Doc.dr.sc. Vlasta Zanki dipl.ing.stroj.	Sustainable production	ECTS:6
P: Goran Sirovatka dipl. ing.,pred. A: Goran Sirovatka dipl. ing.,pred. L: Goran Sirovatka dipl. ing.,pred.	Operational research in mechanical engineering	ECTS:6
P:mr.sc. Branimir Preprotić dipl. inž. stroj. A:mr.sc. Branimir Preprotić dipl. inž. stroj. S:mr.sc. Branimir Preprotić dipl. inž. stroj.		ECTS:6
Undergraduate professional study in mechanical engineering elective courses		
P:prof. dr. sc. Dario Matika P:dr. sc. Toni Bjažić prof. v. š. L:prof. dr. sc. Dario Matika	Digital systems management	ECTS:6
P:mr.sc. Goran Malčić v.pred. P: Tomislav Pavlic L:mr.sc. Goran Malčić v.pred. L: Tomislav Pavlic	Flexible production systems	ECTS:6
P: Goran Sirovatka dipl. ing.,pred. P: Mia Čarapina dipl. ing., pred. L: Goran Sirovatka dipl. ing.,pred.	Object oriented programming	ECTS:6
P:prof. dr. sc. Dario Matika L:prof. dr. sc. Dario Matika L: Domagoj Malez	Basics of robotics	ECTS:6
P:dr. sc. Toni Bjažić prof. v. š. L:dr. sc. Toni Bjažić prof. v. š. S:dr. sc. Toni Bjažić prof. v. š.	Synthesis of linear control systems	ECTS:6

Semester 3		
Undergraduate professional study in mechanical engineering elective courses		
P:prof. dr. sc. Dario Matika P:mr.sc. Goran Malčić v.pred. L:prof. dr. sc. Dario Matika L: Domagoj Malez	Automatic control of plants and processes in environmental protection	ECTS:6
P: Vesna Alić-Kostešić dipl.ing.stroj. P: Gregor Drago Zupančić P: Mario Panjičko A: Gregor Drago Zupančić S: Gregor Drago Zupančić A: Mario Panjičko S: Mario Panjičko	Advanced methods of water and wastewater treatment	ECTS:6
P: Vesna Alić-Kostešić dipl.ing.stroj. P: Goran Lukić P: Mario Panjičko A: Goran Lukić S: Goran Lukić A: Mario Panjičko S: Mario Panjičko	Waste gas treatment and air protection	ECTS:6
P: Vesna Alić-Kostešić dipl.ing.stroj. P: Gregor Drago Zupančić P: Mario Panjičko A: Gregor Drago Zupančić S: Gregor Drago Zupančić A: Mario Panjičko S: Mario Panjičko	Biomass management technologies	ECTS:6
P: Hrvoje Rakić , dipl.ing.stroj., pred. A: Hrvoje Rakić , dipl.ing.stroj., pred.	Production management	ECTS:6
Undergraduate professional study in mechanical engineering elective courses		
P:dr. sc. Branko Katana , mag. ing. mech. A:dr. sc. Branko Katana , mag. ing. mech. L:dr. sc. Branko Katana , mag. ing. mech.	Innovation management	ECTS:6
P:mag.oec Kristina Perec P:doc.dr.sc. Dalija Kuvačić profesor visoke škole A:mag.oec Kristina Perec S:mag.oec Kristina Perec	Business models and entrepreneurship	ECTS:6
P:doc.dr.sc. Dalija Kuvačić profesor visoke škole A:mag.oec Kristina Perec S:mag.oec Kristina Perec	Strategic technology entrepreneurship	ECTS:6
P: Hrvoje Rakić , dipl.ing.stroj., pred. A: Hrvoje Rakić , dipl.ing.stroj., pred.	Production management	ECTS:6
P:mr.sc. Branimir Preprotić dipl. inž. stroj. A:mr.sc. Branimir Preprotić dipl. inž. stroj. S:mr.sc. Branimir Preprotić dipl. inž. stroj.	Facility Management	ECTS:6
Undergraduate professional study in mechanical engineering elective courses		
P:prof. dr. sc. Dario Matika P:mr.sc. Goran Malčić v.pred. L:prof. dr. sc. Dario Matika L: Domagoj Malez	Plant and process automation	ECTS:6
P:prof. dr. sc. Dario Matika P: Tomislav Pavlic L: Tomislav Pavlic	Industrial and mobile robotics	ECTS:6

L:prof. dr. sc. Dario Matika		
P:dr. sc. Toni Bjažić prof. v. š. L:dr. sc. Toni Bjažić prof. v. š. L: Dean Fraj struč. spec. ing. el.	Design of embedded computer systems	ECTS:6
P: Goran Čubrić P:dr. sc. Toni Bjažić prof. v. š. L:dr. sc. Toni Bjažić prof. v. š. L: Goran Čubrić	Sensors and actuators in industrial processes	ECTS:6
P: Hrvoje Rakić , dipl.ing.stroj., pred. A: Hrvoje Rakić , dipl.ing.stroj., pred.	Production management	ECTS:6

Semester 4		
Undergraduate professional study in mechanical engineering elective courses		
S: Vesna Alić-Kostešić dipl.ing.stroj.	Thesis	ECTS:18
P: Vesna Alić-Kostešić dipl.ing.stroj. L: Vesna Alić-Kostešić dipl.ing.stroj. S: Vesna Alić-Kostešić dipl.ing.stroj.	Business production information systems	ECTS:6
P:mr.sc. Lucija Bačić v.pred. A: Nataša Uzelac S: Nataša Uzelac	Human resource management	ECTS:6
Undergraduate professional study in mechanical engineering elective courses		
Nositelj predmeta nije poznat	Thesis	ECTS:18
P: Vesna Alić-Kostešić dipl.ing.stroj. L: Vesna Alić-Kostešić dipl.ing.stroj. S: Vesna Alić-Kostešić dipl.ing.stroj.	Business production information systems	ECTS:6
P:mr.sc. Lucija Bačić v.pred. A: Nataša Uzelac S: Nataša Uzelac	Human resource management	ECTS:6
Undergraduate professional study in mechanical engineering elective courses		
S: Vesna Alić-Kostešić dipl.ing.stroj.	Thesis	ECTS:18
P: Vesna Alić-Kostešić dipl.ing.stroj. L: Vesna Alić-Kostešić dipl.ing.stroj. S: Vesna Alić-Kostešić dipl.ing.stroj.	Business production information systems	ECTS:6
P: Vesna Alić-Kostešić dipl.ing.stroj. P: Tamara Ivelja mag. ing., pred. L: Tamara Ivelja mag. ing., pred. L: Domagoj Malez	Computer vision	ECTS:6

Semester 5

Semester 6

Code WEB/ISVU	26389/192598	**ECTS**	6	**Academic year**	2020/2021
Name					
Status	1st semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - obligatory course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+0+10+0) 120
Teachers	Lectures:1. mr.sc. Branimir Preprotić dipl. inž. stroj. Lectures: Vesna Alić-Kostešić dipl.ing.stroj. Auditory exercises:mr.sc. Branimir Preprotić dipl. inž. stroj. Seminar exercises:mr.sc. Branimir Preprotić dipl. inž. stroj.				
Course objectives	To empower a student to understand that Asset management is not a separate process, but an integrated part of every business system. As Asset management team members they will be responsible to solve potential challenges and in position to give constant improvements proposals. Through the lessons the student will be familiar with the process of procurement, use and maintenance of the property, as well as planning and investment processes and human resources importance. As Asset management team member the student will be in position to solve various problem situations under realistic market conditions.				
Learning outcomes:	1.Identify the role and place of asset management within the business system. Level:6 2.Link importance of planning process and market analysis in order to ensure successful asset management. Level:6,7 3.Key performance indicators comment of asset management over the lifetime. Level:6 4.Identify the sequence and understand the importance of investment project monitoring. Level:6 5.Critically evaluate results of analysis of use fixed assets and maintenance based on method of reliability of asset management. Level:7 6.Be prepared for active participation in processes of asset management within the business system. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Discussion The lessons are exhibited in a way that the theoretical framework combines with examples of practice and students are encouraged to give an overview of the examples they have come up with.				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Interactive problem solving Workshop				
Methods of carrying out seminars	Essay writing				
Course content lectures	1.Definitions of Property Types, Historical Development of Property Management, Case Study Private Life Management, 3h, Learning outcomes:1 2.Strategic management process using the Balanced Scorecard (BSC) model, 3h, Learning outcomes:2 3.Key Principles of Managing Material Property, 3h, Learning outcomes:3 4.Property Management System according to British Standard International PASS 55 and according to ISO 55000, 3h, Learning outcomes:4 5.Benchmarking and Key Performance Indicators, 3h, Learning outcomes:4 6.Cost Analysis During Life-LCC Method 3h,, 3h, Learning outcomes:4 7.Risk management, 3h, Learning outcomes:5 8.Tools and methodologies for continuous improvement, and for creating new processes,, 3h, Learning outcomes:5 9.Maintenance in the Physical Property Management System,,, 3h, Learning outcomes:5 10.The relationship between Managing Material, Facility Management and Maintenance, 3h, Learning outcomes:6 11.Amplitude and phase frequency response 12.no class 13.no class 14.no class 15.no class				
Course content auditory	1.Type and purpose of Assets and the Process of Asset Management Planning, 2h, Learning outcomes:1,2 2.Market Analysis Methods Applying, 2h, Learning outcomes:3 3.Cost and revenue analysis in process of performance indicators calculation , 2h, Learning outcomes:3 4.I colloquium , 1h, Learning outcomes:1,2,3 5.Practical application of process norms in Asset management , 2h, Learning outcomes:4 6.Investment project analysis, 2h, Learning outcomes:4,5 7.Faults and damage monitoring of Fixed assets during their life cycle , 3h, Learning outcomes:6 8.II colloquium , 1h, Learning outcomes:4,5,6 9.No lessons 10.No lessons 11.No lessons 12.No lessons 13.No lessons 14.No lessons 15.No lessons				
Course content seminars	1.No activities, 2h 2.No activities, 2h 3.No activities, 2h 4.No activities, 2h				

	5.No activities, 2h 6.No activities, 2h 7.No activities, 2h 8.No activities, 2h 9.No activities, 2h 10.No activities, 2h 11.No activities, 2h 12.No activities, 2h 13.No activities, 2h 14.No activities, 2h 15.Seminar activities, 2h, Learning outcomes:1,2,3,4,5,6
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory Overhead projector
Exam literature	Obavezna literatura: 1.prof. dr.sc. Ivo Čala i ostali: Održavanje i gospodarenje imovinom, Hrvatsko društvo održavatelja, Zagreb, 2016. 2.dr.sc. Mladen Mauher i mr.sc. Sanja Bračun: Aktualne elektroničke mape nastavnika pripremljene za predavanja dostupne na LMS sustavu Preporučena literatura: 1.S. Duffuaa; A Raouf, Cham: e-book Planning and control of maintenance systems: modelling and analysis", Springer, 2015. 2.John Woodhouse: ISO 55000: Asset management What to do and why? 2014. 3.David G Cotts; Kathy O Roper; Richard P Payant, Chichester: e-book International facility management, West Sussex, United Kingdom, 2014. 4.Constantin May; Peter Schimek, Ansbach: Total productive management: fundamentals and introduction to TPM - or how to achieve operational excellence", CETPM Publ. 2014. 5.David G Cotts; Kathy O Roper; Richard P Payant: e-book The facility management handbook, New York: American Management Association, 2010. 6.D. J. VANIER, Asset management: "A to Z", Institute for Research in Construction, National Research Council Canada, 1200 Montreal Road, Ottawa, 2001.
Students obligations	70% of attendance on lessons and exercises
Knowledge evaluation during semester	1st and 2nd colloquium
Knowledge evaluation after semester	Oral Exam (in case of non-fulfilment of 1st and 2nd colloquium conditions)
Student activities:	Aktivnost — ECTS (Written exam) — 2 (Oral exam) — 2 (Activity in class) — 2
Remark	This course can be used for final thesis theme

Code WEB/ISVU	26390/192600	**ECTS**	6	**Academic year**	2020/2021
Name					
Status	1st semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - obligatory course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 120
Teachers	Lectures:1. Davor Šterc Lectures: Goran Sirovatka dipl. ing.,pred. Auditory exercises: Goran Sirovatka dipl. ing.,pred. Auditory exercises: Davor Šterc				
Course objectives	Develop students ability to apply basic equations of linear algebra to engineering tasks that await them in future professional life.				
Learning outcomes:	1.Integrate geometry of linear equation systems. Level:6,7 2.generate transposition, permutation and vector space. Level:6,7 3.solve the problem of homogeneous and inhomogeneous systems. Level:7 4.integrate space matrix, rank; orthogonal vectors and subspaces. Level:6,7 5.Link differential equations and exponential matrix functions; Markov matrix, Fourier order. Level:6,7 6.calculate multiplication of matrices and inverse matrices. Level:6				
Methods of carrying out lectures	Ex cathedra teaching Discussion Questions and answers Seminar, students presentation and discussion				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Interactive problem solving				
Course content lectures	1. Geometry of linear equation systems; eliminating unknowns using a matrix, 2h, Learning outcomes:1 2.Multiplication of matrices and inverse matrices; matrix separation on a multicolored triangular matrix, 2h, Learning outcomes:6 3.Transposition, permutations and vector spaces: column space and zero-space, 2h, Learning outcomes:6 4.Solving a homogeneous system, pivotal notions, special solutions; solving a non-homogeneous system, 2h, Learning outcomes:3 5.Independence of base and dimension. Four basic subsurface, 2h, Learning outcomes:3 6.Matrix spaces, rank; orthogonal vectors and subspaces, 2h, Learning outcomes:4 7.Projection matrix and small squares, 2h, Learning outcomes:4 8.Orthogonal matrix and Gram-Schmidt method; properties of determinants, 2h, Learning outcomes:4 9.Formulas for determinants and cofactors; Cramer rule, inverse matrix and volume, 2h, Learning outcomes:4 10.Own Values and Own Vectors; diagonalization and potency of the matrix, 2h, Learning outcomes:4 11.Differential equations and exponential matrix function; Markov matrix, Fourier order, 2h, Learning outcomes:5 12.Symmetric matrices and positive definitions; complex matrices, discrete and fast Fourier transformations, 2h, Learning outcomes:5 13.Positively definite matrices and search for minimum, similar matrices and Jordanian form, 2h, Learning outcomes:5 14.Separation of singular values; linear transformations and their matrices, 2h, Learning outcomes:5 15.Changing the base, pseudoinverted; norm and condition of the matrix, iterative procedures, 2h, Learning outcomes:5				
Course content auditory	1.Geometry of linear equation systems; eliminating unknowns using a matrix, 2h, Learning outcomes:1 2.Multiplication of matrices and inverse matrices; matrix separation on a multicolored triangular matrix, 2h, Learning outcomes:6 3.Transposition, permutations and vector spaces: column space and zero space, 2h, Learning outcomes:2,6 4.Solving a homogeneous system, pivotal notions, special solutions; solving a non-homogeneous system, sequencing, 2h, Learning outcomes:2 5.Independence, base and dimension. Four basic subsurface, 2h, Learning outcomes:2 6.Matrix spaces, rank; orthogonal vectors and subspaces, 2h, Learning outcomes:2 7.Projection matrix and small squares, 2h, Learning outcomes:3 8.Orthogonal matrix and Gram-Schmidt method; properties of determinants, 2h, Learning outcomes:3 9.Formulas for determinants and cofactors; Cramer rule, inverse matrix and volume, 2h, Learning outcomes:3 10.Own Values and Own Vectors; diagonalization and potency of the matrix, 2h, Learning outcomes:4 11.Differential equations and exponential matrix function; Markov matrix, Fourier order, 2h, Learning outcomes:4 12.Symmetric matrices ipozitivna definicija; complex matrices, discrete and fast Fourier transformations, 2h, Learning outcomes:4,5 13.Positively definite matrices and search for minimum, similar matrices and Jordanian form, 2h, Learning outcomes:4,5 14.Separation of singular values; linear transformations and their matrices, 2h, Learning outcomes:5 15.Changing the base, pseudoinverted; norm and condition of the matrix, iterative procedures, 2h, Learning outcomes:5				
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector				
Exam literature	1.Davor Butković ,Predavanja iz linearne algebre,,978-953-6931-31-6,2008 2.D.Bakić,Linearna algebra, Školska knjiga,,2008 3.Pablo Fernandez Gallardo , Google's secret and Linear Algebra,EMS Newsletter ,,2007				

	4.Gilbert Strang , Wavelets,American Scientist. Vol. 82.,,1994 5.Davor Butković ,Kompleksni konačnodimenzionalni vektorski prostori,,978-953-6931-28-6,2007	
Students obligations	Attendance with the permitted number of absences according to the Rulebook on Studying. Solving tasks at auditory and seminar exercises.	
Knowledge evaluation during semester	1st Colloquium 2nd Colloquium seminar work	
Knowledge evaluation after semester	written exam seminar work	
Student activities:	Aktivnost (Classes attendance) (Seminar Work) (Written exam) (Research) (Constantly tested knowledge)	ECTS 1 1 1 1 2
Remark	This course can not be used for final thesis theme	
Proposal made by	Goran Sirovatka , 23.10.2018	

Code WEB/ISVU	26391/192601	**ECTS**	6	**Academic year**	2020/2021
Name					
Status	1st semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - obligatory course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 120
Teachers	Lectures:1. dr.sc. Vlatko Mićković prof. Auditory exercises:dr.sc. Vlatko Mićković prof.				
Course objectives	Provide students with insights into the patterns and systematics that lie in the background of engineering mathematical methods by reviewing a number of notable examples and problems and to learn and master the effective procedures for calculating their solutions.				
Learning outcomes:	1.integrate methods of solving linear equation systems. Level:6,7 2.calculate your own values, vectors and dynamic systems. Level:6 3.Generate differential equation equations in one dimension. Level:6,7 4.justify numerical procedures for linear and nonlinear equations. Level:7 5.number theory-integration of mathematical induction and combinatorics. Level:6,7 6.link final stochastic processes with problematic tasks. Level:6,7 7.use inductive statistics in processes. Level:6				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Modelling Questions and answers Seminar, students presentation and discussion				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming				
Course content lectures	1.Framework for application of matrix equations. Limits and Lagrange Multipliers, 2h, Learning outcomes:1 2.Minimal squares estimation, 2h, Learning outcomes:1 3.Differential Balance Equations in One Dimension. Laplace equation and potential flow, 2h, Learning outcomes:2 4.Vector differential and integral calculus in three dimensions, 2h, Learning outcomes:2 5.Fourier order and orthogonal development. Discrete Fourier Rows of Convolutions. Fourier integral, 2h, Learning outcomes:3 6.Numerical procedures for linear and nonlinear equations. Semi direct and iterative methods, 2h, Learning outcomes:3 7.Mathematical induction and finishing methods, combinatoric, 2h, Learning outcomes:3 8.Modeling recursive relationships and modeling theory, 2h, Learning outcomes:4 9.Probability with finite event space models, 2h, Learning outcomes:4 10.Conditional probability, stochastic independence, boundary theorems, 2h, Learning outcomes:4,6 11.Final stochastic processes, 2h, Learning outcomes:5,6 12.Markov chains, 2h, Learning outcomes:5,6 13.Sigma Algebra, Axiom Kolmogorova, 2h, Learning outcomes:6 14.Inductive statistics, 2h, Learning outcomes:7 15.Inductive statistics, 2h, Learning outcomes:7				
Course content auditory	1.Vector differential and integral calculus in three dimensions, 2h, Learning outcomes:1 2.Fourier order and orthogonal development. Discrete Fourier Rows of Convolutions. Fourier integral, 2h, Learning outcomes:1 3.Numerical procedures for linear and nonlinear equations. Neutral and iterative methods, 2h, Learning outcomes:2 4.Mathematical induction and finishing methods, combinatorics, 2h, Learning outcomes:2,5 5.Modeling recursive relationships and modeling theory, 2h, Learning outcomes:3 6.Probability with finite event space models, 2h, Learning outcomes:3 7.Conditional probability, stochastic independence, boundary theorems, 2h, Learning outcomes:4 8.Final stochastic processes, 2h, Learning outcomes:6 9.Markov chains, 2h, Learning outcomes:4 10.Sigma Algebra, Axiom Kolmogorova, 2h, Learning outcomes:5,6 11.Inductive statistics, 2h, Learning outcomes:7 12.Inductive statistics, 2h, Learning outcomes:7 13.Framework for application of matrix equations. Limits and Lagrange Multipliers, 2h, Learning outcomes:1,2 14.Minimal squares estimation, 2h, Learning outcomes:1 15.Differential Balance Equations in One Dimension. Laplace equation and potential flow, 2h, Learning outcomes:3				
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector				
Exam literature	1.Davor Butković ,Predavanja iz linearne algebre, 978-953-6931-31-6,2008 2.Ivan Ivanšić,Fourierovi redovi. Diferencijalne jednadžbe, 953-6032-29-5,2000 3.Davor Butković ,Kompleksni konačnodimenzionalni vektorski prostori, 978-953-6931-28-6, 2007 4.Ivan Ivanšić,Funkcije kompleksne varijable. Laplaceova transformacija.,Liber, 1987 5.Ivan Ivanšić,Numerička matematika, 953-197-526-4, 2002 6.Rudolf Scitovski,Numerička matematika, 953-6032-24-4, 2004				
Students obligations	Attendance with the permitted number of absences according to the Rulebook on Studying				

Knowledge evaluation during semester	1st Colloquium 2nd Colloquium seminar work	
Knowledge evaluation after semester	written exam seminar work	
Student activities:	Aktivnost (Classes attendance) (Written exam) (Research) (Activity in class) (Constantly tested knowledge)	ECTS 1 1 1 1 2
Remark	This course can be used for final thesis theme	
Proposal made by	Vlatko Mićković , 23.10.2018	

Code WEB/ISVU	26392/192603	**ECTS**	6	**Academic year**	2020/2021
Name					
Status	1st semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - obligatory course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+0+10+0) 120
Teachers	Lectures:1. Vesna Alić-Kostešić dipl.ing.stroj. Auditory exercises: Hrvoje Rakić , dipl.ing.stroj., pred. Seminar exercises: Vesna Alić-Kostešić dipl.ing.stroj.				
Course objectives	To introduce students to basic elements of management in the project based activities such as business, manufacturing and various services				
Learning outcomes:	1.ability to formulate /create the project goal in accordance with the strategy of an organization. Level:6,7 2.ability to formulate/to design a project according to a strategy of an organisation. Level: 3.ability to compose a proposal of a project and a project plan in a seminar paper. Level:6,7 4.ability to control processes in a project, its scope, time, costs, quality, people, communication, risks and project procurement . Level:6,7 5.ability to estimate the project risks on a project proposal. Level:6,7 6.ability to analyse the project phases and activities the results of which contribute to the project goal. Level:6 7.ability to standardise the time and resources necessary for carrying out activities by using techniques of network planning. Level:6,7 8.abilityto plan the expenses related to carrying out the project activities. Level:6,7 9.ability to analyse a project proposal through a logical matrix. Level:6 10.ability to develop willingness for teamwork and cooperation. Level:6,7 11.ability to combine methods and procedures for making decisions. Level:6,7 12.ability to state the influence of a project product on the environment. Level:7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Demonstration Discussion The whole material is presented in lectures illustrated by drawings, tables and graphs to facilitate understanding of the topic. It can be presented on OHP or in Power Point.				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Interactive problem solving Workshop Problems of each particular topic analysed are solved on the blackboard. After explaining and solving a problem of a topic, students are given a related one to solve it on their own but with assistance of the teacher. Using the BK technique and with assistance of their teacher, students create a smaller project.				
Methods of carrying out seminars	Group problem solving Discussion, brainstorming Workshop posters, markers, adhesive tape				
Course content lectures	1.The nature and context of project management processes and knowledge areas, 2h, Learning outcomes:1 2.Strategy and project management, 4h, Learning outcomes:1 3.Project management and stakeholders, 2h, Learning outcomes:2 4.Appropriate project organizational structure, 2h, Learning outcomes:2 5.The initial phase of the project, 2h, Learning outcomes:3 6.Initiating and Planning Project, 3h, Learning outcomes:4 7.Preparation of project proposal, 3h, Learning outcomes:4,5,7,10 8.Planning techniques, 4h, Learning outcomes:6,7,8 9.Implementation phase of the project, 4h, Learning outcomes:7,8,9,10 10.Concluding phase and evaluation of the project, 2h, Learning outcomes:7,8,10,11,12 11.Colloquium, 2h, Learning outcomes:1,2,3,4,5,6,8,9,10,11,12 12.no classes 13.no classes 14.no classes 15.no classes				
Course content auditory	1.no classes 2.no classes 3.no classes 4.no classes 5.no classes 6.no classes 7.no classes 8.exercise TMP, CPM, 4h, Learning outcomes:7 9.exercise TMP, PERTH,PD, 4h, Learning outcomes:7 10.Colloqium, 2h, Learning outcomes:7 11.no classes 12.no classes 13.no classes 14.methods of decision-making, 2h, Learning outcomes:5,6,7,9 15.methods of project cycle - logical framework, 3h, Learning outcomes:5,6,7,9,10,11,12				

Course content seminars	1.no classes 2.no classes 3.no classes 4. no classes 5. no classes 6. methods for problem solving, Brainstorming, making the problem tree and objective tree, elaboration of project ideas, 4h, Learning outcomes:9,10,11,12 7.working on the papers, 1h, Learning outcomes:9,10,11,12 8.working on the papers, 1h, Learning outcomes:9,12 9.working on the papers, 1h, Learning outcomes:9,10,11,12 10.working on the papers, 1h, Learning outcomes:9,10,11,12 11.working on the papers, 1h, Learning outcomes:9,10,11,12 12.working on the papers, 1h, Learning outcomes:9,10,11,12 13.working on the papers, 1h, Learning outcomes:9,10,11,12 14.working on the papers, 1h, Learning outcomes:9,10,11,12 15.papers due, 3h, Learning outcomes:9,11,12
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector Operating supplies posters, markers, adhesive tape
Exam literature	PMI- Vodič kroz znanje o upravljanju projektima (Vodič kroz PMBOK,4. izdanje), Mate d.o.o., Zagreb 2011. nikolić, Čala, alić Kostešić: Metode planiranje u proizvodnji odjeće, ZS 2010. Čala,I; i ostali autori: Inženjerski priručnik, dio 4, poglavlja 6. Planiranje i praćenje proizvodnje, Školska knjiga, Zagreb, 2002. Vila, A; Štajdl, B; Čala, I; Karabajić, I: Metode planiranja proizvodnje, Informator, Zagreb, 1982. Vila, A; Leicher, Z: Planiranje proizvodnje i kontrola rokova, Informator, 3. izdanje, Zagreb 1983. Schroeder, Roger,G: Upravljanje proizvodnjom, Mate, Zagreb, 1999. Bilješke koje nastavnik priprema za nastavu Čala, I: Stupnjevito planiranje, izlaganje na savjetovanju Upravljanje proizvodnjom, CDI Zagreb, Briuni, 1989. Dilworth,J.B.: Operations Management, Mc Grow Hill, inc., New York, 1995. Schonberger,R.J., Knod, M.E.: Operations Management, Irwin, 1994. Majstorović, V.: Upravljanje Proizvodnjom i projektima (Production and Project Management), Nakladnici Sveučilište u Mostaru i DAAAM International Vienna, Mostar-Wien 2001.
Students obligations	delivery of a seminar paper
Knowledge evaluation during semester	1.colloquim - tasks numerical type max 50 points - 30 min 2.colloquim - objective type tasks maximum 50 points - 30 min 3.seminar work max 50 points - 30 min max total 150 points - 90 min Points rating 0-89 inadequate 90-105 sufficient 106-120 good 121-135 very good 136-150 excellent
Knowledge evaluation after semester	written exam, seminar paper Points rating 0-89 inadequate 90-105 sufficient 106-120 good 121-135 very good 136-150 excellent
Student activities:	Aktivnost — ECTS (Constantly tested knowledge) — 1 (Seminar Work) — 2 (Written exam) — 2 (Practical work) — 1
Remark	This course can be used for final thesis theme
Proposal made by	Vesna Alic Kostesic

Code WEB/ISVU	26393/192604	**ECTS**	6	**Academic year**	2020/2021
Name					
Status	1st semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - obligatory course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 120
Teachers	Lectures:1. mr.sc. Ante Zaninović dipl.ing.brod. Auditory exercises:mr.sc. Ante Zaninović dipl.ing.brod.				
Course objectives	students will acquire basic knowledge of quality management				
Learning outcomes:	1.ability to assess compliance with the rules and standards regulating the quality of a product or service. Level:7 2.ability to choose appropriate tools for solving the quality nonconformities of process, product or service. Level:7 3.ability to measure a degree of the process stability and process variability. Level:7 4.ability to write a report on corrective and preventive measures to the purchaser or the mangement . Level:6,7 5.ability to build the quality system on selected model of production or institution. Level:6,7 6.ability to suggest activities to improve the existing processes in the organization, enhance efficiency and reduce costs. Level:6,7 7.ability to manage the quality system of the selected model of organization or institution. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Discussion Seminar, students presentation and discussion Other Material is delivered with maximum use of drawings, tables and diagrams to facilitate understanding, but also provides the concrete examples through photographs and finished materials introduction of standards in specific companies. The process of introducing a system of quality management are drawn, etc, and constantly questions the students so that they can more actively participate in the teaching.				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Workshop Other problems are solved with students				
Course content lectures	1.Introduction to the course, assessment of general concepts and definitions of quality, 4h, Learning outcomes:1,2,3,4,5,6,7 2.Systems standards, introduction to ISO 9001 Requirements for Management System, 4h, Learning outcomes:1,2,3,4,5,6,7 3.Collecting and displaying data, FMEA analysis, 3h, Learning outcomes:1,2,3,4,5,6,7 4.Process control and statistics, 3h, Learning outcomes:1,2,3,4,5,6,7 5.Repetition of topics S1-S4, 1h, Learning outcomes:1,2,3,4,5,6,7 6.Quality control of the process, SWOT analysis, 5S, 4h, Learning outcomes:1,2,3,4,5,6,7 7.Method six sigma, 3h, Learning outcomes:1,2,3,4,5,6,7 8.Product design, engineering, 3h, Learning outcomes:1,2,3,4,5,6,7 9.Method eight disciplines, 1h, Learning outcomes:1,2,3,4,5,6,7 10.Quality in procurement, 3h, Learning outcomes:1,2,3,4,5,6,7 11.Repetition of topics S5-S9, 1h, Learning outcomes:1,2,3,4,5,6,7 12. no lessons 13. no lessons 14. no lessons 15. no lessons				
Course content auditory	1.Process development and manufacturing, FMEA analysis, 2h, Learning outcomes:1,2,3,4,5,6,7 2.Xsr R-map, the analysis of the production process, 2h, Learning outcomes:1,2,3,4,5,6,7 3.Key Performance Indicators, 2h, Learning outcomes:1,2,3,4,5,6,7 4.quality plans, 2h, Learning outcomes:1,2,3,4,5,6,7 5.8D method, internal audits, 2h, Learning outcomes:1,2,3,4,5,6,7 6.Presentation of seminar papers, 2h, Learning outcomes:1,2,3,4,5,6,7 7. no lessons 8. no lessons 9. no lessons 10. no lessons 11. no lessons 12. no lessons 13. no lessons 14. no lessons 15. no lessons				
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector				
Exam literature	Bilješke koje nastavnik priprema za nastavu J.M.Juran, Quality Control Handbook, McGraw-Hill, New York, 1989. Juran, Joseph Moses; Frank M. Gryna. 1993, 1999, Planiranje i analiza kvalitete. MATE d.o.o. Zagreb E.L.Grant, R.S.Leavenworth, Statistical Quality Control, McGraw-Hill, New York, 1988.				

	Lazibat, Tonči, 2009, Upravljanje kvalitetom, Znanstv. knjiga, Zagreb. Oslić, Ivica, 2008, Kvaliteta i poslovna izvrsnost, MEP Consult, Zagreb Štajdohar-Pađen, Olga, 2009, Plivati s ISO-m i ostati živ, Kigen, Zagreb	
Students obligations	80% of class attendance	
Knowledge evaluation during semester	Paper tests #2#100#50$	
Knowledge evaluation after semester	written and oral exam	
Student activities:	Aktivnost (Written exam) (Oral exam) (Classes attendance)	ECTS 4 1 1
Remark	This course can be used for final thesis theme	
Proposal made by	dr.sc. Ljubivoj Cvitaš dipl.ing., 1.6.2015	

Code WEB/ISVU	26397/192609	**ECTS**	6	**Academic year**	2020/2021
Name					
Status	2nd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+0+10+0) 120
Teachers	Lectures:1. Vesna Alić-Kostešić dipl.ing.stroj. Auditory exercises: Vesna Alić-Kostešić dipl.ing.stroj. Seminar exercises: Vesna Alić-Kostešić dipl.ing.stroj.				
Course objectives	Understanding of logistics processes in production and trade of goods and services. Knowing the Basis of Technical Logistics. Knowledge of material features and their flows. Performance and features of transport and storage system. Knowledge and application of methodology, methods and information for designing logistic systems. Understanding the Logistics Potential				
Learning outcomes:	1.Plan logistics and supply chain management.. Level:6,7 2.Plan areas and tasks of logistics. Level:6,7 3.Classify technical logistics problems in industrial companies. Level:6,7 4.Suggest a link to handling material with production processes. Level:6,7 5.Categorize resources of internal transport.. Level:6 6.Calculate the basic parameters of the material handling system and internal transport. Level:6 7.Categorize storage equipment. Level:6 8.Calculate basic storage system parameters. Level:6 9.Valorize individual technical logistics solutions. Level:7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Interactive problem solving Workshop				
Methods of carrying out seminars	Essay writing Other				
Course content lectures	1.Concept and Definition of Logistics. Historical development. Significance and objectives of logistics, 2h, Learning outcomes:1,2 2.Concept and Definition of Logistics. Historical development. Significance and objectives of logistics, 2h, Learning outcomes:2,3 3.Handling Material Significance and Goals. Handling principles of material. Materials Streams, 2h, Learning outcomes:4 4.Concept, significance and tasks of transport systems in industry (internal transport). Classification of transport systems. Types of transport equipment, 2h, Learning outcomes:5 5.Systematization, performance principles and technical-technological parameters of transport equipment for breakdowns of materials (boundaries and vehicles). AGV systems, 2h, Learning outcomes:5 6.Systematization, performance principles and technical-technological parameters of transport equipment for breakdowns of materials (boundaries and vehicles). AGV systems, 2h, Learning outcomes:5 7.Concept, significance and tasks of warehouse systems. Types of storage systems. Basic zones and functions in the warehouse. Storage floor, 2h, Learning outcomes:7 8.Gift warehouse design by type of gift: pallet, polish, flow, transit, transport, console gift, turntable, 2h, outcomes: 7 10. Systematization of transport equipment in the warehouse, means for forming unit loads, auxiliary and additional equipment in the warehouse, 2h, Learning outcomes:7 9.Systematization of transport equipment in the warehouse, means for forming unit loads, auxiliary and ancillary equipment in the warehouse, 2h, Learning outcomes:7 10.Warehouse design, 2h, Learning outcomes:6,9 11.Methods for allocating a disposal site. Automated Storage Systems (AS / R), 2h, Learning outcomes:7 12.Commitment and sorting processes. The commissioning system, 2h, Learning outcomes:7 13.Goods Receiving Processes. Process of issuing goods. crossdocking, 2h, Learning outcomes:7 14.Trends in logistics and handling materials, 2h, Learning outcomes:9 15.Trends in logistics and handling materials, 2h, Learning outcomes:9				
Course content auditory	1.Classification of materials. ABC analysis examples, 2h, Learning outcomes:5,6 2.Analysis and design of material flows. Graphic and analytical presentation. Optimization of unit loads,, 2h, Learning outcomes:6 3.Intermediate transportation tasks, 2h, Learning outcomes:6 4.Intermediate transportation tasks, 2h, Learning outcomes:6 5.Means of Continuous Transport Tasks, 2h, Learning outcomes:6 6.Means of Continuous Transport Tasks, 2h, Learning outcomes:6 7.AGV systems examples. Preparation for a colloquy, 2h, Learning outcomes:6 8.colloquy, 2h, Learning outcomes:1,2,3,4,5,6 9.Designing warehouse systems. Shaping the storage zon, 2h, Learning outcomes:7,8 10.Designing warehouse systems. Shaping the storage zon, 2h, Learning outcomes:7,8 11.Designing warehouse systems. Shaping the storage zone, 2h, Learning outcomes:7,8 12.Designing warehouse systems. Shaping the storage zone, 2h, Learning outcomes:7,8 13.Designing a commissioning system. Multiple working cycles, 2h, Learning outcomes:7,8 14.Formation of reception and transmission zones. Preparation for a colloquy, 2h, Learning outcomes:7,8 15.colloquy, 2h, Learning outcomes:6,7,8				

Course content seminars	1.they are not performed 2.they are not performed 3.they are not performed 4.they are not performed 5.they are not performed 6.they are not performed 7.they are not performed 8.they are not performed 9.they are not performed 10.they are not performed 11.they are not performed 12.they are not performed 13.they are not performed 14.they are not performed 15.they are not performed
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector
Exam literature	Oluić, Č.: Skladištenje u industriji, FSB, Zagreb, 1997. Oluić, Č.: Transport u industriji, Sveučilišna naklada, Zagreb, 1991. Waters D.: Logistics An Introduction to Supply Chain management, Palgrave, NY, 2003
Students obligations	presence in teaching
Knowledge evaluation during semester	through a colloquium
Knowledge evaluation after semester	written exam
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Activity in class) — 1 (Written exam) — 4
Remark	This course can be used for final thesis theme
Proposal made by	Vesna Alić-Kostešić mag.ing.mech, senior lecturer

Code WEB/ISVU	26398/192610	**ECTS**	6	**Academic year**	2020/2021
Name					
Status	2nd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+0+10+0) 120
Teachers	Lectures:1. mr.sc. Branimir Preprotić dipl. inž. stroj. Auditory exercises:mr.sc. Branimir Preprotić dipl. inž. stroj. Seminar exercises:mr.sc. Branimir Preprotić dipl. inž. stroj.				
Course objectives	To learn about activities, tools and methodologies for continuous increase of operational process efficiency through the elimination of specific losses				
Learning outcomes:	1.Identify what "Operational Excellence" does. Level:7 2.Classify specific losses in one of the seven groups. Level:6,7 3.Compare the observed process with the ideal process. Level:6,7 4.Create more efficient processes by eliminating specific losses. Level:6,7 5.Establish measures to monitor process efficiency using key performance indicators. Level:6,7 6.create conditions for continuous process improvement. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion Seminar, students presentation and discussion Homework presentation				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Workshop Other Case studies				
Methods of carrying out seminars	Essay writing Discussion, brainstorming				
Course content lectures	1.Introduction to and definition of Operational excellence, 3h, Learning outcomes:1 Seven types of specific losses, 2h, Learning outcomes:2 2.Seven types of specific losses, 5h, Learning outcomes:2 3.Seven types of specific losses, 2h, Learning outcomes:2 Tools and Methodologies for achieving Operational Excellence (Lean Manufacturing, DBR, FMEA, JIT, DBR, SMED, Kanban, OPEX), 3h, Learning outcomes:3,4 4.Tools and Methodologies for achieving Operational Excellence (Lean Manufacturing, DBR, FMEA, JIT, DBR, SMED, Kanban, OPEX), 5h, Learning outcomes:3,4 5.Tools and Methodologies for achieving Operational Excellence (Lean Manufacturing, DBR, FMEA, JIT, DBR, SMED, Kanban, OPEX), 1h, Learning outcomes:3,4 Existing financial indicators and creating of additional KPIs to evaluate process excellence, 3h, Learning outcomes:5 Development of competence, awareness and responsibility of employees, 1h, Learning outcomes:6 6.Development of competence, awareness and responsibility of employees, 5h, Learning outcomes:6 7.No classes 8.No classes 9.No classes 10.No classes 11.No classes 12.No classes 13.No classes 14.No classes 15.No classes				
Course content auditory	1.FMEA, 5h, Learning outcomes:3,4 2.Kanban, 5h, Learning outcomes:3,4 3.JIT, 5h, Learning outcomes:3,4 4.OPEX, 5h, Learning outcomes:3,4 5.no classes 6.no classes 7.no classes 8.no classes 9.no classes 10.no classes 11.no classes 12.no classes 13.no classes 14.no classes 15.no classes				
Course content seminars	1.No classes 2.No classes 3.No classes 4.No classes				

	5.Proposal for process improvement / or trends in operational excellence, 5h, Learning outcomes:3,4 6.Proposal for process improvement / or trends in operational excellence, 5h, Learning outcomes:3,4 7.No classes 8.No classes 9.No classes 10.No classes 11.No classes 12.No classes 13.No classes 14.No classes 15.No classes
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector
Exam literature	Gilat Issar, Liat Ramati Navon: Operational Exelence; Springer International Publishing Switzerland 2016. Dennis P. Hobbs, Lean manufacturing Implementation; J. Ross Publishing,Inc, USA, 2004, Japan Management Association: Kanban, Just in Time at Toyota, Productivity Press, 1986, USA RobinE. McDermott, Raymond J. Mikulak, Michael R. Bearugard: The Basics of FMEA, CRC Press USA, 2008
Students obligations	Class attendance with the permitted number of absences according to the Rulebook on Studying. Active participation in case studies.
Knowledge evaluation during semester	1st Colloquium (min 50, max 100), written, objective type assignments, 30% outcomes 1, 2, 3 2nd Colloquium (min 50, max 100), written, objective type assignments, 30% outcomes 4, 5, 6 3. case studies - scoring good solutions (min 30, max 50), oral, problem solving tasks, group work, 40% outcomes 2, 3, 4, 5, 6 50-63 pass 64-76 good 77-89 very good 90-100 excellent
Knowledge evaluation after semester	Written exam (min 50, max 100), objective type assignments, problem solving tasks the outcomes of 1, 2, 3, 4, 5, 6 Seminar work (min 30, max 50), self-study 50-63 pass 64-76 good 77-89 very good 90-100 excellent
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Activity in class) — 1 (Seminar Work) — 1 (Written exam) — 1 (Constantly tested knowledge) — 2
Remark	This course can not be used for final thesis theme
Proposal made by	M.Sc. Branimir Preprotić, senior lecturer

Code WEB/ISVU	26526/215753	**ECTS**	6	**Academic year**	2020/2021
Name	Advanced methods of water and wastewater treatment				
Status	3rd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course3rd semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+0+10+0) 120
Teachers	Lectures:1. Gregor Drago Zupančić Lectures:2. Mario Panjičko Lectures: Vesna Alić-Kostešić dipl.ing.stroj. Auditory exercises: Mario Panjičko Auditory exercises: Gregor Drago Zupančić Seminar exercises: Mario Panjičko Seminar exercises: Gregor Drago Zupančić				
Course objectives	Acquire advanced specific knowledge in the field of water treatment and wastewater reuse, understanding of advanced applications in drinking and wastewater treatment, understanding of process economics and technologies.				
Learning outcomes:	1.1. Valorize the technological parameters of drinking water,. Level:7 2.2. Combine different advanced water treatment processes. Level:6,7 3.3. Calculate process parameters. Level:6 4.4. Recommend treatment plants using advanced purification methods,. Level:7 5.5. Evaluate the economies of advanced wastewater treatment methods.. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies				
Methods of carrying out auditory exercises	Laboratory exercises on laboratory equipment Group problem solving				
Methods of carrying out seminars	Traditional literature analysis Data mining and knowledge discovery on the Web Essay writing Discussion, brainstorming				
Course content lectures	1.1. Definition of technological parameters of drinking water quality., 2h, Learning outcomes:1 2.2. Recycling and reuse of wastewater,, 2h, Learning outcomes:1 3.3.Tehnologije obrade i pripreme pitke vode, 2h, Learning outcomes:1,2 4.4. Membrane technologies,, 2h, Learning outcomes:1,2 5.5. Advanced oxidation processes (ozonation, peroxide treatment,),, 2h, Learning outcomes:1,2 6.5. Advanced oxidation processes (ozonation, peroxide treatment,),, 2h, Learning outcomes:1,2 7.6. Chemical treatment methods (catalytic oxidation),, 2h, Learning outcomes:1,2 8.6. Chemical treatment methods (catalytic oxidation),, 2h, Learning outcomes:1,2 9.7. Reuse of industrial wastewater,, 2h, Learning outcomes:1,2 10.8. Reverse osmosis,, 2h, Learning outcomes:1,2 11.9. Additional chapters in advanced wastewater treatment processes: technologies with the use of algae, microbiological fuel cells, electrochemical processes, advanced oxidation processes, ..., 2h, Learning outcomes:3,4 12.9. Additional chapters in advanced wastewater treatment processes: technologies with the use of algae, microbiological fuel cells, electrochemical processes, advanced oxidation processes, ..., 2h, Learning outcomes:3,4 13.9. Additional chapters in advanced wastewater treatment processes: technologies with the use of algae, microbiological fuel cells, electrochemical processes, advanced oxidation processes, ..., 2h, Learning outcomes:3,4 14.9. Additional chapters in advanced wastewater treatment processes: technologies with the use of algae, microbiological fuel cells, electrochemical processes, advanced oxidation processes, ..., 2h, Learning outcomes:3,4 15.10. Economics of processing, 2h, Learning outcomes:5				
Course content auditory	1.analysis of water treatment and wastewater reuse problems, 5h, Learning outcomes:1,2,3,4,5 2.analysis of water treatment and wastewater reuse problems, 5h, Learning outcomes:1,2,3,4,5 3.analysis of water treatment and wastewater reuse problems, 5h, Learning outcomes:1,2,3,4,5 4.analysis of water treatment and wastewater reuse problems, 5h, Learning outcomes:1,2,3,4,5 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.				
Course content seminars	1. 2. 3. 4. 5. 6.				

	7. 8. 9. 10. 11. 12. 13. 14.guidelines and assignments for seminar work, 5h, Learning outcomes:1,2,3,4,5 15.guidelines and assignments for seminar work, 5h, Learning outcomes:1,2,3,4,5	
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory	
Exam literature	Tušar B. Pročišćavanje otpadnih voda, Zagreb, 2009.	
Knowledge evaluation after semester	exam and / or seminar paper	
Student activities:	Aktivnost (Classes attendance) (Activity in class) (Seminar Work)	ECTS 1 2 3
Remark	This course can be used for final thesis theme	

Code WEB/ISVU	26525/215752	**ECTS**	6	**Academic year**	2020/2021
Name	Automatic control of plants and processes in environmental protection				
Status	3rd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course3rd semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. prof. dr. sc. Dario Matika Lectures:2. mr.sc. Goran Malčić v.pred. Laboratory exercises: Domagoj Malez Laboratory exercises:prof. dr. sc. Dario Matika				
Course objectives	To enable students to solve problems in the field of plant and process automation as well as the design of automation systems				
Learning outcomes:	1.compare theoretical and practical knowledge for solving problems in the field of plant and process automation. Level:6,7 2.choose the option of designing automation systems through mastering the work with programmable controllers (PLC) for automation of more complex technological processes. Level:7 3.propose a software solution for the controller and process visualization. Level:6,7 4.valorize the application of software tools in solving project tasks in the field of plant and process automation. Level:7 5.evaluate the conceptual design and terms of reference, using the PID diagram in design (Process and Instrumentation Diagrams). Level:7				
Methods of carrying out lectures	Ex cathedra teaching Demonstration Simulations Seminar, students presentation and discussion Other online				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Group problem solving Workshop				
Course content lectures	1.Introduction to the course, definition of basic terms and categories in plant and process automation, 2h, Learning outcomes:1 2.Modern technological solutions for plant and process automation, 2h, Learning outcomes:1,2 3.Sensors, probes and analyzers for plant and process automation, 2h, Learning outcomes:1,2 4.Actuators for plant and process automation, 2h, Learning outcomes:1,2 5.Programmable controller (PLC) for plant and process automation, 2h, Learning outcomes:1,2,3 6.Visualization of the automation process using a , 2h, Learning outcomes:1,2,3 7.The first knowledge check, 2h, Learning outcomes:1,2,3 8.SCADA systems in plant and process automatio, 2h, Learning outcomes:3 9.Application of ERP system (production planning system) in plant and process automation, 2h, Learning outcomes:4 10.Application of RTU communication (remote control) in the design of plant and process automation, 2h, Learning outcomes:4 11.Busbars and interfaces in plant and process automation design, 2h, Learning outcomes:2,4 12.Development of algorithms and environments for plant and process automation design, 2h, Learning outcomes:4,5 13.Application of PID diagrams (Process and Instrumentation Diagrams) in the design of plant and process automation, 2h, Learning outcomes:5 14.Design solutions for complex plant and process automation systems, 2h, Learning outcomes:5 15.The second knowledge check, 2h, Learning outcomes:3,4,5				
Course content laboratory	1.Analog and digital sensors in process and plant automation, 3h, Learning outcomes:1,2 2.Electromechanical, hydraulic, pneumatic and micro actuators in process and plant automation, 3h, Learning outcomes:1,2 3.Examples of PLC programming, 3h, Learning outcomes:2,3 4.Examples of process visualization, 3h, Learning outcomes:2,3 5.Modeling and simulation of automation process using Simulink, 3h, Learning outcomes:3,4 6.Development of program routines for automation process control in Matlab, 3h, Learning outcomes:3,4 7.Optimization of static and dynamic characteristics of actuators - drawing characteristics in Matlab, 3h, Learning outcomes:3,4 8.Design of plant and process automation systems using TIA Portal, 3h, Learning outcomes:3,4 9.Implementation and integration of control algorithms, process computers, buses and interfaces, 3h, Learning outcomes:4,5 10.Development of PID documentation, connection of user interface (HMI) and SCADA support, 3h, Learning outcomes:4,5 11.No classes 12.No classes 13.No classes 14.No classes 15.No classes				
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory Whiteboard with markers Overhead projector				

Exam literature	Basic literature: 1. Perić N., Petrović I., Vašak M.: Procesna automatizacija, Skripta Zavoda za APR, FER, Zagreb, 2013. 2. Perić N., Petrović I.: Automatizacija postrojenja i procesa predavanja, Skripta Zavoda za APR, FER, Zagreb, 2000. Dodatna: 1. Berger H.: SIMATIC automatizacijski sustavi, Graphis, Zagreb, 2013. 2. Groover P.M.: Automation, Production System and Computer-Integrated Manufacturing, Global Edition, Pearson education Limited, 9780133499612, 2015.
Students obligations	Attendance continues with the allowed number of absences according to the Rulebook on studying. Solving tasks in exercises.
Knowledge evaluation during semester	Maximum 60 points, minimum 15 points. Achieved 15 and less than 30 points require additional knowledge testing. The supplementary knowledge test consists of two tasks from each individual outcome test (four tasks) and brings a maximum of 15 points. The student must achieve a total score with a supplementary test of a minimum of 30 points to take the final exam. Exercise reports are 20 points, the pass threshold is 10 points. First outcome check maximum 20 points, pass threshold 10 points. Second outcome check maximum 20 points, pass threshold 10 points. The knowledge test in the semester is carried out in accordance with Article 4 of the Ordinance on student assessment at the Zagreb University of Applied Sciences.
Knowledge evaluation after semester	Maximum 40 points, minimum 20 points. Oral exam with practical part (defense of seminar paper). The final grade is formed in accordance with Article 8 of the Ordinance on student assessment at the Technical Polytechnic in Zagreb.
Student activities:	Aktivnost — ECTS (Classes attendance) — 2 (Constantly tested knowledge) — 4
Remark	This course can be used for final thesis theme
Proposal made by	prof. Dario Matika, Ph.D.

Code WEB/ISVU	26569/216095	**ECTS**	6	**Academic year**	2020/2021
Name	Basics of robotics				
Status	2nd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. prof. dr. sc. Dario Matika Laboratory exercises: Domagoj Malez Laboratory exercises:prof. dr. sc. Dario Matika				
Course objectives	Adoption of theoretical basics and practical knowledge of robotics (robotic manipulators) to solve basic industrial robotics problems (direct and inverse kinematics, robotic trajectory planning, robot dynamics and robot robot analysis and synthesis).				
Learning outcomes:	1.Classify the fundamental properties and technical characteristics of robotic systems in the industry, the development and application of robot manipulators. Level:6,7 2.Identify the underlying physical laws and phenomena that determine the behavior of robot manipulators. Level:7 3.Compare basic robotic manipulator structures (serial, parallel, micro and nano robots). Level:6,7 4.Design the control circuit and robotic hand and tool management system. Level:6,7 5.Create a kinematics and robotic robot dynamics calculation, and design a robotic arm and tool path. Level:6				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Demonstration Simulations Modelling Questions and answers				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Group problem solving Discussion, brainstorming Computer simulations				
Course content lectures	1.Introduction to robots and robotic systems, 2h, Learning outcomes:1,2 2.Robot Definition and Robot Application Examples with Particular Focus on Industrial Robots, 2h, Learning outcomes:1,2 3.Basic parts of the robot, 2h, Learning outcomes:1,2 4.Types of robot joints and basic robot configuration, 2h, Learning outcomes:3 5.Robot position (position and orientation), 2h, Learning outcomes:3,4 6.Direct Kinematics and Coordinate Transformation. Inverse transformation of the coordinates, 2h, Learning outcomes:5 7.Rotation and translation. Complex rotations and tool orientation (vector description), Euler angles. Orientation with Quaternions, 2h, Learning outcomes:4,5 8.Homogeneous coordinates and problem solving of direct kinematics. Denavit-Hartenberg's method of determining kinematic parameters, 2h, Learning outcomes:3,4 9.Equilibrium manipulator arm (three-plane planar rotary robot, five oscillating rotary robot, SCARA robot and puma robot), 2h, Learning outcomes:4,5 10.Solving Inverse Kinematics Problems through Tool Configuration Vector on Example of Three-Axis Planar Rotary Robot and SCARA Robot. Dynamic robot model analysis (Lagrange-Euler model and Newton-Euler model). , 2h, Learning outcomes:4,5 11.Trajectory planning (point-to-point robot motion, continuous robot motion and interpolated cubic polynomial motion) on the example of a three-plane planar rotational robot, 2h, Learning outcomes:4,5 12.Determining trajectory and Ho-Cook approach to trajectory planning). Basic robot robot drive elements and drive types in the robot, 2h, Learning outcomes:4,5 13.Same-engine engine and its application in sequential robot systems. Transmission by means of a gearbox and the mode of managing the sequential systems of robot mechanisms, 2h, Learning outcomes:4,5 14.Synthesis of the regulator sequence (P and PD regulator) and (PI regulator) of the speed of rotation, 2h, Learning outcomes:4,5 15.Handling the robot's wrist, analyzing static and dynamic behavior. Compensation, robust and adaptive position management (Hsia method). Robotic mechanism touch control, 2h, Learning outcomes:4,5				
Course content laboratory	1.Robotic Hand Model - Direct Kinematics, 2h, Learning outcomes:4,5 2.Robotic Hand Model - Direct Kinematics, 2h, Learning outcomes:4,5 3.Robotic Hand Model - Inverse Kinematics, 2h, Learning outcomes:4,5 4.Robotic Hand Model - Inverse Kinematics, 2h, Learning outcomes:4,5 5.Model of robotic arm - orientation using Euler angles, 2h, Learning outcomes:4,5 6.Model of robotic arm - orientation using Euler angles, 2h, Learning outcomes:4,5 7.Model of a robotic hand - orientation by a quaternions, 2h, Learning outcomes:4,5 8.Model of a robotic hand - orientation by a quaternions, 2h, Learning outcomes:4,5 9.Model of robotic hands - planning and tracing of trajectories, 2h, Learning outcomes:4,5 10.Model of robotic hands - planning and tracing of trajectories, 2h, Learning outcomes:4,5 11.Model of robotic hands - planning and tracing of trajectories, 2h, Learning outcomes:4,5 12.Robotic arm model - position control, speed of rotation and touch force, 2h, Learning outcomes:4,5 13.Robotic arm model - position control, speed of rotation and touch force, 2h, Learning outcomes:4,5 14.Robotic arm model - position control, speed of rotation and touch force, 2h, Learning outcomes:4,5 15.Robotic arm model - position control, speed of rotation and touch force, 2h, Learning outcomes:4,5				

Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory Special purpose computer laboratory Maquette
Exam literature	Kovačić Z., Bogdan S., Krajči V.,Osnove robotike,Graphis, Zagreb,,2008 Richard M. Murray Zexiang Li S. Shankar Sastry,A Mathematical Introduction to Robotic Manipulation,CRC Press,,1994
Students obligations	presence of exercises 80%
Knowledge evaluation during semester	written exam 50% research work 20% seminar paper 30%
Knowledge evaluation after semester	written exam 50% oral exam 30% seminar work 20%
Student activities:	Aktivnost — ECTS (Written exam) — 3 (Oral exam) — 2 (Seminar Work) — 1
Remark	This course can be used for final thesis theme
ISVU equivalents:	200522;

Code WEB/ISVU	26528/215755	**ECTS**	6	**Academic year**	2020/2021
Name	Biomass management technologies				
Status	3rd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course3rd semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+0+10+0) 120
Teachers	Lectures:1. Mario Panjičko Lectures: Vesna Alić-Kostešić dipl.ing.stroj. Lectures: Gregor Drago Zupančić Auditory exercises: Mario Panjičko Auditory exercises: Gregor Drago Zupančić Seminar exercises: Mario Panjičko Seminar exercises: Gregor Drago Zupančić				
Course objectives	Acquire knowledge in the field of biomass processing and biofuel production				
Learning outcomes:	1.1. Combine the basic principles of different energy extraction systems from biomass and the appropriate type of biomass depending on the methods of its application. Level:6,7 2.2. To determine the desirable characteristics of individual sources of biomass and their advantages in relation to conventional fuels. Level:7 3.3. Assess the limitations of the use of certain types of biomass in terms of location, investment costs and profitability compared to conventional energy sources. Level:7 4.4. Calculate the production of biomass from waste and energy plants. Level:6 5.5. Calculate wood biomass production. Level:6 6.6. Calculate energy yields from biomass processing processes, amount of produced biogas, bioethanol and biodiesel. Level:6 7.7. Plan mass and energy balances of biomass processing procedures with justification of process efficiency. Level:6,7 8.8. Calculate the economic viability of individual biofuel production processes (from the first to the fourth generation).. Level:6				
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion Seminar, students presentation and discussion				
Methods of carrying out auditory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Group problem solving Workshop				
Methods of carrying out seminars	Essay writing Discussion, brainstorming				
Course content lectures	1.1. An overview of basic concepts in understanding biofuels and bioenergy systems, 2h, Learning outcomes:1 2.2. Overview of renewable biomass sources, definition of possibilities of utilization: biofuels, biomass, raw materials,, 2h, Learning outcomes:1 3.3. Availability and characteristics for biofuel production,, 2h, Learning outcomes:2 4.4. Overview of the basic characteristics of different types of biomass and plants for biomass processing and biofuel production as a basis for technological, construction and mechanical design,, 2h, Learning outcomes:3 5.5. Biofuels of the first, second, third and fourth generation,, 2h, Learning outcomes:3 6.6. Thermo-chemical conversion of biomass into heat and electricity and fuel,, 2h, Learning outcomes:4,5 7.7. Biochemical conversion of biomass into fuel,, 2h, Learning outcomes:4,5 8.8. Production of biogas, bioethanol and biodiesel,, 2h, Learning outcomes:4,5 9.9. Utilization of wood biomass, composting of biomass,, 2h, Learning outcomes:5 10.10. Preparation of mass and energy balances of biofuel production processes,, 2h, Learning outcomes:5,6 11.10. Preparation of mass and energy balances of biofuel production processes,, 2h, Learning outcomes:4,5 12.11. Ecological aspects of biofuel production,, 2h, Learning outcomes:4,5 13.12. Preparation of economic balances of biofuel production and utilization of biomass as raw material,, 2h, Learning outcomes:6,7 14.12. Preparation of economic balances of biofuel production and utilization of biomass as raw material,, 2h, Learning outcomes:6,7 15.13. Advanced, CO2 negative, biomass production processes (algae biomass production, , 2h, Learning outcomes:6,7				
Course content auditory	1.biomass processing and biofuel production processes, 5h, Learning outcomes:1,2,3,4,5,6,7 2.biomass processing and biofuel production processes, 5h, Learning outcomes:1,2,3,4,5,6,7 3.biomass processing and biofuel production processes, 5h, Learning outcomes:1,2,3,4,5,6,7 4.biomass processing and biofuel production processes, 5h, Learning outcomes:1,2,3,4,5,6,7 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.				

	15.
Course content seminars	1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.guidelines and preparation of seminar papers, 5h, Learning outcomes:1,2,3,4,5,6,7,8 15.guidelines and preparation of seminar papers, 5h, Learning outcomes:1,2,3,4,5,6,7
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory
Exam literature	J. Domac, et al. BIOEN Program korištenja energije biomase i otpada: Nove spoznaje i provedbe. Energetski institut Hrvoje Požar, Zagreb, 2001.
Students obligations	class attendance
Knowledge evaluation during semester	colloquium
Knowledge evaluation after semester	exam and / or seminar paper
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Activity in class) — 2 (Seminar Work) — 3
Remark	This course can be used for final thesis theme

Code WEB/ISVU	26534/215761	**ECTS**	6	**Academic year**	2020/2021
Name	Business models and entrepreneurship				
Status	3rd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course3rd semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+0+10+0) 120
Teachers	Lectures:1. doc.dr.sc. Dalija Kuvačić profesor visoke škole Lectures:mag.oec Kristina Perec Auditory exercises:mag.oec Kristina Perec Seminar exercises:mag.oec Kristina Perec				
Course objectives	To understand modern processes in entrepreneurship, the functioning of entrepreneurship in the context of globalization				
Learning outcomes:	1.identify entrepreneurship as a challenge of the present. Level:6 2.establish the functions of entrepreneurship. Level:6 3.distinguish different types of businesses. Level:6 4.analyze the business environment. Level:6 5.analyze strategic areas of the business model. Level:6 6.identify mission, vision, goals and appropriate strategies. Level:6 7.shape the elements of a business plan. Level:6 8.compile a business plan. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching				
Methods of carrying out auditory exercises	Other -				
Methods of carrying out seminars	Data mining and knowledge discovery on the Web Essay writing Workshop				
Course content lectures	1.Introduction and introduction of students to the content of the course, outcomes and how to test knowledge, 2h 2.conceptual definition of business model and entrepreneurship, 2h, Learning outcomes:1 3.functions of entrepreneurship, 2h, Learning outcomes:2 4.forms and functions of entrepreneurship, 2h, Learning outcomes:2 5.starting an entrepreneurial project, 2h, Learning outcomes:3 6.analysis of strategic areas: business model environment, evaluation, perception according to blue ocean strategies, 2h, Learning outcomes:5 7.managing multiple business models, 2h, Learning outcomes:6 8.competitive advantage and entrepreneurial strategies, 2h, Learning outcomes:5 9.entrepreneurship in the context of globalization, 2h, Learning outcomes:4,5 10.business model structure, 2h, Learning outcomes:4,5 11.business model design process, 2h, Learning outcomes:5 12.business plan, planning, 2h, Learning outcomes:7 13.business plan, types of planning, 2h, Learning outcomes:7 14.business plan, defining a business plan, 2h, Learning outcomes:7 15.business plan, use and application of a business plan, 2h, Learning outcomes:7				
Course content auditory	1.no class 2.no class 3.no class 4.no class 5.no class 6.no class 7.no class 8.no class 9.no class 10.no class 11.no class 12.no class 13.no class 14.no class 15.no class				
Course content seminars	1.getting acquainted with the way of working, 2h 2.team formation, 2h, Learning outcomes:7,8 3.planning and development of business model and business plan, 2h, Learning outcomes:7,8 4.planning and development of business model and business plan, 2h, Learning outcomes:7,8 5.planning and development of business model and business plan, 2h, Learning outcomes:7,8 6.planning and development of business model and business plan, 2h, Learning outcomes:7,8 7.presenting a business plan, 2h, Learning outcomes:7,8 8.presenting a business plan, 2h, Learning outcomes:7,8 9.presenting a business plan, 2h, Learning outcomes:7,8 10.presenting a business plan, 2h, Learning outcomes:7,8 11.presenting a business plan, 2h, Learning outcomes:7,8				

	12.presenting a business plan, 2h, Learning outcomes:7,8 13.presenting a business plan, 2h, Learning outcomes:7,8 14.presenting a business plan, 2h, Learning outcomes:7,8 15.presenting a business plan, 2h, Learning outcomes:7,8
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector
Exam literature	A.Osterwald, Y.Pigneur: Stvaranje poslovnih modela, Školska knjiga, Zagreb 2014. B.Boflek, L. Sigurnjak: Poduzetništvo, Veleučilište u Slavonskom Brodu, 2011. Buble, M.et.al, Strateški menadžment, Sinergija, Zagreb, 2005. Hirsrich, R.D, Peters M.P, Shepherd, d.A, Poduzetništvo, Mate, Zagreb, 2011.
Students obligations	Regular class attendance with the allowed number of absences according to the Rulebook on studying
Knowledge evaluation during semester	1st colloquium, 33.33%, outcomes 1, 2 and 3 2nd colloquium, 33.33%, outcomes 4, 5 and 6 Seminar paper, 33.33%, outcomes 7 and 8 0-89 Insufficient 90-105 Enough 106-120 Good 121-135 Very good 136-150 Excellent
Knowledge evaluation after semester	Written exam, 66.67%, outcomes 1, 2, 3, 4, 5 and 6 Seminar paper, 33.33%, outcomes 7 and 8 0-89 Insufficient 90-105 Enough 106-120 Good 121-135 Very good 136-150 Excellent
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Activity in class) — 1 (Seminar Work) — 1 (Written exam) — 1 (Constantly tested knowledge) — 1 (Practical work) — 1
Remark	This course can be used for final thesis theme
Proposal made by	Vesna Alić Kostešić, dipl.ing.stroj., v. pred., 17.7.2020

Code WEB/ISVU	26531/215758	**ECTS**	6	**Academic year**	2020/2021
Name	Business production information systems				
Status	4th semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course4th semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+15+15+0) 120
Teachers	Lectures:1. Vesna Alić-Kostešić dipl.ing.stroj. Laboratory exercises: Vesna Alić-Kostešić dipl.ing.stroj. Seminar exercises: Vesna Alić-Kostešić dipl.ing.stroj.				
Course objectives	BUSINESS and PRODUCTION INFORMATION SYSTEMS				
Learning outcomes:	1.Present the organizational structure (scheme) of the company as a prerequisite. Level:6,7 2.standardize ERP and CIPP systems. Level:6,7 3.present the implementation of ERP systems in the enterprise. Level:6,7 4.analyze the functionality of ERP and CIPP systems. Level:6 5.assess the applicability of an appropriate ERP or CIPP system to troubleshooting. Level:7 6.anticipate limiting factors in the implementation of ERP or CIPP. Level:6,7 7.plan CIPP (Computer Production Planning) and ERP (Enterprise Resource Planning) business information system. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Discussion Seminar, students presentation and discussion				
Methods of carrying out laboratory exercises	Laboratory exercises, computer simulations				
Methods of carrying out seminars	Data mining and knowledge discovery on the Web Discussion, brainstorming				
Course content lectures	1.Organizational structure of the company, 2h, Learning outcomes:1 2.Organizational structure of the company, 2h, Learning outcomes:1 3.Significance and role of ERP systems, 2h, Learning outcomes:1,2 4.Significance and role of ERP systems, 2h, Learning outcomes:1,2 5.Business processes in the company, 2h, Learning outcomes:1,2,3 6.Significance and role of the CIPP system, 2h, Learning outcomes:4 7.Elements of production planning, 2h, Learning outcomes:4,5,6 8.Production management - areas, 2h, Learning outcomes:4,5,6 9.The restrictions in the planning and management of production, 2h, Learning outcomes:4,5,6 10.Production planning activities , 2h, Learning outcomes:7 11.Production planning activities, 2h, Learning outcomes:7 12.Production control activities, 2h, Learning outcomes:7 13.Production control activities, 2h, Learning outcomes:7 14.Material inventory management, 2h, Learning outcomes:7 15.Material inventory management, 2h, Learning outcomes:7				
Course content laboratory	1.ERP system functionalities, 5h, Learning outcomes:1,2,3,4,5,6,7 2.ERP system functionalities, 5h, Learning outcomes:1,2,3,4,5,6,7 3.ERP system functionalities, 5h, Learning outcomes:1,2,3,4,5,6 4.there are no classes 5.there are no classes 6.there are no classes 7.there are no classes 8.there are no classes 9.there are no classes 10.there are no classes 11.there are no classes 12.there are no classes 13.there are no classes 14.there are no classes 15.there are no classes				
Course content seminars	1. there are no classes 2.there are no classes 3.there are no classes 4.there are no classes 5.there are no classes 6.there are no classes 7.there are no classes 8.there are no classes 9.there are no classes 10.there are no classes 11.there are no classes				

	12.there are no classes 13.Introduction to the guidelines for preparing a seminar paper, 5h, Learning outcomes:1,2,3,4,5,6,7 14.Introduction to the guidelines for preparing a seminar paper, 5h, Learning outcomes:1,2,3,4,5,6,7 15.Introduction to the guidelines for preparing a seminar paper, 5h, Learning outcomes:1,2,3,4,5,6,7
Required materials	General purpose computer laboratory Special equipment
Exam literature	INFORMACIJSKI SUSTAVI U POSLOVANJU,Spremić, Mario; Srića, Velimir; Bosilj, Vukšić, Vesna; Ćurko, Katarina; Jaković, Božidar; Milanović Glavan, Ljubica; Pejić Bach, Mirjana; Strugar, Ivan; Varga, Mladen; Vlahović, Nikola; Zoroja, Jovana,Sveučilište u Zagrebu, 2016.
Students obligations	regular class attendance
Knowledge evaluation during semester	that are evaluated are expressed in points Performance for each activity - Ui% Way/ method Verification of outcomes Weight share in the assessment - Ti% Criterion of evaluation of total achievement #931;_ (i = 1) ^ N#9618;UiTi N - total number of evaluated activities min max Continuous monitoring during classes 1. Seminar paper 50 100 30% Achievement% evaluation 2. research work 50 100 20% 50-63 64-76 77-89 90-100 sufficient good very good excellent 3.npr: Written examination 50 100 50% 4th Exam deadlines Final exam 1. eg Written exam 50 100 50% 50-63 64-76 77-89 90-100 sufficient good very good excellen
Knowledge evaluation after semester	Exam deadlines Final exam 1. eg Written exam 50 100 50% 50-63 64-76 77-89 90-100 sufficient good very good excellent
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Activity in class) — 2 (Seminar Work) — 3
Remark	This course can be used for final thesis theme

Code WEB/ISVU	26539/215766	**ECTS**	6	**Academic year**	2020/2021
Name	Business production information systems				
Status	4th semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course4th semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+15+15+0) 120
Teachers	Lectures:1. Vesna Alić-Kostešić dipl.ing.stroj. Laboratory exercises: Vesna Alić-Kostešić dipl.ing.stroj. Seminar exercises: Vesna Alić-Kostešić dipl.ing.stroj.				
Course objectives	BUSINESS and PRODUCTION INFORMATION SYSTEMS				
Learning outcomes:	1.Present the organizational structure (scheme) of the company as a prerequisite. Level:6,7 2.standardize ERP and CIPP systems. Level:6,7 3.present the implementation of ERP systems in the enterprise. Level:6,7 4.analyze the functionality of ERP and CIPP systems. Level:6 5.assess the applicability of an appropriate ERP or CIPP system to troubleshooting. Level:7 6.anticipate limiting factors in the implementation of ERP or CIPP. Level:6,7 7.plan CIPP (Computer Production Planning) and ERP (Enterprise Resource Planning) business information system. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Discussion Seminar, students presentation and discussion				
Methods of carrying out laboratory exercises	Laboratory exercises, computer simulations				
Methods of carrying out seminars	Data mining and knowledge discovery on the Web Discussion, brainstorming				
Course content lectures	1.Organizational structure of the company, 2h, Learning outcomes:1 2.Organizational structure of the company, 2h, Learning outcomes:1 3.Significance and role of ERP systems, 2h, Learning outcomes:1,2 4.Significance and role of ERP systems, 2h, Learning outcomes:1,2 5.Business processes in the company, 2h, Learning outcomes:1,2,3 6.Significance and role of the CIPP system, 2h, Learning outcomes:4 7.Elements of production planning, 2h, Learning outcomes:4,5,6 8.Production management - areas, 2h, Learning outcomes:4,5,6 9.The restrictions in the planning and management of production, 2h, Learning outcomes:4,5,6 10.Production planning activities , 2h, Learning outcomes:7 11.Production planning activities, 2h, Learning outcomes:7 12.Production control activities, 2h, Learning outcomes:7 13.Production control activities, 2h, Learning outcomes:7 14.Material inventory management, 2h, Learning outcomes:7 15.Material inventory management, 2h, Learning outcomes:7				
Course content laboratory	1.ERP system functionalities, 5h, Learning outcomes:1,2,3,4,5,6,7 2.ERP system functionalities, 5h, Learning outcomes:1,2,3,4,5,6,7 3.ERP system functionalities, 5h, Learning outcomes:1,2,3,4,5,6 4.there are no classes 5.there are no classes 6.there are no classes 7.there are no classes 8.there are no classes 9.there are no classes 10.there are no classes 11.there are no classes 12.there are no classes 13.there are no classes 14.there are no classes 15.there are no classes				
Course content seminars	1. there are no classes 2.there are no classes 3.there are no classes 4.there are no classes 5.there are no classes 6.there are no classes 7.there are no classes 8.there are no classes 9.there are no classes 10.there are no classes 11.there are no classes				

	12.there are no classes 13.Introduction to the guidelines for preparing a seminar paper, 5h, Learning outcomes:1,2,3,4,5,6,7 14.Introduction to the guidelines for preparing a seminar paper, 5h, Learning outcomes:1,2,3,4,5,6,7 15.Introduction to the guidelines for preparing a seminar paper, 5h, Learning outcomes:1,2,3,4,5,6,7
Required materials	General purpose computer laboratory Special equipment
Exam literature	INFORMACIJSKI SUSTAVI U POSLOVANJU,Spremić, Mario; Srića, Velimir; Bosilj, Vukšić, Vesna; Ćurko, Katarina; Jaković, Božidar; Milanović Glavan, Ljubica; Pejić Bach, Mirjana; Strugar, Ivan; Varga, Mladen; Vlahović, Nikola; Zoroja, Jovana,Sveučilište u Zagrebu, 2016.
Students obligations	regular class attendance
Knowledge evaluation during semester	that are evaluated are expressed in points Performance for each activity - Ui% Way/ method Verification of outcomes Weight share in the assessment - Ti% Criterion of evaluation of total achievement #931;_ (i = 1) ^ N#9618;UiTi N - total number of evaluated activities min max Continuous monitoring during classes 1. Seminar paper 50 100 30% Achievement% evaluation 2. research work 50 100 20% 50-63 64-76 77-89 90-100 sufficient good very good excellent 3.npr: Written examination 50 100 50% 4th Exam deadlines Final exam 1. eg Written exam 50 100 50% 50-63 64-76 77-89 90-100 sufficient good very good excellen
Knowledge evaluation after semester	Exam deadlines Final exam 1. eg Written exam 50 100 50% 50-63 64-76 77-89 90-100 sufficient good very good excellent
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Activity in class) — 2 (Seminar Work) — 3
Remark	This course can be used for final thesis theme

Code WEB/ISVU	26523/215750	**ECTS**	6	**Academic year**	2020/2021
Name	Business production information systems				
Status	4th semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course4th semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+15+15+0) 120
Teachers	Lectures:1. Vesna Alić-Kostešić dipl.ing.stroj. Laboratory exercises: Vesna Alić-Kostešić dipl.ing.stroj. Seminar exercises: Vesna Alić-Kostešić dipl.ing.stroj.				
Course objectives	BUSINESS and PRODUCTION INFORMATION SYSTEMS				
Learning outcomes:	1.Present the organizational structure (scheme) of the company as a prerequisite. Level:6,7 2.standardize ERP and CIPP systems. Level:6,7 3.present the implementation of ERP systems in the enterprise. Level:6,7 4.analyze the functionality of ERP and CIPP systems. Level:6 5.assess the applicability of an appropriate ERP or CIPP system to troubleshooting. Level:7 6.anticipate limiting factors in the implementation of ERP or CIPP. Level:6,7 7.plan CIPP (Computer Production Planning) and ERP (Enterprise Resource Planning) business information system. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Discussion Seminar, students presentation and discussion				
Methods of carrying out laboratory exercises	Laboratory exercises, computer simulations				
Methods of carrying out seminars	Data mining and knowledge discovery on the Web Discussion, brainstorming				
Course content lectures	1.Organizational structure of the company, 2h, Learning outcomes:1 2.Organizational structure of the company, 2h, Learning outcomes:1 3.Significance and role of ERP systems, 2h, Learning outcomes:1,2 4.Significance and role of ERP systems, 2h, Learning outcomes:1,2 5.Business processes in the company, 2h, Learning outcomes:1,2,3 6.Significance and role of the CIPP system, 2h, Learning outcomes:4 7.Elements of production planning, 2h, Learning outcomes:4,5,6 8.Production management - areas, 2h, Learning outcomes:4,5,6 9.The restrictions in the planning and management of production, 2h, Learning outcomes:4,5,6 10.Production planning activities , 2h, Learning outcomes:7 11.Production planning activities, 2h, Learning outcomes:7 12.Production control activities, 2h, Learning outcomes:7 13.Production control activities, 2h, Learning outcomes:7 14.Material inventory management, 2h, Learning outcomes:7 15.Material inventory management, 2h, Learning outcomes:7				
Course content laboratory	1.ERP system functionalities, 5h, Learning outcomes:1,2,3,4,5,6,7 2.ERP system functionalities, 5h, Learning outcomes:1,2,3,4,5,6,7 3.ERP system functionalities, 5h, Learning outcomes:1,2,3,4,5,6 4.there are no classes 5.there are no classes 6.there are no classes 7.there are no classes 8.there are no classes 9.there are no classes 10.there are no classes 11.there are no classes 12.there are no classes 13.there are no classes 14.there are no classes 15.there are no classes				
Course content seminars	1. there are no classes 2.there are no classes 3.there are no classes 4.there are no classes 5.there are no classes 6.there are no classes 7.there are no classes 8.there are no classes 9.there are no classes 10.there are no classes 11.there are no classes				

	12.there are no classes 13.Introduction to the guidelines for preparing a seminar paper, 5h, Learning outcomes:1,2,3,4,5,6,7 14.Introduction to the guidelines for preparing a seminar paper, 5h, Learning outcomes:1,2,3,4,5,6,7 15.Introduction to the guidelines for preparing a seminar paper, 5h, Learning outcomes:1,2,3,4,5,6,7
Required materials	General purpose computer laboratory Special equipment
Exam literature	INFORMACIJSKI SUSTAVI U POSLOVANJU,Spremić, Mario; Srića, Velimir; Bosilj, Vukšić, Vesna; Ćurko, Katarina; Jaković, Božidar; Milanović Glavan, Ljubica; Pejić Bach, Mirjana; Strugar, Ivan; Varga, Mladen; Vlahović, Nikola; Zoroja, Jovana,Sveučilište u Zagrebu, 2016.
Students obligations	regular class attendance
Knowledge evaluation during semester	that are evaluated are expressed in points Performance for each activity - Ui% Way/ method Verification of outcomes Weight share in the assessment - Ti% Criterion of evaluation of total achievement #931;_ (i = 1) ^ N#9618;UiTi N - total number of evaluated activities min max Continuous monitoring during classes 1. Seminar paper 50 100 30% Achievement% evaluation 2. research work 50 100 20% 50-63 64-76 77-89 90-100 sufficient good very good excellent 3.npr: Written examination 50 100 50% 4th Exam deadlines Final exam 1. eg Written exam 50 100 50% 50-63 64-76 77-89 90-100 sufficient good very good excellen
Knowledge evaluation after semester	Exam deadlines Final exam 1. eg Written exam 50 100 50% 50-63 64-76 77-89 90-100 sufficient good very good excellent
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Activity in class) — 2 (Seminar Work) — 3
Remark	This course can be used for final thesis theme

Code WEB/ISVU	26524/215751	**ECTS**	6	**Academic year**	2020/2021
Name	Computer vision				
Status	4th semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course4th semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. Tamara Ivelja mag. ing., pred. Lectures: Vesna Alić-Kostešić dipl.ing.stroj. Laboratory exercises: Tamara Ivelja mag. ing., pred. Laboratory exercises: Domagoj Malez				
Course objectives	creating a real-world model from images or a timeline of images				
Learning outcomes:	1.1. identify concepts from computer vision and complex systems based on computer vision. Level:7 2.Analyze the given problem in the field of computer vision. Level:6 3.Classify computer vision algorithms. Level:6,7 4.analyze the problem of computer or robotic vision systems. Level:6 5.create an image processing algorithm using a computer vision software library. Level:6,7 6.develop a computer or robotic vision system for a specific application. Level:6,7 7. Assess the quality of computer-based system solutions. Level:7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Simulations Modelling				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Data mining and knowledge discovery on the Web Discussion, brainstorming Mind mapping Computer simulations				
Course content lectures	1.1. Definition of computer and robotic vision. Tasks of the computer vision system. Relationship between biological and computer vision. computer vision and related areas , 2h, Learning outcomes:1 2.2. Image, cameras, models, calibration, light perception, 2h, Learning outcomes:1 3.3. Basic relations between image elements, binary image processing,, 2h, Learning outcomes:1 4.4. Projections, string length coding and binary algorithms (size filter, Euler number, region edge, area, range, compactness, distance transformation, central axes, thinning, expansion and contraction),, 2h, Learning outcomes:2 5.5. Morphological operators, basic operations, dilatation, erosion, closure, opening, binary morphology,, 2h, Learning outcomes:3 6.6. Improvement of gray image properties, exponential transformations, histogram modeling, linear filters (convolutional filter, spatial averaging filter, Gaussian filter, Median filter),, 2h, Learning outcomes:4 7.7. Area-based image segmentation. Dispersion and fusion method. Otsu's threshold selection method. Heuristic methods. Area view , 2h, Learning outcomes:5 8.8. Edge detection, edge segmentation. Gaussian operator. Sobel and compass edge operators. LoG edge detector. Canny edge detector, 2x, Outcome 5 , 2h, Learning outcomes:5 9.9. Textures and colors in images, color models, eye physiology, texture recognition algorithms, , 2h, Learning outcomes:6 10.10. 3D space, points in 3D space, coordinate system transformation, internal orientation and calibration, 2h, Learning outcomes:6 11.11. Recognize objects in an image. Artificial neural networks for object recognition in images,, 2h, Learning outcomes:5 12.12. Deep and convolutional artificial neural networks for object recognition in an image, , 2h, Learning outcomes:7 13.13. Detection and tracking of moving objects, change detection and change-based segmentation, 2h, Learning outcomes:7 14.14. Scene comprehension system models: Hierarchical, bulletin board model. Descriptive formalisms. Demonstration of knowledge in computer and robotic vision systems, 2h, Learning outcomes:7 15.15. Illustrations of procedures and solving tasks,, 2h, Learning outcomes:7				
Course content laboratory	1.1. Introduction to software development and open computer vision library., 2h, Learning outcomes:1 2.2. Basic and advanced image manipulations, 2h, Learning outcomes:2 3.2. Basic and advanced image manipulations, 2h, Learning outcomes:2 4.3. Image processing procedures, 2h, Learning outcomes:2 5.3. Image processing procedures, 2h, Learning outcomes:3 6.4. Morphological operators: object marking, dilatation, erosion, closing and opening , 2h, Learning outcomes:3 7.4. Morphological operators: object marking, dilatation, erosion, closing and opening , 2h, Learning outcomes:4 8.5. Program library OpenCV: image processing, detection and classification of objects, work with time series of images, detection and tracking of objects, 2h, Learning outcomes:5,6,7 9.5. Program library OpenCV: image processing, detection and classification of objects, work with time series of images, detection and tracking of objects, 2h, Learning outcomes:5,6,7 10.5. Program library OpenCV: image processing, detection and classification of objects, work with time series of images, detection and tracking of objects, 2h, Learning outcomes:5,6,7 11.5. Program library OpenCV: image processing, detection and classification of objects, work with time series of images, detection and tracking of objects, 2h, Learning outcomes:4,5,6 12.5. Program library OpenCV: image processing, detection and classification of objects, work with time series of images, detection and tracking of objects, 2h, Learning outcomes:4,5,6				

	13.5.5. Program library OpenCV: image processing, detection and classification of objects, work with time series of images, detection and tracking of objects, 2h, Learning outcomes:5,6,7 14.5. Program library OpenCV: image processing, detection and classification of objects, work with time series of images, detection and tracking of objects, 2h, Learning outcomes:5,6,7 15.5. Program library OpenCV: image processing, detection and classification of objects, work with time series of images, detection and tracking of objects, 2h, Learning outcomes:5,6,7
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory
Exam literature	1.D. A. Forsyth, J. P. Ponce: Computer Vision: A Modern Approach, Prentice Hall, 2003. 2.W. E. Snyder, H. Qi: Machine Vision, Cambridge University Press, 2004. 3.M. Nixon, A. Aguado: Feature Extraction Image Processing, Elsevier, 2008. 4.G. Bradski, A. Kaehler: Learning OpenCV, O'Reilly, 2008.
Students obligations	regular class attendance
Knowledge evaluation during semester	colloqium
Knowledge evaluation after semester	wrutten exam
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Activity in class) — 2 (Research) — 1 (Practical work) — 2
Remark	This course can be used for final thesis theme

Code WEB/ISVU	26519/215741	**ECTS**	6	**Academic year**	2020/2021
Name	Design of embedded computer systems				
Status	3rd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course3rd semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. dr. sc. Toni Bjažić prof. v. š. Laboratory exercises:dr. sc. Toni Bjažić prof. v. š. Laboratory exercises: Dean Fraj struč. spec. ing. el.				
Course objectives	To enable students to design and program embedded computer systems and fast implementation on prototype hardware using a higher programming language				
Learning outcomes:	1.select a suitable microcontroller system with regard to application requirements (speed, cost, power, energy). Level:7 2.write simple programs in a higher programming language for a prototype microcontroller system. Level:6,7 3.analyze program code, predefined simple libraries, and application program interfaces. Level:6 4.develop simple libraries (classes) with the aim of sharing within the team and accelerating prototype development. Level:6,7 5.combine own libraries with predefined libraries to work with peripheral units of the prototype microcontroller system. Level:6,7 6.develop programs for a prototype microcontroller system based on real-time operating system and Internet of Things. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Demonstration Seminar, students presentation and discussion online				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Group problem solving Workshop Other online				
Course content lectures	1.Introduction to Embedded Computer Systems and the Internet of Things, 2h, Learning outcomes:1 2.Introduction to hardware and software development platform, 2h, Learning outcomes:1 3.Embedded computer system architecture, 2h, Learning outcomes:1 4.Introduction to embedded computer system programming, 2h, Learning outcomes:2,3,4,5 5.Digital inputs and outputs, 2h, Learning outcomes:2,3,4,5 6.Low power mode interrupts and features, 2h, Learning outcomes:2,3,4,5 7.Program libraries (use and development), 2h, Learning outcomes:2,3,4,5 8.Analog inputs and outputs, 2h, Learning outcomes:2,3,4,5 9.Timers and pulse-width modulation, 2h, Learning outcomes:2,3,4,5 10.Serial communication, 2h, Learning outcomes:2,3,4,5 11.Real-time operating system, 2h, Learning outcomes:5,6 12.Network connection via Bluetooth Smart (Bluetooth Low Energy, BLE) technology, 2h, Learning outcomes:5,6 13.Linking , 2h, Learning outcomes:5,6 14.System integration, 2h, Learning outcomes:5,6 15.System integration, 2h, Learning outcomes:5,6				
Course content laboratory	1.Introduction to the development platform and the first program. Standard digital outputs, 2h, Learning outcomes:2,3,4,5 2.Standard and OpenDrain digital outputs. Digital inputs with pull modes, 2h, Learning outcomes:2,3,4,5 3.Low power mode interrupts and features, 2h, Learning outcomes:2,3,4,5 4.Development of a program library on the example of a specific sensor, 2h, Learning outcomes:2,3,4,5 5.Analog inputs and outputs (use of potentiometers, waveform generation), 2h, Learning outcomes:2,3,4,5 6.Analog inputs and outputs (temperature sensor, LDR resistor, analog communication between two microcontrollers), 2h, Learning outcomes:2,3,4,5 7.PWM signal generation. LED brightness control using PWM modulation Adjusts the color of the RGB LED using PWM modulation. Sending a PWM signal to the speaker (piezo buzzer). Servo motor control using PWM modulation, 2h, Learning outcomes:2,3,4,5 8.Working with real-time operating system, 2h, Learning outcomes:5,6 9.Network connection via Bluetooth Smart (Bluetooth Low Energy, BLE) technology, 2h, Learning outcomes:5,6 10.Connecting things to the cloud and system integration., 2h, Learning outcomes:5,6 11.Connecting things to the cloud and system integration., 2h, Learning outcomes:5,6 12.Presentation of seminar papers, 2h, Learning outcomes:1,2,3,4,5,6 13.Presentation of seminar papers, 2h, Learning outcomes:1,2,3,4,5,6 14.Presentation of seminar papers, 2h, Learning outcomes:1,2,3,4,5,6 15.Presentation of seminar papers, 2h, Learning outcomes:1,2,3,4,5,6				
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory Overhead projector				
Exam literature	Osnovna: 1. Rob Toulson, Tim Wilmshurst: Fast and Effective Embedded Systems Design - Applying the ARM mbed, Second Edition, 978-0-08-100880-5, 2017. 2. Ljubivoj Cvitaš,Brzi razvoj prototipova na bazi mikroupravljača,Tehničko veleučilište u Zagrebu, 2015.				

	Additional literature: 1.Julijan Šribar, Boris Motik,Demistificirani C++,Element,978-953-197-620-6,2014 2.Joyce M. Farrell,Object Oriented Programming Using C++,Course Technology, Inc.,978-1423902577,2009 3.Bjarne Stroustrup,The C++ Programming Language,Addison-Wesley,978-0321563842,2013 4.ARM University Program,Embedded Systems/MCUs,ARM,,2016 5.ARM University Program,Mechatronics/Intro Robotics,ARM,,2016 6.ARM University Program,OS Applications Development,ARM,,2016 7.ARM University Program,Internet of Things,ARM,,2016 8.Mario Kovač,Arhitektura računala,Fakultet elektrotehnike i računarstva, Zagreb,978-953-184-205-1,2015.
Students obligations	completed all laboratory exercises and accepted the topic of the seminar paper
Knowledge evaluation during semester	preparation and defense of a seminar paper with a demonstration of the operation of the system with a microcontroller
Knowledge evaluation after semester	preparation and defense of a seminar paper with a demonstration of the operation of the system with a microcontroller or classical exam
Student activities:	Aktivnost — ECTS (Classes attendance) — 2 (Constantly tested knowledge) — 4
Remark	This course can be used for final thesis theme
Proposal made by	prof. Toni Bjažić, Ph.D., 2020-07-15

Code WEB/ISVU	26563/216089	**ECTS**	6	**Academic year**	2020/2021
Name	Digital systems management				
Status	2nd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. prof. dr. sc. Dario Matika Lectures:2. dr. sc. Toni Bjažić prof. v. š. Laboratory exercises:prof. dr. sc. Dario Matika				
Course objectives	Acquisition of basic knowledge and skills in the field of discrete and digital systems management, ability to analyze and synthesize discrete automated control systems.				
Learning outcomes:	1.formulate a linear discrete system. Level:6,7 2.create discrete mathematical models using Z transformation. Level:6,7 3.analyze a discrete (digital) automatic control system. Level:6 4.analyze the characteristics of discrete (digital) regulators. Level:6 5.calculate the parameters for a discrete (digital) automatic control system. Level:6 6.solve the set problem in the design of the discrete controller. Level:6				
Methods of carrying out lectures	Ex cathedra teaching Case studies Simulations Discussion				
Methods of carrying out laboratory exercises	Laboratory exercises, computer simulations Group problem solving Computer simulations Other online				
Course content lectures	1.Basic concepts and definitions, 2h, Learning outcomes:1 2.Open, Closed and Combined Control System, 2h, Learning outcomes:1 3.Mathematical description of linear discrete control systems, 2h, Learning outcomes:2 4.Mathematical description of linear discrete control systems, 2h, Learning outcomes:2 5.Analysis of linear discrete control systems, 2h, Learning outcomes:3 6.Analysis of linear discrete management systems, 2h, Learning outcomes:3 7.knowledge test, 2h, Learning outcomes:1,2,3 8.Transmission function, stability, accuracy and transient characteristic of discrete systems, 2h, Learning outcomes:3,4 9.Discrete systems in the state of space and equation of the state in the Z-plane, 2h, Learning outcomes:3,4 10.Discrete systems in the state of space and equation of the state in the Z-plane, 2h, Learning outcomes:3,4 11.Discrete Regulator in Space, 2h, Learning outcomes:5 12.Controlability and observability of discrete systems, 2h, Learning outcomes:5 13.Controlability and observability of discrete systems, 2h, Learning outcomes:5 14.Determination of P, PI and PID discrete regulators, 2h, Learning outcomes:6 15.knowledge test, 2h, Learning outcomes:4,5,6				
Course content laboratory	1.Mathematical description of linear discrete management systems, 2h, Learning outcomes:1 2.Application of Z-transformation, 2h, Learning outcomes:2 3.An example of a linear discrete management system analysis, 2h, Learning outcomes:3 4.An example of a linear discrete management system analysis, 2h, Learning outcomes:3 5.Transfer function, stability, accuracy and transient characteristic of the discrete system, 2h, Learning outcomes:3 6.Transfer function, stability, accuracy and transient characteristic of the discrete system, 2h, Learning outcomes:3 7.Discrete system in the state of space and equation of the state in the Z-plane, 2h, Learning outcomes:4 8.Discrete system in the state of space and equation of the state in the Z-plane, 2h, Learning outcomes:4 9.Discrete Regulator in State Space, 2h, Learning outcomes:5 10.Discrete Regulator in State Space, 2h, Learning outcomes:5 11.Determination of P, PI and PID discrete regulators, 2h, Learning outcomes:5 12.Determination of P, PI and PID discrete regulators, 2h, Learning outcomes:5 13.Implementation of discrete controller on a microcontroller, 2h, Learning outcomes:6 14.Implementation of discrete controller on a microcontroller, 2h, Learning outcomes:6 15.Knowledge check, 2h, Learning outcomes:1,2,3,4,5,6				
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers				
Exam literature	1.Matika D.,Sustavi digitalnog upravljanja,Graphis,2007 2.Petrović I.,Digitalni sustavi upravljanja,skripta FRS Mostar				
Students obligations	Continuous assessment of knowledge				
Knowledge evaluation during semester	Continuous assessment of knowledge 3 checks				
Knowledge evaluation after semester	written exam				
Student activities:	Aktivnost (Classes attendance)			ECTS 2	

	(Constantly tested knowledge) (Written exam)	2 2
Remark	This course can be used for final thesis theme	
ISVU equivalents:	200519;	

Code WEB/ISVU	26545/215803	**ECTS**	6	**Academic year**	2020/2021
Name	Environmental protection				
Status	2nd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+0+10+0) 120
Teachers	Lectures:1. Mario Panjičko Auditory exercises: Mario Panjičko Seminar exercises: Mario Panjičko				
Course objectives	The subject of the students is primarily the relationship and the relationship between individual fields of environmental themes, ie natural sciences, technical and social sciences, and contains basic knowledge in chemistry, biology, ecology, meteorology, hydrology, economics, sociology and toxicology.				
Learning outcomes:	1.Propose basic measures to prevent environmental degradation, ie to reduce adverse environmental impacts.. Level:7 2.Link knowledge between individual scientific disciplines in the field of environmental protection,. Level:6,7 3.evaluate the effects of ecosystems and basic phenomena in the environment,. Level:6 4.Re-examine the consequences of satisfying human needs for food, energy and raw materials,. Level:6,7 5.Carry out interdisciplinary research on environmental issues,. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion Questions and answers				
Methods of carrying out auditory exercises	Group problem solving Traditional literature analysis Data mining and knowledge discovery on the Web Essay writing Discussion, brainstorming				
Methods of carrying out seminars	Essay writing				
Course content lectures	1.Ecosystem, 2h, Learning outcomes:1,2 2.Earth as a System, 2h, Learning outcomes:1,2,3 3. Life and Environment, 2h, Learning outcomes:1,2,3 4.Life Resources Conservation, 2h, Learning outcomes:1,2,3 5.Life Resources Conservation, 2h, Learning outcomes:1,2,3 6.Energy, 2h, Learning outcomes:1,2,3 7.Energy, 2h, Learning outcomes:1,2,3 8.Water Environment, 2h, Learning outcomes:1,2,3 9.Water Environment, 2h, Learning outcomes:1,2 10.Polluted Air Issue, 2h, Learning outcomes:3,4 11.Polluted Air Issue, 2h, Learning outcomes:3,4,5 12.Waste Production and Processin, 2h, Learning outcomes:3,4,5 13.Waste Production and Processin, 2h, Learning outcomes:3,5 14.Social Ecology., 2h, Learning outcomes:3,4,5 15.Social Ecology., 2h, Learning outcomes:3,4,5				
Course content auditory	1.no classes, 2h 2.no classes, 2h 3.no classes, 2h 4.no classes, 2h 5.Set up practical problems by groups, 2h, Learning outcomes:1,2,3,4,5 6.no classes, 2h 7.Solving concrete, practical environmental problems in groups of 3 to 5 students, 2h, Learning outcomes:1,2,3,4,5 8.Solving concrete, practical environmental problems in groups of 3 to 5 students, 2h, Learning outcomes:1,2,3,4,5 9.Solving concrete, practical environmental problems in groups of 3 to 5 students, 2h, Learning outcomes:1,2,3,4,5 10.Solving concrete, practical environmental problems in groups of 3 to 5 students, 2h, Learning outcomes:1,2,3,4,5 11.Solving concrete, practical environmental problems in groups of 3 to 5 students, 2h, Learning outcomes:1,2,3,4,5 12.Solving concrete, practical environmental problems in groups of 3 to 5 students, 2h, Learning outcomes:1,2,3,4,5 13.Solving concrete, practical environmental problems in groups of 3 to 5 students, 2h, Learning outcomes:1,2,3,4,5 14.presentation of works, 2h, Learning outcomes:1,2,3,4,5 15.presentation of works, 2h, Learning outcomes:1,2,3,4,5				
Course content seminars	1.Defining seminar tasks, 2h, Learning outcomes:3,4,5 2.no classes, 2h 3.no classes, 2h 4.no classes, 2h 5.no classes, 2h 6.no classes, 2h 7.no classes, 2h 8.no classes, 2h 9.no classes, 2h 10.no classes, 2h 11.no classes, 2h 12.presentation of seminar papers, 2h, Learning outcomes:1,2,3,4,5				

	13.presentation of seminar papers, 2h, Learning outcomes:1,2,3,4,5 14.presentation of seminar papers, 2h, Learning outcomes:1,2,3,4,5 15.presentation of seminar papers, 2h, Learning outcomes:1,2,3,4,5
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector Tools Operating supplies
Exam literature	D. Botkin, E. Keller: Environmental Science Earth as a Living Planet, 5. izdanje, J. WileySons, New York, 2005
Students obligations	written seminar
Knowledge evaluation during semester	1. Seminar work 20% 2. Exercises and Homework 20%
Knowledge evaluation after semester	Written exam 40% Oral Exam 60 % 50-63 ... fair 64-76. .. good 77-89 ... very good 90-100 ... excellent
Student activities:	Aktivnost — ECTS (Written exam) — 4 (Constantly tested knowledge) — 1 (Seminar Work) — 1
Remark	This course can be used for final thesis theme
ISVU equivalents:	200526;
Proposal made by	Goran Sirovatka , 14.6.2019

Code WEB/ISVU	26537/215764	**ECTS**	6	**Academic year**	2020/2021
Name	Facility Management				
Status	3rd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course3rd semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+0+10+0) 120
Teachers	Lectures:1. mr.sc. Branimir Preprotić dipl. inž. stroj. Auditory exercises:mr.sc. Branimir Preprotić dipl. inž. stroj. Seminar exercises:mr.sc. Branimir Preprotić dipl. inž. stroj.				
Course objectives	Acquire knowledge of Facility Management				
Learning outcomes:	1.sigificance of Facility management in the business environment. Level:7 2.Organize FM in order to fully support realization of Organization trategic goals . Level:6,7 3.Select FM management model based on the internal processes and situation on the FM market. Level:7 4.Create specification for bidding process of selection of external Facility Management provider. Level:6,7 5.Rank quality of quotes obtained in bidding process. Level:7 6.Develop Communication skills necessary for interaction with Facility Management customers . Level:6,7 7.Evaluate process performance using Key Performance Indicators (KPI). Level:7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Discussion Seminar, students presentation and discussion				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Mind mapping Workshop				
Methods of carrying out seminars	Data mining and knowledge discovery on the Web Essay writing				
Course content lectures	1.Definitions and historical development of FM industry in EU and Croatia, 4h, Learning outcomes:1 2.Setting department goals aligned Organization's Strategy, 4h, Learning outcomes:2 3.Review of processes and services that are part of Facility Management, 4h, Learning outcomes:2 4.Review of processes and services that are part of Facility Management, 4h, Learning outcomes:2 5.No lessons 6.Select optimal model of Facility Management, 4h, Learning outcomes:3 7.Creation of bidding specifications for vendor selection process,Tools for evaluation of bidds, 4h, Learning outcomes:4,5 8.Communication with clients (giving and requesting feedback, how to say , 4h, Learning outcomes:6 9.Key Performance Indicators of Facility Management, 2h, Learning outcomes:7 10.No Lessons 11.No Lessons 12.No Lessons, Learning outcomes:7 13.No Lessons 14.No Lessons 15.No Lessons				
Course content auditory	1.No lessons 2.No lessons 3.No lessons 4.No lessons 5.Test, 4h, Learning outcomes:1,2 6.No lessons 7.No lessons 8.No lessons 9.No lessons 10.Test, 4h, Learning outcomes:3,4,5,6,7 11.Case study 1, 4h, Learning outcomes:1,2,3,4,5,6,7 12.Case study 2, 4h, Learning outcomes:1,2,3,4,5,6,7 13.Case study 3, 4h, Learning outcomes:1,2,3,4,5,6,7 14.No lessons 15.No lessons				
Course content seminars	1.No lessons 2.No lessons 3.No lessons 4.No lessons 5.No lessons 6.No lessons 7.No lessons 8.No lessons 9.Asigning semianrs, 2h				

	10.No lessons 11.No lessons 12.No lessons 13.No lessons 14.Consulting regarding smianrs, 4h, Learning outcomes:1,2,3,4,5,6 15.Presenting seminars, 4h, Learning outcomes:1,2,3,4,5,6
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector
Exam literature	[1] Wiggins J.M. "Facilities Manager's Desk Reference, Wiley Blackwel, 2014 [2] Atkin B, Brooks A. "Total Facility Management" Wiley Blackwel, 2015 [3] Williams J., "Facilities Management Operations Handbook",
Students obligations	regular class attendance
Knowledge evaluation during semester	colloqium
Knowledge evaluation after semester	exam and / or seminar paper
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Constantly tested knowledge) — 3 (Activity in class) — 1 (Seminar Work) — 1
Remark	This course can be used for final thesis theme
Proposal made by	mr.sc. Branimir Preprotić mech eng, 15.7.2020

Code WEB/ISVU	26565/216091	**ECTS**	6	**Academic year**	2020/2021
Name	Flexible production systems				
Status	2nd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. mr.sc. Goran Malčić v.pred. Lectures:2. Tomislav Pavlic Laboratory exercises:mr.sc. Goran Malčić v.pred. Laboratory exercises: Tomislav Pavlic				
Course objectives	Adoption of theoretical basics and practical knowledge in the field of flexible production systems for solving basic problems in the area of production automation.				
Learning outcomes:	1.Classify Flexible Manufacturing Systems (Flexible Production Cells). Level:6,7 2.Distinguish the fundamental properties and technical characteristics of dominant production systems (dedicated production lines, flexible production systems and reconfigurable production systems). Level:6 3.Edit simple (worksheets) cells. Level:6,7 4.Analyze the role of numerically manageable machines in the configuration of flexible production systems. Level:6 5.Assess the role of robots and machining centers (centers) in the automation of flexible manufacturing systems. Level:6,7 6.Compile the cell of a one-way movement of workpieces. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion Questions and answers				
Methods of carrying out laboratory exercises	Laboratory exercises, computer simulations Group problem solving Computer simulations Interactive problem solving Workshop				
Course content lectures	1.Definition of the production system and basic properties, 2h, Learning outcomes:1 2.Designing production systems, technology plans and assembly, 2h, Learning outcomes:2 3.Production structures, lines and cells, 2h, Learning outcomes:2 4.Material course and stand alone workplaces, 2h, Learning outcomes:3,4 5.Models and production flow algorithms, 2h, Learning outcomes:2 6.Classification and designation of parts and forms of processing, 2h, Learning outcomes:2 7.Cluster analysis and determination of the most favorable structure, 2h, Learning outcomes:2 8.Automated fabrication structures that combine flexibility with efficiency, 2h, Learning outcomes:3 9.Flexible and Production System Components, 2h, Learning outcomes:3,4,6 10.Directly controlled numerical tooling and machining robots, 2h, Learning outcomes:3,4,6 11.Automatic Coordinate Measuring Machines, 2h, Learning outcomes:3,4 12.Automatic transport, handling and storage system, 2h, Learning outcomes:2,4 13.Flexible cell, flexible multi-machine system, and multilayer flexible system, 2h, Learning outcomes:2,4,5,6 14.Numerically controlled machines and automatic programming, 2h, Learning outcomes:4,5 15.Quantitative analysis of flexible production systems, 2h, Learning outcomes:2				
Course content laboratory	1.Design, analysis and programming of the selected flexible manufacturing system, 2h, Learning outcomes:1 2.Design, analysis and programming of the selected flexible manufacturing system, 2h, Learning outcomes:1 3.Design, analysis and programming of the selected flexible manufacturing system, 2h, Learning outcomes:2 4.Design, analysis and programming of the selected flexible manufacturing system, 2h, Learning outcomes:2 5.Design, analysis and programming of the selected flexible manufacturing system, 2h, Learning outcomes:3 6.Design, analysis and programming of the selected flexible manufacturing system, 2h, Learning outcomes:3 7.Design, analysis and programming of the selected flexible manufacturing system, 2h, Learning outcomes:4 8.Design, analysis and programming of the selected flexible manufacturing system, 2h, Learning outcomes:4 9.Design, analysis and programming of the selected flexible manufacturing system, 2h, Learning outcomes:5 10.Design, analysis and programming of the selected flexible manufacturing system, 2h, Learning outcomes:5 11.Making seminar work, 2h, Learning outcomes:3,6 12.Making seminar work, 2h, Learning outcomes:3,6 13.Making seminar work, 2h, Learning outcomes:3,6 14.Making seminar work, 2h, Learning outcomes:3,6 15.Making seminar work, 2h, Learning outcomes:3,6				
Required materials	Basic: classroom, blackboard, chalk... Special purpose computer laboratory Whiteboard with markers Overhead projector				
Exam literature	Kunica Z.,Montaža I. dio,FSB Zagreb,,2016 Groover P.M.,Automation, Production System and Computer-Integrated Manufacturing,Global Edition, Pearson education Limited, 9780133499612, 2015				
Students obligations	Attendance Exercises 80%				
Knowledge evaluation during	two written tests of knowledge				

semester		
Knowledge evaluation after semester	Written exam	
Student activities:	Aktivnost (Written exam) (Seminar Work) (Research)	ECTS 3 2 1
Remark	This course can be used for final thesis theme	
ISVU equivalents:	200520;	

Code WEB/ISVU	26532/215759	**ECTS**	6	**Academic year**	2020/2021
Name	Human resource management				
Status	4th semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course4th semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+0+10+0) 120
Teachers	Lectures:1. mr.sc. Lucija Bačić v.pred. Auditory exercises: Nataša Uzelac Seminar exercises: Nataša Uzelac				
Course objectives	Introduce students to the challenges and concepts of human resources management and the specifics of this management function within the management of the company				
Learning outcomes:	1.propose the goals, processes and role of human resource management in the firm. Level:6,7 2.choose human resource management approaches. Level:7 3.Recommend competencies for human resource management of intellectual capital. Level:7 4.suggest a way to solve practical problems while working with employees. Level:6,7 5.compare information on human resource management from various sources. Level:6,7 6.solve practical problems by applying tools, methods and procedures of human resource management. Level:6 7.develop the skills needed to motivate and reward employees. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Interactive problem solving				
Methods of carrying out seminars	Data mining and knowledge discovery on the Web Essay writing				
Course content lectures	1.Introductory lecture - human resource management, human capital, organizational functions, activities and roles in human resource management, 2h, Learning outcomes:1,2,3,4 2.Concept, meaning, goals and activities - introduction to these concepts and their basic difference., 2h, Learning outcomes:1,2,3,4 3.Intellectual capital. Defining intellectual capital and the impact of human resources on intellectual capital management. The structure of intellectual capital., 2h, Learning outcomes:1,2,3,4 4.Knowledge management. Intellectual capital management model., 2h, Learning outcomes:1,2,3,4 5.Characteristics of intellectual capital and its importance for the competitiveness of the organization. Knowledge management systems, 2h, Learning outcomes:1,2,3,4 6.Human resource management depending on the number of employees - how to manage human resources given the size, type and structure of the company, 2h, Learning outcomes:1,2,3,4 7.1st colloquium, 2h, Learning outcomes:1,2,3,4 8.Business task analysis and design - basic concepts of business task analysis and design. The concept of job description and content. Examples from practice., 2h, Learning outcomes:1,2,3,4 9.Selection, employee guidance (resource management) - ways and methods of employee selection and guidance, 2h, Learning outcomes:1,2,3,4 10.Employee training - ways and types of training people, on-the-job and off-the-job training, 2h, Learning outcomes:1,2,3,4 11.Performance management - the concept of work performance, performance appraisal of employees and managers (methods and techniques)., 2h, Learning outcomes:1,2,3,4 12.Development of communication skills in the workplace, 2h, Learning outcomes:1,2,3,4 13.Human resource management, individual work, team work, group work, pyramid vs. linear management models, 2h, Learning outcomes:1,2,3,4 14.Performance evaluation (evaluation and evaluation) and rewarding employees - the concept and importance of compensation in the organization., 2h, Learning outcomes:1,2,3,4 15.2nd colloquium, 2h, Learning outcomes:1,2,3,4				
Course content auditory	1.no class 2.no class 3.no class 4.no class 5.no class 6.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 7.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 8.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 9.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 10.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 11.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 12.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7				

	13.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 14.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 15.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7
Course content seminars	1.Seminars and presentations, 2h, Learning outcomes:5 2.Seminars and presentations, 2h, Learning outcomes:5 3.Seminars and presentations, 2h, Learning outcomes:5 4.Seminars and presentations, 2h, Learning outcomes:5 5.Seminars and presentations, 2h, Learning outcomes:5 6.no class 7.no class 8.no class 9.no class 10.no class 11.no class 12.no class 13.no class 14.no class 15.no class
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector
Exam literature	Noe, R.A; Hollenbeck, J.R; Gerhart, B; Wright, P.M: Menadžment ljudskih potencijala, Mate, Zagreb, 2006.
Students obligations	Regular class attendance with the allowed number of absences according to the Rulebook on studying
Knowledge evaluation during semester	Class attendance, 10% Activities during classes, 10% Access paper - research, 20% 1st colloquium, 30% 2nd colloquium, 30% 0 - 50 insufficient (1) 51 - 65 sufficient (2) 66 - 80 good (3) 81 - 90 very good (4) 91 - 100 excellent (5)
Knowledge evaluation after semester	Written exam, 80% Access paper - research, 20% 0 - 50 insufficient (1) 51 - 65 sufficient (2) 66 - 80 good (3) 81 - 90 very good (4) 91 - 100 excellent (5)
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Activity in class) — 1 (Research) — 2 (Written exam) — 2
Remark	This course can be used for final thesis theme
Proposal made by	Vesna Alić-Kostešić, dipl.ing.stroj., v. pred., 16.7.2020

Code WEB/ISVU	26540/215767	**ECTS**	6	**Academic year**	2020/2021
Name	Human resource management				
Status	4th semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course4th semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+0+10+0) 120
Teachers	Lectures:1. mr.sc. Lucija Bačić v.pred. Auditory exercises: Nataša Uzelac Seminar exercises: Nataša Uzelac				
Course objectives	Introduce students to the challenges and concepts of human resources management and the specifics of this management function within the management of the company				
Learning outcomes:	1.propose the goals, processes and role of human resource management in the firm. Level:6,7 2.choose human resource management approaches. Level:7 3.Recommend competencies for human resource management of intellectual capital. Level:7 4.suggest a way to solve practical problems while working with employees. Level:6,7 5.compare information on human resource management from various sources. Level:6,7 6.solve practical problems by applying tools, methods and procedures of human resource management. Level:6 7.develop the skills needed to motivate and reward employees. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Interactive problem solving				
Methods of carrying out seminars	Data mining and knowledge discovery on the Web Essay writing				
Course content lectures	1.Introductory lecture - human resource management, human capital, organizational functions, activities and roles in human resource management, 2h, Learning outcomes:1,2,3,4 2.Concept, meaning, goals and activities - introduction to these concepts and their basic difference., 2h, Learning outcomes:1,2,3,4 3.Intellectual capital. Defining intellectual capital and the impact of human resources on intellectual capital management. The structure of intellectual capital., 2h, Learning outcomes:1,2,3,4 4.Knowledge management. Intellectual capital management model., 2h, Learning outcomes:1,2,3,4 5.Characteristics of intellectual capital and its importance for the competitiveness of the organization. Knowledge management systems, 2h, Learning outcomes:1,2,3,4 6.Human resource management depending on the number of employees - how to manage human resources given the size, type and structure of the company, 2h, Learning outcomes:1,2,3,4 7.1st colloquium, 2h, Learning outcomes:1,2,3,4 8.Business task analysis and design - basic concepts of business task analysis and design. The concept of job description and content. Examples from practice., 2h, Learning outcomes:1,2,3,4 9.Selection, employee guidance (resource management) - ways and methods of employee selection and guidance, 2h, Learning outcomes:1,2,3,4 10.Employee training - ways and types of training people, on-the-job and off-the-job training, 2h, Learning outcomes:1,2,3,4 11.Performance management - the concept of work performance, performance appraisal of employees and managers (methods and techniques)., 2h, Learning outcomes:1,2,3,4 12.Development of communication skills in the workplace, 2h, Learning outcomes:1,2,3,4 13.Human resource management, individual work, team work, group work, pyramid vs. linear management models, 2h, Learning outcomes:1,2,3,4 14.Performance evaluation (evaluation and evaluation) and rewarding employees - the concept and importance of compensation in the organization., 2h, Learning outcomes:1,2,3,4 15.2nd colloquium, 2h, Learning outcomes:1,2,3,4				
Course content auditory	1.no class 2.no class 3.no class 4.no class 5.no class 6.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 7.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 8.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 9.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 10.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 11.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 12.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7				

	13.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 14.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7 15.Solving practical problems and examples using tools, methods and procedures of human resource management, 2h, Learning outcomes:6,7
Course content seminars	1.Seminars and presentations, 2h, Learning outcomes:5 2.Seminars and presentations, 2h, Learning outcomes:5 3.Seminars and presentations, 2h, Learning outcomes:5 4.Seminars and presentations, 2h, Learning outcomes:5 5.Seminars and presentations, 2h, Learning outcomes:5 6.no class 7.no class 8.no class 9.no class 10.no class 11.no class 12.no class 13.no class 14.no class 15.no class
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector
Exam literature	Noe, R.A; Hollenbeck, J.R; Gerhart, B; Wright, P.M: Menadžment ljudskih potencijala, Mate, Zagreb, 2006.
Students obligations	Regular class attendance with the allowed number of absences according to the Rulebook on studying
Knowledge evaluation during semester	Class attendance, 10% Activities during classes, 10% Access paper - research, 20% 1st colloquium, 30% 2nd colloquium, 30% 0 - 50 insufficient (1) 51 - 65 sufficient (2) 66 - 80 good (3) 81 - 90 very good (4) 91 - 100 excellent (5)
Knowledge evaluation after semester	Written exam, 80% Access paper - research, 20% 0 - 50 insufficient (1) 51 - 65 sufficient (2) 66 - 80 good (3) 81 - 90 very good (4) 91 - 100 excellent (5)
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Activity in class) — 1 (Research) — 2 (Written exam) — 2
Remark	This course can be used for final thesis theme
Proposal made by	Vesna Alić-Kostešić, dipl.ing.stroj., v. pred., 16.7.2020

Code WEB/ISVU	26518/215740	**ECTS**	6	**Academic year**	2020/2021
Name	Industrial and mobile robotics				
Status	3rd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course3rd semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. prof. dr. sc. Dario Matika Lectures:2. Tomislav Pavlic Laboratory exercises:prof. dr. sc. Dario Matika Laboratory exercises: Tomislav Pavlic				
Course objectives	Acquisition of basic theoretical and practical knowledge and skills in the field of application of industrial robots, the main components of industrial robots, control methods, trajectory planning and estimation of position, speed and torque, and use and maintenance of industrial robots.				
Learning outcomes:	1.plan the structure of a modern industrial and mobile robot. Level:6,7 2.devise the design and role of each robot element. Level:6,7 3.analyze a particular type of industrial robot from the point of view of use and maintenance. Level:6 4.analyze the locomotion (drive) and sensors of the mobile robot. Level:6 5.judge the purpose of a particular type of robot for a specific work task. Level:7 6.synthesize robot trajectory planning with robot position, speed and torque estimation. Level:6,7 7.control robot movement functions. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Demonstration Seminar, students presentation and discussion Other online				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Group problem solving Workshop Other visits to factories and companies				
Course content lectures	1.Introduction to industrial robots and application examples of industrial robots, 2h, Learning outcomes:1,2,3,4,5,6,7 2.Classification of industrial robots and historical development, 2h, Learning outcomes:1,2,3,4,5,6,7 3.Forms of today's industrial and mobile robots and the industrial and mobile robots of the future, 2h, Learning outcomes:1,2,3,4,5,6,7 4.Industrial and mobile welding robots (spot welding and arc welding), 2h, Learning outcomes:1,2,3,4,5,6,7 5.Industrial and mobile robots for painting and coating, 2h, Learning outcomes:1,2,3,4,5,6,7 6.Industrial and mobile machining robots (drilling, laser cutting, part cutting, grinding, finishing and polishing), 2h, Learning outcomes:1,2,3,4,5,6,7 7.Industrial and mobile robots for assembly and compilation, 2h, Learning outcomes:1,2,3,4,5,6,7 8.Industrial and mobile robots for machine maintenance, 2h, Learning outcomes:1,2,3,4,5,6,7 9.Palletizing robots, 2h, Learning outcomes:1,2,3,4,5,6,7 10.Robots in foundry; Flexible clamping robots, 2h, Learning outcomes:1,2,3,4,5,6,7 11.Quality control robots; Maintenance robots, 2h, Learning outcomes:1,2,3,4,5,6,7 12.Robots in the food industry, 2h, Learning outcomes:1,2,3,4,5,6,7 13.Robots in construction, 2h, Learning outcomes:1,2,3,4,5,6,7 14.Control, use and maintenance of industrial and mobile robots, 2h, Learning outcomes:1,2,3,4,5,6,7 15.Simulation models of robot trajectory planning and design of position, velocity and torque estimators, 2h, Learning outcomes:1,2,3,4,5,6,7				
Course content laboratory	1.Demonstrations and laboratory work, visits to factories and companies using different types of industrial robots, 30h, Learning outcomes:1,2,3,4,5,6,7 2.No classes 3.No classes 4.No classes 5.No classes 6.No classes 7.No classes 8.No classes 9.No classes 10.No classes 11.No classes 12.No classes 13.No classes 14.No classes 15.No classes				
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory Whiteboard with markers Overhead projector				
Exam literature	Basic literature:				

	1. Perlberg James, Industrial Robotics, Wadsworth Publishing Co Inc, 978-1133610991, 2016. 2. Hegde S. Ganesh, Industrial Robotics, 978-8131805183, 2015. 3. Šurina Tihomir, Crnković Mladen, Industrijski roboti, Sveučilište u Zagrebu, 1990. 4. R. Siegwart, Illah R. Nourbakhsh and Davide Scaramuzza, Introduction to Autonomous Mobile Robots, The MIT Press, 2011. Dodatna: 1. Industrijski roboti KUKA (http://www.hunor.hr/?option=com_contentview=articleid=102Itemid=136) 2. Univerzalni roboti (http://www.industrijskiroboti.si/) 3. Industrijski roboti (http://troska.hr/index.php/robotizacija/industrijski-roboti-universal-robots) 4. Industrijski roboti (http://www.fanuc.eu/si/hr/roboti) 5. Industrijski roboti (http://www.mikronplus.si/industrijski-roboti.php) 6. Industrijski roboti i održavanje (http://ind-mtc.com/hr/robotika/)
Students obligations	Attendance continues with the allowed number of absences according to the Rulebook on studying. Solving tasks in exercises.
Knowledge evaluation during semester	Maximum 60 points, minimum 15 points. Achieved 15 and less than 30 points require additional knowledge testing. The supplementary knowledge test consists of two tasks from each individual outcome test (four tasks) and brings a maximum of 15 points. The student must achieve a total score with a supplementary test of a minimum of 30 points to take the final exam. Exercise reports are 20 points, the pass threshold is 10 points. First outcome check maximum 20 points, pass threshold 10 points. Second outcome check maximum 20 points, pass threshold 10 points. The knowledge test in the semester is carried out in accordance with Article 4 of the Ordinance on student assessment at the Zagreb University of Applied Sciences.
Knowledge evaluation after semester	Maximum 40 points, minimum 20 points. Oral exam with practical part (defense of seminar paper). The final grade is formed in accordance with Article 8 of the Ordinance on student assessment at the Technical Polytechnic in Zagreb.
Student activities:	Aktivnost — ECTS (Classes attendance) — 2 (Constantly tested knowledge) — 4
Remark	This course can be used for final thesis theme
Proposal made by	prof. Dario Matika, Ph.D.

Code WEB/ISVU	26533/215760	**ECTS**	6	**Academic year**	2020/2021
Name	Innovation management				
Status	3rd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course3rd semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+10+0+0) 120
Teachers	Lectures:1. dr. sc. Branko Katana , mag. ing. mech. Auditory exercises:dr. sc. Branko Katana , mag. ing. mech. Laboratory exercises:dr. sc. Branko Katana , mag. ing. mech.				
Course objectives	Introduction to innovation as a managerial process. Analysis of innovation as a competitive advantage. Analysis of individual phases of the innovation process and the consequences of its insufficient understanding.				
Learning outcomes:	1.Identify user needs and product features. Level:6 2.rethink the concept. Level:6,7 3.identify the role of design and prototype in the product development process. Level:6 4.Manage innovation. Level:6,7 5.Identify the development of innovation as a managerial process. Level:7 6.Combine sources of ideas. Level:6,7 7.Recommend procedures for developing and launching a new product on the market. Level:7 8.Valorize performance (through learning by trying to innovate). Level:7				
Methods of carrying out lectures	Ex cathedra teaching Seminar, students presentation and discussion				
Methods of carrying out auditory exercises	Essay writing Workshop				
Methods of carrying out laboratory exercises	Other -				
Course content lectures	1.Needs identification, 2h, Learning outcomes:1 2.Product specification, 2h, Learning outcomes:1 3.Concept generation, selection and testing, 2h, Learning outcomes:2 4.The role of industrial design in the product development process, 2h, Learning outcomes:3 5.Production design, 2h, Learning outcomes:3 6.The role of prototypes, 2h, Learning outcomes:3 7.Innovation as a managerial process, 2h, Learning outcomes:5 8.Innovation strategy and associated risks, 2h, Learning outcomes:4 9.Copyright, intellectual property and patent protection, 2h, Learning outcomes:4 10.Developing an innovative organization and managing the research and development (RD) department, 2h, Learning outcomes:5 11.Source of ideas and cooperation in innovation, 2h, Learning outcomes:6 12.New product development vs. development of a new service, 2h, Learning outcomes:7 13.Launching products on the market, 2h, Learning outcomes:7 14.Learning to try to innovate, 2h, Learning outcomes:7 15.Innovation and how to measure performance, 2h, Learning outcomes:8				
Course content auditory	1.The role of the state in innovation, 2h, Learning outcomes:1,6,7,8 2.Cooperation in innovation (with whom and why), 2h, Learning outcomes:1,6,7,8 3.Visit to the Association of Innovators, 2h, Learning outcomes:1,6,7,8 4.Visit to innovation exhibitions, 2h, Learning outcomes:1,6,7,8 5.Case study, 2h, Learning outcomes:1,6,7,8 6.Seminar presentations, 2h, Learning outcomes:1,6,7,8 7.Seminar presentations, 2h, Learning outcomes:1,6,7,8 8.Seminar presentations, 2h, Learning outcomes:1,6,7,8 9.Seminar presentations, 2h, Learning outcomes:1,6,7,8 10.Seminar presentations, 2h, Learning outcomes:1,6,7,8 11.Seminar presentations, 2h, Learning outcomes:1,6,7,8 12.Seminar presentations, 2h, Learning outcomes:1,6,7,8 13.Seminar presentations, 2h, Learning outcomes:1,6,7,8 14.Seminar presentations, 2h, Learning outcomes:1,6,7,8 15.Seminar presentations, 2h, Learning outcomes:1,6,7,8				
Course content laboratory	1.no class 2.no class 3.no class 4.no class 5.no class 6.no class 7.no class 8.no class 9.no class 10.no class 11.no class 12.no class				

	13.no class 14.no class 15.no class
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector
Exam literature	Prester, J.: Menadžment inovacija, Sinergija-nakladništvo d.o.o., Zagreb, 2010. Krstulović-Opara, L., Domazet, Ž.: Dizajn industrijskih proizvoda, Fakultet elektrotehnike, strojarstva i brodogradnje Sveučilišta u Splitu, Split, 2009. Quarante, D.: Osnove industrijskog dizajna, Arhitektonski fakultet Sveučilišta u Zagrebu, 1984.
Students obligations	Regular class attendance with the allowed number of absences according to the Rulebook on studying
Knowledge evaluation during semester	Seminar paper, 66.67%, outcomes 1, 2, 3 and 4 Paper presentation, 33.33%, outcomes 5, 6, 7 and 8 0-89 insufficient 90-105 sufficient 106-120 good 121-135 very good 136-150 excellent
Knowledge evaluation after semester	Seminar paper, 66.67%, outcomes 1, 2, 3 and 4 Paper presentation, 33.33%, outcomes 5, 6, 7 and 8 0-89 insufficient 90-105 sufficient 106-120 good 121-135 very good 136-150 excellent
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Activity in class) — 1 (Seminar Work) — 1 (Written exam) — 1 (Constantly tested knowledge) — 2
Remark	This course can be used for final thesis theme
Proposal made by	Branko Katana, PhD, mag.ing.mech., lecturer, July 17th 2020

Code WEB/ISVU	26567/216093	**ECTS**	6	**Academic year**	2020/2021
Name	Object oriented programming				
Status	2nd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. Goran Sirovatka dipl. ing.,pred. Lectures:2. Mia Čarapina dipl. ing., pred. Laboratory exercises: Goran Sirovatka dipl. ing.,pred.				
Course objectives	Master the underlying concepts and techniques of object-oriented programming in C ++ programming language.				
Learning outcomes:	1.apply good programming practice (style) and explain its impact on developing and maintaining the program in C ++ language. Level:6,7 2.explain the underlying concepts of object-oriented programming. Level:6,7 3. describe how object-oriented programming concepts are supported by features and specificities of the C ++ programming language. Level:6,7 4.apply object-oriented programming concepts to program development in C ++ language. Level:6,7 5.use generic C ++ language features, including standard template library (STL). Level:6,7 6.develop object-oriented software solutions for smaller systems (problems) with multiple objects in C ++ language. Level:6,7 7.test and fix errors in C ++ programs. Level:7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Demonstration Discussion Questions and answers				
Methods of carrying out laboratory exercises	Laboratory exercises, computer simulations Group problem solving				
Course content lectures	1.procedural programming and object-oriented paradigm, 2h, Learning outcomes:1,2 2.basic concepts of object oriented programming (objects, classes, encapsulation , data hacking, abstraction, inheritance, polymorphism), 2h, Learning outcomes:1,2,3 3.structures and classes, creating objects and accessing class members,, 2h, Learning outcomes:2,3 4.defining the public and private functions of class members, 2h, Learning outcomes:2,3 5.Memory allocation of objects and static members, 2h, Learning outcomes:2,3 6.Forwarding objects to functions and restoring objects from functions, 2h, Learning outcomes:2,3,4 7.Creating and Destroying Objects (Constructors and Destructors), 2h, Learning outcomes:2,3,4 8.Overload of functions and operator, 2h, Learning outcomes:2,3,4 9.inheritance, 2h, Learning outcomes:2,3,4 10.Polymorphism , 2h, Learning outcomes:2,3,4 11.Functions and Grades Templates,, 2h, Learning outcomes:2,3,4 12.Manage Exceptions, 2h, Learning outcomes:4,5,6,7 13.Organize the code in multiple files, 2h, Learning outcomes:3,4,5,6,7 14.directories, Standard template library, 2h, Learning outcomes:3,4,5,6,7 15.File processing, 2h, Learning outcomes:4,5,6,7				
Course content laboratory	1.Program solution of the set problem by procedural approach, 2h, Learning outcomes:2,3,4 2.Object Oriented Programming Solution to the Problem (Introduction), 2h, Learning outcomes:1,2,3,4 3.Declaring and implementing the first class as part of a solution to the problem, 2h, Learning outcomes:1,2,3,4 4.Introducing additional functionalities by defining public and private functions of class members, 2h, Learning outcomes:1,2,3,4 5.Improving the current class of static members in terms of reduced memory resources, 2h, Learning outcomes:3,4 6.Forwarding objects to functions and restoring objects from functions, 2h, Learning outcomes:1,2,3,4 7.partial exam, 2h, Learning outcomes:1,2,3,4 8.Creating and Destroying Created Class Builders (Constructors and Destructors),, 2h, Learning outcomes:3,4,5,6,7 9.Overloading the function of the created class and introducing the operator, 2h, Learning outcomes:3,4,5,6,7 10.Concept of inheritance and polymorphism, 2h, Learning outcomes:3,4,5,6,7 11.Use template and class templates and standard template libraries to improve the created class, 2h, Learning outcomes:3,4,5,6,7 12.Manage Exceptions, 2h, Learning outcomes:4,5,6,7 13.Organize the code in multiple files, 2h, Learning outcomes:4,5,6,7 14.Using a directory, 2h, Learning outcomes:4,5,6,7 15.partial exam, 2h, Learning outcomes:4,5,6,7				
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory Whiteboard with markers Overhead projector Tools Operating supplies				
Exam literature	Julijan Šribar, Boris Motik,Demistificirani C++,Element,978-953-197-620-6,2014 Željko Kovačević,C++ analiza i primjena,Školska knjiga,978-953-0-21154-4,2004 .Joyce M. Farrell,Object Oriented				

	Programming Using C++,Course Technology, Inc.,978-1423902577,2009 Bjarne Stroustrup,The C++ Programming Language,Addison-Wesley,978-0321563842,2013
Students obligations	Attendance with the permitted number of absences according to the Book of Rules .. Solving tasks at labs, and solving tasks as prepartion for labs. Up to 10% absences of laboratory exercises.
Knowledge evaluation during semester	2 part time exams each with 50% points, all learning outcomes passed 50-63 ... fair 64-76. .. good 77-89 ... very good 90-100 ... excellent
Knowledge evaluation after semester	Written exam min 60% for passing mark Oral examination of all outcomes. 50-63 ... fair 64-76. .. good 77-89 ... very good 90-100 ... excellent
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Written exam) — 1 (Activity in class) — 1 (Constantly tested knowledge) — 2 (Research) — 1
Remark	This course can be used for final thesis theme
ISVU equivalents:	200521;
Proposal made by	Goran Sirovatka

Code WEB/ISVU	26553/215823	**ECTS**	6	**Academic year**	2020/2021
Name	Operational research in mechanical engineering				
Status	2nd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (15+15+0+0) 120
Teachers	Lectures:1. Goran Sirovatka dipl. ing.,pred. Auditory exercises: Goran Sirovatka dipl. ing.,pred. Laboratory exercises: Goran Sirovatka dipl. ing.,pred.				
Course objectives	mastering (using) scientific and professional methods and techniques based on quantitative basics to find alternative (optimal) solutions to real business and technical problems based on which analysis and synthesis of solutions can be made, decisions are made and predict consequences				
Learning outcomes:	1.planning operational research and application areas. Level:6,7 2.propose mathematical modeling and its role in operational research. Level:6,7 3.Create a mathematical model of linear programming problem. Level:6,7 4.determine the linear program solution by graphical, simplex and dual method. Level:7 5.Develop sensitivity analysis. Level:6,7 6.Classify a transport problem. Level:6,7 7.Compare methods for solving transport problems. Level:6,7 8.compare the transport problem solution by applying different methods. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Demonstration Modelling Discussion Questions and answers Seminar, students presentation and discussion				
Methods of carrying out auditory exercises	Group problem solving Essay writing Interactive problem solving Workshop				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Discussion, brainstorming Interactive problem solving				
Course content lectures	1.Introduction. Classification of problems, 2h, Learning outcomes:1 2.Linear programming, 2h, Learning outcomes:2 3.graphic solution, 2h, Learning outcomes:2,4 4.simplex method, 2h, Learning outcomes:2,4 5.dual problem, 2h, Learning outcomes:3,4 6.Transport problem, 2h, Learning outcomes:6 7.Transport problem, 2h, Learning outcomes:6 8.Nonlinear programming, 2h, Learning outcomes:5 9.Nonlinear programming, 2h, Learning outcomes:5 10.Dynamic programming, 2h, Learning outcomes:7 11.Dynamic programming, 2h, Learning outcomes:7 12.Network Planning, 2h, Learning outcomes:1,6,7,8 13.Network Planning, 2h, Learning outcomes:6,7,8 14.PERT method, 2h, Learning outcomes:8 15.PERT method, 2h, Learning outcomes:8				
Course content auditory	1.linear programming, 1h, Learning outcomes:1,2,3 2.linear programming, 1h, Learning outcomes:1,2,3 3.transport problems, 1h, Learning outcomes:2,6,7 4.transport problems, 1h, Learning outcomes:2,6,7 5.solving problems , 1h, Learning outcomes:4,5,7,8 6.part time exam , 1h, Learning outcomes:4 7.dynamic programming, 1h, Learning outcomes:1,4 8.dynamic programming, 1h, Learning outcomes:1,4 9.network planning, 1h, Learning outcomes:1 10.network planning, 1h, Learning outcomes:1 11.nonlinear programmin, 1h, Learning outcomes:5,6,7 12.nonlinear programmin, 1h, Learning outcomes:5,6,7 13.time analysis by PERT / CPM method, 1h, Learning outcomes:8 14.time analysis by PERT / CPM method, 1h, Learning outcomes:8 15.part time exam, 1h, Learning outcomes:1,2,3,4,5,6,7				
Course content laboratory	1.linear programming, 1h, Learning outcomes:1,2 2.linear programming, 1h, Learning outcomes:1,2 3.transport problems, 1h, Learning outcomes:2,6,7				

	4.transport problems, 1h, Learning outcomes:2,6,7 5.problem solving , 1h, Learning outcomes:1,2,3,4,5,6,7 6.partime exam, 1h, Learning outcomes:1,2,3,4,5,6,7,8 7.dynamic programming, 1h, Learning outcomes:1,4 8.dynamic programming, 1h, Learning outcomes:1,4 9.network planning, 1h, Learning outcomes:1,4,5 10.network planning, 1h, Learning outcomes:1,4,5 11.nonlinear programmin, 1h, Learning outcomes:5,6,7 12.nonlinear programmin, 1h, Learning outcomes:5,6,7 13.time analysis by PERT / CPM method, 1h, Learning outcomes:6,7 14.time analysis by PERT / CPM method, 1h, Learning outcomes:6,7 15.part time exam , 1h, Learning outcomes:1,2,3,4,5,6,7
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory Whiteboard with markers Overhead projector Tools
Exam literature	FREDERICK S. HILLIER, GERALD J. LIEBERMAN: INTRODUCTION TO OPERATIONS RESEARCH, Seventh Edition, McGraw-Hill Higher Education, 2001 D. Kalpić, V. Mornar (1996.), Operacijska istraživanja, Zeus - DRIP, Zagreb
Students obligations	Attendance with the permitted number of absences according to the Rulebook on Studying
Knowledge evaluation during semester	1st Colloquium 2nd Colloquium seminar work
Knowledge evaluation after semester	Written exam
Student activities:	Aktivnost — ECTS (Constantly tested knowledge) — 4 (Seminar Work) — 1 (Experimental work) — 1
Remark	This course can be used for final thesis theme
ISVU equivalents:	192608;
Proposal made by	Goran Sirovatka , 23.10.2018

Code WEB/ISVU	26517/215739	**ECTS**	6	**Academic year**	2020/2021
Name	Plant and process automation				
Status	3rd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course3rd semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. prof. dr. sc. Dario Matika Lectures:2. mr.sc. Goran Malčić v.pred. Laboratory exercises: Domagoj Malez Laboratory exercises:prof. dr. sc. Dario Matika				
Course objectives	To enable students to solve problems in the field of plant and process automation as well as the design of automation systems				
Learning outcomes:	1.compare theoretical and practical knowledge for solving problems in the field of plant and process automation. Level:6,7 2.choose the option of designing automation systems through mastering the work with programmable controllers (PLC) for automation of more complex technological processes. Level:7 3.propose a software solution for the controller and process visualization. Level:6,7 4.valorize the application of software tools in solving project tasks in the field of plant and process automation. Level:7 5.evaluate the conceptual design and terms of reference, using the PID diagram in design (Process and Instrumentation Diagrams). Level:7				
Methods of carrying out lectures	Ex cathedra teaching Demonstration Simulations Seminar, students presentation and discussion Other online				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Laboratory exercises, computer simulations Group problem solving Workshop				
Course content lectures	1.Introduction to the course, definition of basic terms and categories in plant and process automation, 2h, Learning outcomes:1 2.Modern technological solutions for plant and process automation, 2h, Learning outcomes:1,2 3.Sensors, probes and analyzers for plant and process automation, 2h, Learning outcomes:1,2 4.Actuators for plant and process automation, 2h, Learning outcomes:1,2 5.Programmable controller (PLC) for plant and process automation, 2h, Learning outcomes:1,2,3 6.Visualization of the automation process using a , 2h, Learning outcomes:1,2,3 7.The first knowledge check, 2h, Learning outcomes:1,2,3 8.SCADA systems in plant and process automatio, 2h, Learning outcomes:3 9.Application of ERP system (production planning system) in plant and process automation, 2h, Learning outcomes:4 10.Application of RTU communication (remote control) in the design of plant and process automation, 2h, Learning outcomes:4 11.Busbars and interfaces in plant and process automation design, 2h, Learning outcomes:2,4 12.Development of algorithms and environments for plant and process automation design, 2h, Learning outcomes:4,5 13.Application of PID diagrams (Process and Instrumentation Diagrams) in the design of plant and process automation, 2h, Learning outcomes:5 14.Design solutions for complex plant and process automation systems, 2h, Learning outcomes:5 15.The second knowledge check, 2h, Learning outcomes:3,4,5				
Course content laboratory	1.Analog and digital sensors in process and plant automation, 3h, Learning outcomes:1,2 2.Electromechanical, hydraulic, pneumatic and micro actuators in process and plant automation, 3h, Learning outcomes:1,2 3.Examples of PLC programming, 3h, Learning outcomes:2,3 4.Examples of process visualization, 3h, Learning outcomes:2,3 5.Modeling and simulation of automation process using Simulink, 3h, Learning outcomes:3,4 6.Development of program routines for automation process control in Matlab, 3h, Learning outcomes:3,4 7.Optimization of static and dynamic characteristics of actuators - drawing characteristics in Matlab, 3h, Learning outcomes:3,4 8.Design of plant and process automation systems using TIA Portal, 3h, Learning outcomes:3,4 9.Implementation and integration of control algorithms, process computers, buses and interfaces, 3h, Learning outcomes:4,5 10.Development of PID documentation, connection of user interface (HMI) and SCADA support, 3h, Learning outcomes:4,5 11.No classes 12.No classes 13.No classes 14.No classes 15.No classes				
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory Whiteboard with markers Overhead projector				

Exam literature	Basic literature: 1. Perić N., Petrović I., Vašak M.: Procesna automatizacija, Skripta Zavoda za APR, FER, Zagreb, 2013. 2. Perić N., Petrović I.: Automatizacija postrojenja i procesa predavanja, Skripta Zavoda za APR, FER, Zagreb, 2000. Dodatna: 1. Berger H.: SIMATIC automatizacijski sustavi, Graphis, Zagreb, 2013. 2. Groover P.M.: Automation, Production System and Computer-Integrated Manufacturing, Global Edition, Pearson education Limited, 9780133499612, 2015.
Students obligations	Attendance continues with the allowed number of absences according to the Rulebook on studying. Solving tasks in exercises.
Knowledge evaluation during semester	Maximum 60 points, minimum 15 points. Achieved 15 and less than 30 points require additional knowledge testing. The supplementary knowledge test consists of two tasks from each individual outcome test (four tasks) and brings a maximum of 15 points. The student must achieve a total score with a supplementary test of a minimum of 30 points to take the final exam. Exercise reports are 20 points, the pass threshold is 10 points. First outcome check maximum 20 points, pass threshold 10 points. Second outcome check maximum 20 points, pass threshold 10 points. The knowledge test in the semester is carried out in accordance with Article 4 of the Ordinance on student assessment at the Zagreb University of Applied Sciences.
Knowledge evaluation after semester	Maximum 40 points, minimum 20 points. Oral exam with practical part (defense of seminar paper). The final grade is formed in accordance with Article 8 of the Ordinance on student assessment at the Technical Polytechnic in Zagreb.
Student activities:	Aktivnost — ECTS (Classes attendance) — 2 (Constantly tested knowledge) — 4
Remark	This course can be used for final thesis theme
Proposal made by	prof. Dario Matika, Ph.D.

Code WEB/ISVU	26521/215744	**ECTS**	6	**Academic year**	2020/2021
Name	Production management				
Status	3rd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course3rd semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 120
Teachers	Lectures:1. Hrvoje Rakić , dipl.ing.stroj., pred. Auditory exercises: Hrvoje Rakić , dipl.ing.stroj., pred.				
Course objectives	To enable the student to apply knowledge from the organization and management of business processes with regard to the specifics of the production process				
Learning outcomes:	1.plan serial production and individual projects (time and material). Level:6,7 2.manage serial production and individual projects (time and material). Level:6,7 3.distinguish production cycles in relation to the type of production (individual, serial and mass). Level:6 4.assess interoperative delays. Level:6,7 5.calculate flow coefficients and actual production cycles. Level:6 6.make forward and backward Gantt charts. Level:6 7.calculate the optimal order of launching work orders. Level:6 8.manage material (economical quantities and stocks). Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Interactive problem solving				
Course content lectures	1.Production and production types classification, 2h, Learning outcomes:1,2,3 2.Defining and processing theoretical production cycles, 2h, Learning outcomes:1,2,3 3.Production cycles and interoperable downtime, 2h, Learning outcomes:3,4 4.Interoperable downtime and production flow coefficients , 2h, Learning outcomes:4,5 5.Selection and application of flow coefficient in relation to the type of production and to work in shifts, 2h, Learning outcomes:5 6.Method of production planning and management, 2h, Learning outcomes:5 7.Actual production cycle and flow coefficients and their dependence, 2h, Learning outcomes:5 8.Display of production cycle in time diagram (gantt chart), 2h, Learning outcomes:6 9.Representation of product assembly activities according to the assembly scheme using backwards Gantt chart, 2h, Learning outcomes:6 10.Optimal order of launching work orders on two machines, 2h, Learning outcomes:7 11.Optimal order of launching work orders on three machines, 2h, Learning outcomes:7 12.Management of raw and production materials, 2h, Learning outcomes:8 13.Determining stock types based on different criteria, 2h, Learning outcomes:8 14.Calculation of economic quantities, batches and stocks, 2h, Learning outcomes:8 15.Reservation and planned distribution of raw and production materials, 2h, Learning outcomes:8				
Course content auditory	1.Solving tasks from the production cycles (serial, parallel and combined), 2h, Learning outcomes:1,2,3 2.Solving tasks from the production cycles (serial, parallel and combined), 2h, Learning outcomes:1,2,3 3.Tasks related to the concept of interoperable downtime and flow coefficients, 2h, Learning outcomes:4,5 4.Tasks related to the concept of interoperable downtime and flow coefficients, 2h, Learning outcomes:4,5 5.Solve tasks using the rules of drawing backward Gannt charts, 2h, Learning outcomes:6 6.Solve tasks using the rules of drawing backward Gannt charts, 2h, Learning outcomes:6 7.Tasks from the optimal order of launching work orders, 2h, Learning outcomes:7 8.Tasks from the optimal order of launching work orders, 2h, Learning outcomes:7 9.Solving numerical problems from economic series, 2h, Learning outcomes:8 10.Solving numerical problems from economic series, 2h, Learning outcomes:8 11.Solving numerical problems from economic series, 2h, Learning outcomes:8 12.Solving tasks from determining stocks of raw and production materials, 2h, Learning outcomes:8 13.Solving tasks from determining stocks of raw and production materials, 2h, Learning outcomes:8 14.Solving tasks from reservations and optimal distribution of raw and production materials, 2h, Learning outcomes:8 15.Solving tasks from reservations and optimal distribution of raw and production materials, 2h, Learning outcomes:8				
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector				
Exam literature	1. Inženjerski priručnik IP4, poglavlje 6. Planiranje i praćenje proizvodnje, Školska knjiga, Zagreb, 2002 2. Antun Vila i suradnici, Modeli planiranja proizvodnje u industriji, Informator, Zagreb, 1983 3. Nikolić, G., Čala, I., Alić Kostešić V., Metode planiranja u proizvodnji odjeće, Sveučilišni udžbenik, Zagreb, 2010 4. Omazić, M., Baljkas, S., Projektni menadžment, Sinergija, Zagreb, 2005 5. Anton Hauc, Projektni Management, Založba, Ljubljana, 2007				
Students obligations	Regular class attendance with the allowed number of absences according to the Study Regulations. Solving tasks in auditory exercises.				
Knowledge evaluation during	Seminar paper, 30% research work, 20%				

semester	Written check, 50% 50-63 sufficient 64-76 good 77-89 very good 90-100 excellent	
Knowledge evaluation after semester	Written exam, 50% Oral exam, 30% seminar paper, 20% 50-63 sufficient 64-76 good 77-89 very good 90-100 excellent	
Student activities:	Aktivnost (Classes attendance) (Activity in class) (Seminar Work) (Written exam) (Constantly tested knowledge)	ECTS 1 1 1 1 2
Remark	This course can be used for final thesis theme	
Proposal made by	Hrvoje Rakic, mag.ing.mech., lecturer, July 16th, 2020	

Code WEB/ISVU	26529/215756	**ECTS**	6	**Academic year**	2020/2021
Name	Production management				
Status	3rd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course3rd semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 120
Teachers	Lectures:1. Hrvoje Rakić , dipl.ing.stroj., pred. Auditory exercises: Hrvoje Rakić , dipl.ing.stroj., pred.				
Course objectives	To enable the student to apply knowledge from the organization and management of business processes with regard to the specifics of the production process				
Learning outcomes:	1.plan serial production and individual projects (time and material). Level:6,7 2.manage serial production and individual projects (time and material). Level:6,7 3.distinguish production cycles in relation to the type of production (individual, serial and mass). Level:6 4.assess interoperative delays. Level:6,7 5.calculate flow coefficients and actual production cycles. Level:6 6.make forward and backward Gantt charts. Level:6 7.calculate the optimal order of launching work orders. Level:6 8.manage material (economical quantities and stocks). Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Interactive problem solving				
Course content lectures	1.Production and production types classification, 2h, Learning outcomes:1,2,3 2.Defining and processing theoretical production cycles, 2h, Learning outcomes:1,2,3 3.Production cycles and interoperable downtime, 2h, Learning outcomes:3,4 4.Interoperable downtime and production flow coefficients , 2h, Learning outcomes:4,5 5.Selection and application of flow coefficient in relation to the type of production and to work in shifts, 2h, Learning outcomes:5 6.Method of production planning and management, 2h, Learning outcomes:5 7.Actual production cycle and flow coefficients and their dependence, 2h, Learning outcomes:5 8.Display of production cycle in time diagram (gantt chart), 2h, Learning outcomes:6 9.Representation of product assembly activities according to the assembly scheme using backwards Gantt chart, 2h, Learning outcomes:6 10.Optimal order of launching work orders on two machines, 2h, Learning outcomes:7 11.Optimal order of launching work orders on three machines, 2h, Learning outcomes:7 12.Management of raw and production materials, 2h, Learning outcomes:8 13.Determining stock types based on different criteria, 2h, Learning outcomes:8 14.Calculation of economic quantities, batches and stocks, 2h, Learning outcomes:8 15.Reservation and planned distribution of raw and production materials, 2h, Learning outcomes:8				
Course content auditory	1.Solving tasks from the production cycles (serial, parallel and combined), 2h, Learning outcomes:1,2,3 2.Solving tasks from the production cycles (serial, parallel and combined), 2h, Learning outcomes:1,2,3 3.Tasks related to the concept of interoperable downtime and flow coefficients, 2h, Learning outcomes:4,5 4.Tasks related to the concept of interoperable downtime and flow coefficients, 2h, Learning outcomes:4,5 5.Solve tasks using the rules of drawing backward Gannt charts, 2h, Learning outcomes:6 6.Solve tasks using the rules of drawing backward Gannt charts, 2h, Learning outcomes:6 7.Tasks from the optimal order of launching work orders, 2h, Learning outcomes:7 8.Tasks from the optimal order of launching work orders, 2h, Learning outcomes:7 9.Solving numerical problems from economic series, 2h, Learning outcomes:8 10.Solving numerical problems from economic series, 2h, Learning outcomes:8 11.Solving numerical problems from economic series, 2h, Learning outcomes:8 12.Solving tasks from determining stocks of raw and production materials, 2h, Learning outcomes:8 13.Solving tasks from determining stocks of raw and production materials, 2h, Learning outcomes:8 14.Solving tasks from reservations and optimal distribution of raw and production materials, 2h, Learning outcomes:8 15.Solving tasks from reservations and optimal distribution of raw and production materials, 2h, Learning outcomes:8				
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector				
Exam literature	1. Inženjerski priručnik IP4, poglavlje 6. Planiranje i praćenje proizvodnje, Školska knjiga, Zagreb, 2002 2. Antun Vila i suradnici, Modeli planiranja proizvodnje u industriji, Informator, Zagreb, 1983 3. Nikolić, G., Čala, I., Alić Kostešić V., Metode planiranja u proizvodnji odjeće, Sveučilišni udžbenik, Zagreb, 2010 4. Omazić, M., Baljkas, S., Projektni menadžment, Sinergija, Zagreb, 2005 5. Anton Hauc, Projektni Management, Založba, Ljubljana, 2007				
Students obligations	Regular class attendance with the allowed number of absences according to the Study Regulations. Solving tasks in auditory exercises.				
Knowledge evaluation during	Seminar paper, 30% research work, 20%				

semester	Written check, 50% 50-63 sufficient 64-76 good 77-89 very good 90-100 excellent	
Knowledge evaluation after semester	Written exam, 50% Oral exam, 30% seminar paper, 20% 50-63 sufficient 64-76 good 77-89 very good 90-100 excellent	
Student activities:	Aktivnost (Classes attendance) (Activity in class) (Seminar Work) (Written exam) (Constantly tested knowledge)	ECTS 1 1 1 1 2
Remark	This course can be used for final thesis theme	
Proposal made by	Hrvoje Rakic, mag.ing.mech., lecturer, July 16th, 2020	

Code WEB/ISVU	26536/215763	**ECTS**	6	**Academic year**	2020/2021
Name	Production management				
Status	3rd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course3rd semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (30+0+0+0) 120
Teachers	Lectures:1. Hrvoje Rakić , dipl.ing.stroj., pred. Auditory exercises: Hrvoje Rakić , dipl.ing.stroj., pred.				
Course objectives	To enable the student to apply knowledge from the organization and management of business processes with regard to the specifics of the production process				
Learning outcomes:	1.plan serial production and individual projects (time and material). Level:6,7 2.manage serial production and individual projects (time and material). Level:6,7 3.distinguish production cycles in relation to the type of production (individual, serial and mass). Level:6 4.assess interoperative delays. Level:6,7 5.calculate flow coefficients and actual production cycles. Level:6 6.make forward and backward Gantt charts. Level:6 7.calculate the optimal order of launching work orders. Level:6 8.manage material (economical quantities and stocks). Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming Interactive problem solving				
Course content lectures	1.Production and production types classification, 2h, Learning outcomes:1,2,3 2.Defining and processing theoretical production cycles, 2h, Learning outcomes:1,2,3 3.Production cycles and interoperable downtime, 2h, Learning outcomes:3,4 4.Interoperable downtime and production flow coefficients , 2h, Learning outcomes:4,5 5.Selection and application of flow coefficient in relation to the type of production and to work in shifts, 2h, Learning outcomes:5 6.Method of production planning and management, 2h, Learning outcomes:5 7.Actual production cycle and flow coefficients and their dependence, 2h, Learning outcomes:5 8.Display of production cycle in time diagram (gantt chart), 2h, Learning outcomes:6 9.Representation of product assembly activities according to the assembly scheme using backwards Gantt chart, 2h, Learning outcomes:6 10.Optimal order of launching work orders on two machines, 2h, Learning outcomes:7 11.Optimal order of launching work orders on three machines, 2h, Learning outcomes:7 12.Management of raw and production materials, 2h, Learning outcomes:8 13.Determining stock types based on different criteria, 2h, Learning outcomes:8 14.Calculation of economic quantities, batches and stocks, 2h, Learning outcomes:8 15.Reservation and planned distribution of raw and production materials, 2h, Learning outcomes:8				
Course content auditory	1.Solving tasks from the production cycles (serial, parallel and combined), 2h, Learning outcomes:1,2,3 2.Solving tasks from the production cycles (serial, parallel and combined), 2h, Learning outcomes:1,2,3 3.Tasks related to the concept of interoperable downtime and flow coefficients, 2h, Learning outcomes:4,5 4.Tasks related to the concept of interoperable downtime and flow coefficients, 2h, Learning outcomes:4,5 5.Solve tasks using the rules of drawing backward Gannt charts, 2h, Learning outcomes:6 6.Solve tasks using the rules of drawing backward Gannt charts, 2h, Learning outcomes:6 7.Tasks from the optimal order of launching work orders, 2h, Learning outcomes:7 8.Tasks from the optimal order of launching work orders, 2h, Learning outcomes:7 9.Solving numerical problems from economic series, 2h, Learning outcomes:8 10.Solving numerical problems from economic series, 2h, Learning outcomes:8 11.Solving numerical problems from economic series, 2h, Learning outcomes:8 12.Solving tasks from determining stocks of raw and production materials, 2h, Learning outcomes:8 13.Solving tasks from determining stocks of raw and production materials, 2h, Learning outcomes:8 14.Solving tasks from reservations and optimal distribution of raw and production materials, 2h, Learning outcomes:8 15.Solving tasks from reservations and optimal distribution of raw and production materials, 2h, Learning outcomes:8				
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector				
Exam literature	1. Inženjerski priručnik IP4, poglavlje 6. Planiranje i praćenje proizvodnje, Školska knjiga, Zagreb, 2002 2. Antun Vila i suradnici, Modeli planiranja proizvodnje u industriji, Informator, Zagreb, 1983 3. Nikolić, G., Čala, I., Alić Kostešić V., Metode planiranja u proizvodnji odjeće, Sveučilišni udžbenik, Zagreb, 2010 4. Omazić, M., Baljkas, S., Projektni menadžment, Sinergija, Zagreb, 2005 5. Anton Hauc, Projektni Management, Založba, Ljubljana, 2007				
Students obligations	Regular class attendance with the allowed number of absences according to the Study Regulations. Solving tasks in auditory exercises.				
Knowledge evaluation during	Seminar paper, 30% research work, 20%				

semester	Written check, 50% 50-63 sufficient 64-76 good 77-89 very good 90-100 excellent	
Knowledge evaluation after semester	Written exam, 50% Oral exam, 30% seminar paper, 20% 50-63 sufficient 64-76 good 77-89 very good 90-100 excellent	
Student activities:	Aktivnost (Classes attendance) (Activity in class) (Seminar Work) (Written exam) (Constantly tested knowledge)	ECTS 1 1 1 1 2
Remark	This course can be used for final thesis theme	
Proposal made by	Hrvoje Rakic, mag.ing.mech., lecturer, July 16th, 2020	

Code WEB/ISVU	26573/216099	**ECTS**	6	**Academic year**	2020/2021
Name	Prototyping and reversible engineering				
Status	2nd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. dr. sc. Branko Katana , mag. ing. mech. Laboratory exercises:dr. sc. Branko Katana , mag. ing. mech.				
Course objectives	Understand the basic elements of additive prototype production processes and reversible engineering to improve product development				
Learning outcomes:	1.to determine the importance of additive prototype production processes in the contemporary product development. Level:7 2.link prototype design and reversible engineering for development purposes. Level:6,7 3.develop communication in research and development. Level:6,7 4.plan prototype design and reversible engineering systems. Level:6,7 5.to create project proposals for designing prototypes and / or projects from reversible engineering through seminar work. Level:6,7 6.to evaluate models of reversible engineering and models of additive prototype designs depending on the method of application in the technical system. Level:7 7.develop readiness for teamwork and collaboration.. Level:6				
Methods of carrying out lectures	Ex cathedra teaching Case studies Demonstration Simulations Questions and answers Seminar, students presentation and discussion				
Methods of carrying out laboratory exercises	Laboratory exercises, computer simulations Group problem solving Discussion, brainstorming Workshop				
Course content lectures	1.an introduction to the importance of additive methods of developing prototypes in modern development and production, 2h 2.an introduction to the importance of reversible engineering in modern development and production, 2h, Learning outcomes:1 3.basic concepts, definitions and division of prototype design procedures, 2h, Learning outcomes:1,2 4.CAD applications in reversible engineering and prototype design, 2h, Learning outcomes:3,4 5.the procedures of making simple prototypes, 2h, Learning outcomes:3,4 6.the procedures of making complex prototypes, 2h, Learning outcomes:3,4 7.communication in product development, 2h, Learning outcomes:3 8.making elastomer prototypes, 2h, Learning outcomes:2,3 9.making prototypes of polymers and metals, 2h, Learning outcomes:2,3 10.reversible engineering introduction, 2h, Learning outcomes:4 11.the use of scanners in reversible engineering, 2h, Learning outcomes:4,5 12.FEM analysis in structural product optimization, 2h, Learning outcomes:4,5 13.application of reversible engineering, 2h, Learning outcomes:4,5 14.application of reversible engineering, 2h, Learning outcomes:4,5 15.making a project proposal proposal, 2h, Learning outcomes:3				
Course content laboratory	1.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3,7 2.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3,7 3.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3,7 4.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3,7 5.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3,7 6.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3 7.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3 8.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3 9.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3 10.Tasks from reversible engineering, 2h, Learning outcomes:4,5,6,7 11.Tasks from reversible engineering, 2h, Learning outcomes:4,5,6,7 12.Product development by making prototypes and / or reversible engineering, 2h, Learning outcomes:4,5,6,7 13.Drafting a project proposal, 2h, Learning outcomes:4,5,6,7 14.Check project proposal before approval, 2h, Learning outcomes:4,5,6,7 15.Instructions for Seminar Work, 2h, Learning outcomes:4,5,6,7				
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory Whiteboard with markers Overhead projector				
Exam literature	M. Šercer, D. Godec; Adaptivna Proizvodnja, Fakultet strojarstva i brodogradnje, Zagreb, 2015, ISBN 978-953-7738-266				
Students obligations	Attendance with the permitted number of absences according to the Book of Rules .. Solving tasks at auditory and seminar exercises.				

Knowledge evaluation during semester	Continuous monitoring during the course 1.Kolokvij - Written problem tasks - Weighted percentage in% 33,33% 2.Local - Letter of the Objective Type - Weighted% 33.33% 3. seminar work - Independent work - 33.33%	
Knowledge evaluation after semester	Written Exam - Problem Tasks of an Objective Type - Weighted Score in% 66% seminar work - Weighted share% 33.33%	
Student activities:	Aktivnost (Seminar Work) (Classes attendance) (Written exam)	ECTS 2 2 2
Remark	This course can be used for final thesis theme	
ISVU equivalents:	192606;	

Code WEB/ISVU	26572/216098	**ECTS**	6	**Academic year**	2020/2021
Name	Prototyping and reversible engineering				
Status	2nd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. dr. sc. Branko Katana , mag. ing. mech. Laboratory exercises:dr. sc. Branko Katana , mag. ing. mech.				
Course objectives	Understand the basic elements of additive prototype production processes and reversible engineering to improve product development				
Learning outcomes:	1.to determine the importance of additive prototype production processes in the contemporary product development. Level:7 2.link prototype design and reversible engineering for development purposes. Level:6,7 3.develop communication in research and development. Level:6,7 4.plan prototype design and reversible engineering systems. Level:6,7 5.to create project proposals for designing prototypes and / or projects from reversible engineering through seminar work. Level:6,7 6.to evaluate models of reversible engineering and models of additive prototype designs depending on the method of application in the technical system. Level:7 7.develop readiness for teamwork and collaboration.. Level:6				
Methods of carrying out lectures	Ex cathedra teaching Case studies Demonstration Simulations Questions and answers Seminar, students presentation and discussion				
Methods of carrying out laboratory exercises	Laboratory exercises, computer simulations Group problem solving Discussion, brainstorming Workshop				
Course content lectures	1.an introduction to the importance of additive methods of developing prototypes in modern development and production, 2h 2.an introduction to the importance of reversible engineering in modern development and production, 2h, Learning outcomes:1 3.basic concepts, definitions and division of prototype design procedures, 2h, Learning outcomes:1,2 4.CAD applications in reversible engineering and prototype design, 2h, Learning outcomes:3,4 5.the procedures of making simple prototypes, 2h, Learning outcomes:3,4 6.the procedures of making complex prototypes, 2h, Learning outcomes:3,4 7.communication in product development, 2h, Learning outcomes:3 8.making elastomer prototypes, 2h, Learning outcomes:2,3 9.making prototypes of polymers and metals, 2h, Learning outcomes:2,3 10.reversible engineering introduction, 2h, Learning outcomes:4 11.the use of scanners in reversible engineering, 2h, Learning outcomes:4,5 12.FEM analysis in structural product optimization, 2h, Learning outcomes:4,5 13.application of reversible engineering, 2h, Learning outcomes:4,5 14.application of reversible engineering, 2h, Learning outcomes:4,5 15.making a project proposal proposal, 2h, Learning outcomes:3				
Course content laboratory	1.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3,7 2.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3,7 3.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3,7 4.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3,7 5.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3,7 6.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3 7.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3 8.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3 9.Tasks from the field of prototype design, 2h, Learning outcomes:1,2,3 10.Tasks from reversible engineering, 2h, Learning outcomes:4,5,6,7 11.Tasks from reversible engineering, 2h, Learning outcomes:4,5,6,7 12.Product development by making prototypes and / or reversible engineering, 2h, Learning outcomes:4,5,6,7 13.Drafting a project proposal, 2h, Learning outcomes:4,5,6,7 14.Check project proposal before approval, 2h, Learning outcomes:4,5,6,7 15.Instructions for Seminar Work, 2h, Learning outcomes:4,5,6,7				
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory Whiteboard with markers Overhead projector				
Exam literature	M. Šercer, D. Godec; Adaptivna Proizvodnja, Fakultet strojarstva i brodogradnje, Zagreb, 2015, ISBN 978-953-7738-266				
Students obligations	Attendance with the permitted number of absences according to the Book of Rules .. Solving tasks at auditory and seminar exercises.				

Knowledge evaluation during semester	Continuous monitoring during the course 1.Kolokvij - Written problem tasks - Weighted percentage in% 33,33% 2.Local - Letter of the Objective Type - Weighted% 33.33% 3. seminar work - Independent work - 33.33%	
Knowledge evaluation after semester	Written Exam - Problem Tasks of an Objective Type - Weighted Score in% 66% seminar work - Weighted share% 33.33%	
Student activities:	Aktivnost (Seminar Work) (Classes attendance) (Written exam)	ECTS 2 2 2
Remark	This course can be used for final thesis theme	
ISVU equivalents:	200524;	

Code WEB/ISVU	26543/215799	**ECTS**	6	**Academic year**	2020/2021
Name	Renewable energy sources				
Status	2nd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+0+10+0) 120
Teachers	Lectures:1. Doc.dr.sc. Vlasta Zanki dipl.ing.stroj. Auditory exercises:Doc.dr.sc. Vlasta Zanki dipl.ing.stroj. Seminar exercises:Doc.dr.sc. Vlasta Zanki dipl.ing.stroj.				
Course objectives	Acquisition of expert knowledge in the field of renewable energy sources				
Learning outcomes:	1.Analyze the advantages and disadvantages of renewable energy technologies. Level:6 2.Calculate the strength, productivity and other important sizes associated with renewable energy technologies. Level:6 3.Identify the main obstacles to greater integration of renewable energy sources into EES.. Level:6 4.Identify the possibilities for integrating OIE into buildings. Level:6 5.Suggest a suitable type of renewable energy technology for specific application. Level:6,7 6.Compare the various energy storage technologies in the context of renewable energy sources. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Guest lecturer Case studies Discussion Questions and answers				
Methods of carrying out auditory exercises	Laboratory exercises, computer simulations Group problem solving Data mining and knowledge discovery on the Web Discussion, brainstorming Mind mapping Workshop				
Methods of carrying out seminars	Discussion, brainstorming Workshop				
Course content lectures	1.Introduction hour and organization, 2h 2.Introduction to Renewable Energy Sources, 2h, Learning outcomes:1,2,3 3.Essential energy in the context of renewable energy sources, 2h, Learning outcomes:1,2,3,4 4.Solar energy and passive systems, 2h, Learning outcomes:1,2,3,4 5.Thermal solar systems, 2h, Learning outcomes:1,2,3,4 6.Photovoltaic systems, 2h, Learning outcomes:1,2,3,4,6 7.Heat cranes, 2h, Learning outcomes:1,2,3,4 8.Energy of biomass and cogeneration plants, 2h, Learning outcomes:1,2,3 9.The first colloquium, 2h 10.Geothermal energy, 2h, Learning outcomes:1,2,3 11.Small hydroelectric power plants, 2h, Learning outcomes:1,2,3 12.Wind and wind agregate energy, 2h, Learning outcomes:1,2,3 13.Storing Energy in the OIE Context, 2h, Learning outcomes:6 14.Gorgeous cells, 2h, Learning outcomes:1,2,3 15.Energy utilization of the waves, tide and tide 2h, 2h, Learning outcomes:1,2,3,6				
Course content auditory	1.Using advanced tools in the calculation of thermal solar collectors, 2h, Learning outcomes:1 2.Comparison of fuel values of biomass, 2h, Learning outcomes:2 3.Comparison of the use of different heat tanks / abutments on the efficiency of the heat pumps, 2h, Learning outcomes:3,4 4.Field exercises: Visit to a biomass cogeneration plant, 4h, Learning outcomes:1,2,3,4,5,6 5.no classes 6.Field exercises: visit of hydroelectric power plants,, 5h, Learning outcomes:1,2,3,4,5,6 7.no classes 8.no classes 9.no classes 10.Field exercises: Visit to a photovoltaic plant integrated in the building, 5h, Learning outcomes:1,2,3,4,5,6 11.no classes 12.no classes 13.no classes 14.no classes 15.no classes				
Course content seminars	1.no classes 2.no classes 3.no classes 4.no classes 5.no classes 6.no classes 7.no classes 8.no classes 9.no classes				

	10.no classes 11.Case study analysis - workshop, 2h, Learning outcomes:1,2,3,4,5,6 12.Case study analysis - workshop, 2h, Learning outcomes:1,2,3,4,5,6 13.Case study analysis - workshop, 2h, Learning outcomes:1,2,3,4,5,6 14.Case study analysis - workshop, 2h, Learning outcomes:1,2,3,4,5,6 15.Case study analysis - workshop, 2h, Learning outcomes:1,2,3,4,5,6
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector Special equipment equipment in facilities - field work
Exam literature	Lj. Majdandžić, Obnovljivi izvori energije - Energetske tehnologije koje će obilježiti 21. stoljeće, Graphis d.o.o., Zagreb
Students obligations	Attendance with the permitted number of absences according to the Rulebook on Studying
Knowledge evaluation during semester	Continuous monitoring during the course Seminar paper 30% research work 20% Written verification 50%
Knowledge evaluation after semester	Written exam 50% Oral exam 30% seminar work 20%
Student activities:	Aktivnost — ECTS (Classes attendance) — 2 (Seminar Work) — 1 (Oral exam) — 1 (Written exam) — 2
Remark	This course can be used for final thesis theme
ISVU equivalents:	200525;

Code WEB/ISVU	26520/215742	**ECTS**	6	**Academic year**	2020/2021
Name	Sensors and actuators in industrial processes				
Status	3rd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course3rd semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+30+0+0) 120
Teachers	Lectures:1. Goran Čubrić Lectures:2. dr. sc. Toni Bjažić prof. v. š. Laboratory exercises:dr. sc. Toni Bjažić prof. v. š. Laboratory exercises: Goran Čubrić				
Course objectives	Adoption of the principles of operation of the most commonly used sensors and actuators in typical technical systems in industry, and knowledge of the applications and connection of intelligent converters in the communication subsystem of a controlled, monitored or regulated process				
Learning outcomes:	1.assess the cost-effectiveness and justification of using sensors or actuators. Level:6,7 2.select the operation option of intelligent sensor of physical quantity. Level:7 3.suggest the use of an appropriate actuator in a suitable place. Level:6,7 4.combine various types of sensors in industrial plants. Level:6,7 5.formulate the principle of operation of the most commonly used sensors and actuators. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Other online				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment				
Course content lectures	1.Introductory lecture, Mode of operation of sensors, 5h, Learning outcomes:1,2,3,4,5 2.Temperature measurement, Linear position measurement, 5h, Learning outcomes:1,2,3,4,5 3.Pressure measurement, Flow measurement, 5h, Learning outcomes:1,2,3,4,5 4.Actuators 1 and 2, 5h, Learning outcomes:1,2,3,4,5 5.Servo drives, Level measurement, 5h, Learning outcomes:1,2,3,4,5 6.Communications in industrial plants, 5h, Learning outcomes:1,2,3,4,5 7.No classes 8.No classes 9.No classes 10.No classes 11.No classes 12.No classes 13.No classes 14.No classes 15.No classes				
Course content laboratory	1.Examples of measuring transducers and actuators, 5h, Learning outcomes:1,2,3,4,5 2.Examples of technical systems 1, 5h, Learning outcomes:1,2,3,4,5 3.Laboratory exercises 1, 5h, Learning outcomes:1,2,3,4,5 4.Laboratory exercises 2, 5h, Learning outcomes:1,2,3,4,5 5.Laboratory exercises 3, 5h, Learning outcomes:1,2,3,4,5 6.Examples of technical systems 2, 5h, Learning outcomes:1,2,3,4,5 7.No classes 8.No classes 9.No classes 10.No classes 11.No classes 12.No classes 13.No classes 14.No classes 15.No classes				
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory Whiteboard with markers Overhead projector				
Exam literature	Basic literature: 1.Skripta na bazi predavanja 2.Measurement and Instrumentation Principles, A. Morris Butterworth-Heinemann, 2001 3.Fraden, J., Handbook of Modern Sensors - Physics, Designs, and Applications , AIP Press, NY 1997. Dodatna: 1.William C. Dunn, Fundamentals of Industrial Instrumentation and Proces Control, McGraw-Hill 2.Practical Design Techniques For Sensor Signal Conditioning, Analog Devices				
Students obligations	Attendance continues with the allowed number of absences according to the Rulebook on studying				
Knowledge evaluation during semester	1st colloquium (outcomes 1, 2 and 3), in writing, tasks of objective type, 50 points max, 25 for passing 2nd colloquium (outcomes 4 and 5) ,, written, tasks of objective type, 50 points max, 25 for passing Total max 100 points:				

	50-63 sufficient (2) 64-76 good (3) 77-89 very good (4) 90-100 excellent (5)	
Knowledge evaluation after semester	written exam (outcomes 1, 2, 3, 4 and 5), in writing, tasks of objective type, problem tasks, 100 points max, 50 for passing Total max 100 points: 50-63 sufficient (2) 64-76 good (3) 77-89 very good (4) 90-100 excellent (5)	
Student activities:	Aktivnost (Classes attendance) (Constantly tested knowledge)	ECTS 2 4
Remark	This course can be used for final thesis theme	
Proposal made by	Ivan Lujo, senior lecturer	

Code WEB/ISVU	26535/215762	**ECTS**	6	**Academic year**	2020/2021
Name	Strategic technology entrepreneurship				
Status	3rd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course3rd semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+0+10+0) 120
Teachers	Lectures:1. doc.dr.sc. Dalija Kuvačić profesor visoke škole Auditory exercises:mag.oec Kristina Perec Seminar exercises:mag.oec Kristina Perec				
Course objectives	The aim of the course is to harmonize internal dynamics with external technological influences, creating strategies that will satisfy the newly created processes and functions.				
Learning outcomes:	1.create a business entrepreneurial strategy related to new technologies.. Level:6,7 2.reconsider business opportunities. Level:6,7 3.propose new business models based on new technologies. Level:6,7 4.analyze the market. Level:6 5.organize resources. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Seminar, students presentation and discussion				
Methods of carrying out auditory exercises	Other -				
Methods of carrying out seminars	Group problem solving Data mining and knowledge discovery on the Web Essay writing Workshop				
Course content lectures	1.Competitive strategy and market analysis, 3h, Learning outcomes:5 2.Strategy Innovation and product development, 3h, Learning outcomes:1,2,3 3.Business Story and Plan, 3h, Learning outcomes:1,2,3 4.Creativity and product development, 3h, Learning outcomes:1,2,3 5.Types of Business Ventures, 3h, Learning outcomes:1,2,3 6.Acquisition and Organization of Resources, 3h, Learning outcomes:4 7.Acquisitions and Global Expansion, 3h, Learning outcomes:1,2,3 8.Sources of Capital, 3h, Learning outcomes:1,2,3 9.Presentation of Agreements and Negotiations, 3h, Learning outcomes:1,2,3 10.Leading to success, 3h, Learning outcomes:1,2,3 11.no class 12.no class 13.no class 14.no class 15.no class				
Course content auditory	1.no class 2.no class 3.no class 4.no class 5.no class 6.no class 7.no class 8.no class 9.no class 10.no class 11.no class 12.no class 13.no class 14.no class 15.no class				
Course content seminars	1.creating a business entrepreneurial strategy related to new technologies, 2h, Learning outcomes:1 2.reviewing business opportunities, 2h, Learning outcomes:2 3.proposing new business models based on new technologies, 2h, Learning outcomes:3 4.Market Analysis, 2h, Learning outcomes:4 5.organizing resources, 2h, Learning outcomes:5 6.seminar presentation, 2h, Learning outcomes:1,2,3,4,5 7.seminar presentation, 2h, Learning outcomes:1,2,3,4,5 8.seminar presentation, 2h, Learning outcomes:1,2,3,4,5 9.seminar presentation, 2h, Learning outcomes:1,2,3,4,5 10.seminar presentation, 2h, Learning outcomes:1,2,3,4,5 11.seminar presentation, 2h, Learning outcomes:1,2,3,4,5 12.seminar presentation, 2h, Learning outcomes:1,2,3,4,5 13.seminar presentation, 2h, Learning outcomes:1,2,3,4,5				

	14.seminar presentation, 2h, Learning outcomes:1,2,3,4,5 15.seminar presentation, 2h, Learning outcomes:1,2,3,4,5
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector
Exam literature	Thomas H Bayers, Richard C.Dorf, Andrew J. Nelson: Tehnološko poduzetništvo, Tehničko veleučilište u Zagrebu, 2015 Technology ventures. Dorf, Richard C., and Thomas H. Bayers. McGraw Hill, četvrto izdanje
Students obligations	Regular class attendance with the allowed number of absences according to the Rulebook on studying
Knowledge evaluation during semester	Seminar paper, 66.67%, outcomes 1, 2, 3, 4 and 5 Paper presentation, 33.33%, outcomes 1, 2, 3, 4 and 5 0-89 insufficient 90-105 sufficient 106-120 good 121-135 very good 136-150 excellent
Knowledge evaluation after semester	Seminar paper, 66.67%, outcomes 1, 2, 3, 4 and 5 Paper presentation, 33.33%, outcomes 1, 2, 3, 4 and 5 0-89 insufficient 90-105 sufficient 106-120 good 121-135 very good 136-150 excellent
Student activities:	Aktivnost — ECTS (Activity in class) — 2 (Constantly tested knowledge) — 2 (Seminar Work) — 1 (Research) — 1
Remark	This course can be used for final thesis theme
Proposal made by	Sergej Lugović, 16.7.2020

Code WEB/ISVU	26551/215819	**ECTS**	6	**Academic year**	2020/2021
Name	Sustainable production				
Status	2nd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+0+10+0) 120
Teachers	Lectures:1. Doc.dr.sc. Vlasta Zanki dipl.ing.stroj. Auditory exercises:Doc.dr.sc. Vlasta Zanki dipl.ing.stroj. Seminar exercises:Doc.dr.sc. Vlasta Zanki dipl.ing.stroj.				
Course objectives	understanding and using of basic knowledge about sustainable production in which product development and services takes place using the processes and systems that do not pollute the environment; identify and propose the types versions of sustainable systems that conserve energy and natural resources, provide safety and health for workers and/or products; develop sensibility and responsibility towards workers, society and customers				
Learning outcomes:	1.Assess the product life cycle and production process. Level:6,7 2.establish modern manufacturing technologies. Level:6 3.to devise ways of rational use of energy. Level:6,7 4.choose suitable solutions for sustainable energy production. Level:7 5.Conduct methods and procedures of suitable processing of different materials. Level:7 6.present the principles of sustainable production. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Discussion				
Methods of carrying out auditory exercises	Group problem solving Discussion, brainstorming				
Methods of carrying out seminars	Group problem solving Discussion, brainstorming				
Course content lectures	1.Introduction to sustainable production and historical development of concept, 2h, Learning outcomes:4 2.Principles of sustainable production, 2h, Learning outcomes:4 3.Problems of production sustainability, 2h, Learning outcomes:4 4.Estimate of the product life cycle and production process, 2h, Learning outcomes:1 5.Energy efficiency, 2h, Learning outcomes:3 6.Rational use of energy, 2h, Learning outcomes:3 7.Sustainable energy production, 2h, Learning outcomes:4 8.Energy losses and isolation, 2h, Learning outcomes:3 9.Efficient use of material resources, 2h, Learning outcomes:5 10.Materials in the environment, 2h, Learning outcomes:5 11.Sustainable transport, 2h, Learning outcomes:3 12.Clean production and clean technology, Kyoto and other protocols, 2h, Learning outcomes:2 13.Energy production and energy losses, 2h, Learning outcomes:4 14.Energy efficiency and rational use of energy, 2h, Learning outcomes:3 15.Examples of sustainability from nature - biomimicry, 2h, Learning outcomes:6				
Course content auditory	1.Introduction to sustainable production and historical development of concept, 2h, Learning outcomes:4 2.Principles of sustainable production, 2h, Learning outcomes:4 3.Problems of production sustainability, 2h, Learning outcomes:4 4.Estimate of the product life cycle and production process, 2h, Learning outcomes:1 5.Energy efficiency, 2h, Learning outcomes:3 6.Rational use of energy, 2h, Learning outcomes:3 7.Sustainable energy production, 2h, Learning outcomes:4 8.Energy losses and isolation, 2h, Learning outcomes:3 9.Efficient use of material resources, 2h, Learning outcomes:5 10.Materials in the environment, 2h, Learning outcomes:5 11.Sustainable transport, 2h, Learning outcomes:3 12.Clean production and clean technology, Kyoto and other protocols, 2h, Learning outcomes:2 13.Energy production and energy losses, 2h, Learning outcomes:4 14.Energy efficiency and rational use of energy, 2h, Learning outcomes:3 15.Examples of sustainability from nature - biomimicry, 2h, Learning outcomes:6				
Course content seminars	1.No classes 2.No classes 3.No classes 4.No classes 5.No classes 6.No classes 7.No classes 8.No classes 9.No classes 10.No classes 11.No classes 12.No classes 13.No classes 14.No classes				

	15.No classes
Required materials	Basic: classroom, blackboard, chalk... Whiteboard with markers Overhead projector
Exam literature	Niemann, J.; Tichkiewitch, S.; Westkmper: Design of Sustainable Product Life Cycles, Springer Verlag, 2009. Fiksel, J.: A Guide to Sustainable Product Development: Eco-Efficient Product Development and Sustainable Production, Mc.Graw-Hill, 2009. Youssef, H. A., El-Hofy, H.; Machining Technology: Machine Tools and Operations, CRC Press, Taylor and Francis Group, 2008. Dixit U. S., Sarma, D. K., Paulo Davim J.; Environmentally Friendly Machining, SpringerBriefs in Applied Sciences and Technology, Springer, 2012. Bernard A., Tichkiewitch S.: Design of Sustainable Product Life Cycles, Springer Verlag, 2009 Cheremisinoff, N.: Handbook of Cleaner Production, Elsevier, 2009
Students obligations	Class attendance with the permitted number of absences according to the Rulebook on Studying. Active participation in case studies.
Knowledge evaluation during semester	1st Colloquium (min 50, max 100), written, objective type assignments, 30% outcomes 1, 2, 3 2nd Colloquium (min 50, max 100), written, objective type assignments, 30% outcomes 4, 5, 6 3. case studies - scoring good solutions (min 30, max 50), oral, problem solving tasks, group work, 40% outcomes 2, 3, 4, 5, 6 50-63 pass 64-76 good 77-89 very good 90-100 excellent
Knowledge evaluation after semester	Written exam (min 50, max 100), objective type assignments, problem solving tasks the outcomes of 1, 2, 3, 4, 5, 6 50-63 pass 64-76 good 77-89 very good 90-100 excellent
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Written exam) — 1 (Constantly tested knowledge) — 2 (Activity in class) — 2
Remark	This course can be used for final thesis theme
ISVU equivalents:	192607;
Proposal made by	Vlasta Zanki, PhD

Code WEB/ISVU	26541/215786	**ECTS**	6	**Academic year**	2020/2021
Name	Synthesis of linear control systems				
Status	2nd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+15+15+0) 120
Teachers	Lectures:1. dr. sc. Toni Bjažić prof. v. š. Laboratory exercises:dr. sc. Toni Bjažić prof. v. š. Seminar exercises:dr. sc. Toni Bjažić prof. v. š.				
Course objectives	To enable the student to design linear automatic control systems				
Learning outcomes:	1.design a state-space controller, using the method of pole placement, to achieve the given indicators of response quality, with the help of a suitable software package. Level:6,7 2.design a state observer, using the pole placement method, with the help of a suitable software package. Level:6,7 3.design an augmented state-space controller for the purpose of eliminating the static error. Level:6,7 4.design an optimal LQR controller in state-space, with the help of a suitable software package. Level:6,7 5.analyze the results of system simulation with a state-space controller or a state estimator, with the help of a suitable software package. Level:6 6.design a standard PID controller using technical and/or symmetrical optimum. Level:6,7				
Methods of carrying out lectures	Ex cathedra teaching Simulations Seminar, students presentation and discussion Other online				
Methods of carrying out laboratory exercises	Laboratory exercises, computer simulations Group problem solving Computer simulations Other online				
Methods of carrying out seminars	Laboratory exercises, computer simulations Group problem solving Computer simulations Other online				
Course content lectures	1.Introductory lecture; Input/output system models, 2h, Learning outcomes:5,6 2.Quality indicators in time and frequency domain, 2h, Learning outcomes:1,5,6 3.Controller design in frequency domain, technical and symmetrical optimum (Part 1), 2h, Learning outcomes:5,6 4.Controller design in frequency domain, technical and symmetrical optimum (Part 2), 2h, Learning outcomes:5,6 5.Controller design in frequency domain, technical and symmetrical optimum (Part 3), 2h, Learning outcomes:5,6 6.State-space system models; Stability, controlability and observability, 2h, Learning outcomes:1,2,5 7.Canonical implementations of state-space models, 2h, Learning outcomes:1,2,5 8.State-space controller, 2h, Learning outcomes:1,5 9.Alternative approaches to state-space controller design, 2h, Learning outcomes:1,5 10.State observer, 2h, Learning outcomes:2,5 11.Augmented state-space controller, 2h, Learning outcomes:3,5 12.Optimal (LQR) controller, 2h, Learning outcomes:4,5 13.Presentations of seminar papers and discussion, 2h, Learning outcomes:1,2,3,4,5,6 14.Presentations of seminar papers and discussion, 2h, Learning outcomes:1,2,3,4,5,6 15.Presentations of seminar papers and discussion, 2h, Learning outcomes:1,2,3,4,5,6				
Course content laboratory	1.Mathematical modeling of the crane process with load, 1h, Learning outcomes:5,6 2.Simulation of the crane process with load and analysis of quality indicators, 1h, Learning outcomes:5,6 3.Example of controller synthesis according to technical and symmetric optimum, 1h, Learning outcomes:5,6 4.Synthesis of a cascade load position regulator on a crane (inner loop), 1h, Learning outcomes:5,6 5.Synthesis of a cascade load position regulator on a crane (outer loop), 1h, Learning outcomes:5,6 6.Mathematical modeling of the crane process with load in the state space, 1h, Learning outcomes:1,2,5 7.Analysis of stability, controllability and observability and conversion of models into canonical forms, 1h, Learning outcomes:1,2,5 8.An example of the controller synthesis in state space for a system described in a controllable canonical form, 1h, Learning outcomes:1,5 9.Synthesis of state space controlelr for a crane process with load, 1h, Learning outcomes:1,5 10.An example of a state oserver synthesis for a system described in observable canonical form, 1h, Learning outcomes:2,5 11.Example of designing an augmented controller in a state space, 1h, Learning outcomes:3,5 12.Example of designing and optimal LQR controller, 1h, Learning outcomes:4,5 13.Presentations of seminar papers and discussion, 1h, Learning outcomes:1,2,3,4,5,6 14.Presentations of seminar papers and discussion, 1h, Learning outcomes:1,2,3,4,5,6 15.Presentations of seminar papers and discussion, 1h, Learning outcomes:1,2,3,4,5,6				
Course content seminars	1.Mathematical modeling of the crane process with load, 1h, Learning outcomes:5,6 2.Simulation of the crane process with load and analysis of quality indicators, 1h, Learning outcomes:5,6 3.Example of controller synthesis according to technical and symmetric optimum, 1h, Learning outcomes:5,6 4.Synthesis of a cascade load position regulator on a crane (inner loop), 1h, Learning outcomes:5,6 5.Synthesis of a cascade load position regulator on a crane (outer loop), 1h, Learning outcomes:5,6 6.Mathematical modeling of the crane process with load in the state space, 1h, Learning outcomes:1,2,5				

	7.Analysis of stability, controllability and observability and conversion of models into canonical forms, 1h, Learning outcomes:1,2,5 8.An example of the controller synthesis in state space for a system described in a controllable canonical form, 1h, Learning outcomes:1,5 9.Synthesis of state space controller for a crane process with load, 1h, Learning outcomes:1,5 10.An example of a state oserver synthesis for a system described in observable canonical form, 1h, Learning outcomes:2,5 11.Example of designing an augmented controller in a state space, 1h, Learning outcomes:3,5 12.Example of designing and optimal LQR controller, 1h, Learning outcomes:4,5 13.Presentations of seminar papers and discussion, 1h, Learning outcomes:1,2,3,4,5,6 14.Presentations of seminar papers and discussion, 1h, Learning outcomes:1,2,3,4,5,6 15.Presentations of seminar papers and discussion, 1h, Learning outcomes:1,2,3,4,5,6
Required materials	Basic: classroom, blackboard, chalk... General purpose computer laboratory Whiteboard with markers Overhead projector
Exam literature	Osnovna: 1. Norman S. Nise: Control Systems Engineering, 7th Edition, ISBN: 978-1-118-17051-9, John Wiley Sons, Inc., 2015. 2. T. Bjažić: Sinteza linearnih sustava upravljanja - radna skripta, TVZ, 2020. Dodatna: 1. Katsuhiko Ogata: Modern Control Engineering, Pearson, 978-0136156734, 2009. 2. Gene F. Franklin - J. Da Powell - Abbas Emami-Naeini: Feedback Control of Dynamic Systems, Pearson, 978-0133496598, 2014.
Students obligations	all laboratory exercises completed
Knowledge evaluation during semester	Through the written part of the seminar paper it is necessary to demonstrate the mastery of all learning outcomes on the example of the selected technical process. Accepted seminar paper is graded from sufficient (2) to excellent (5) and then the paper is defended (oral exam). The outcome of the paper defense is a confirmed grade of the written part of the seminar paper or the student receives a grade of insufficient (1) and is referred to the completion of the seminar or receives a new seminar paper for the next exam period.
Knowledge evaluation after semester	Through the written part of the seminar paper it is necessary to demonstrate the mastery of all learning outcomes on the example of the selected technical process. Accepted seminar paper is graded from sufficient (2) to excellent (5) and then the paper is defended (oral exam). The outcome of the paper defense is a confirmed grade of the written part of the seminar paper or the student receives a grade of insufficient (1) and is referred to the completion of the seminar or receives a new seminar paper for the next exam period.
Student activities:	Aktivnost — ECTS (Classes attendance) — 2 (Constantly tested knowledge) — 4
Remark	This course can be used for final thesis theme
ISVU equivalents:	205445;
Proposal made by	prof. Toni Bjažić, Ph.D., 2020-07-15

Code WEB/ISVU	26522/215746	**ECTS**	18	**Academic year**	2020/2021
Name	Thesis				
Status	4th semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course4th semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				0+120 (0+0+120+0) 420
Teachers	Seminar exercises:1. Vesna Alić-Kostešić dipl.ing.stroj.				
Course objectives	Connecting the acquired knowledge in independent solving of an engineering task				
Learning outcomes:	1.2. distribute the problem situation into its component parts. Level:6,7 2.1. identify the problem. Level:7 3.3. distribute the problem situation into its component parts. Level:6,7 4.4 integrate existing scientific knowledge into the solution of the identified problem. Level:6,7 5.5. Build a practical solution to the problem. Level:6,7 6.6. conclude the scope and possibility of generalization for your work. Level:6,7 7.7.. present the results of your work. Level:6				
Methods of carrying out seminars	Traditional literature analysis Data mining and knowledge discovery on the Web Mind mapping				
Course content seminars	1.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:1 2.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:2,3 3.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:3 4.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:4 5.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:5 6.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:6 7.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:7 8.consultations with a mentor, preparation of a diploma thesis, 2h 9. 10. , 2h 11. 12. 13. 14. 15.				
Required materials	Operating supplies depending on the type of work, literature				
Exam literature	po izboru				
Students obligations	consultations with a mentor, independent work				
Knowledge evaluation during semester	consultations				
Knowledge evaluation after semester	defense before the graduate thesis committee				
Student activities:	Aktivnost (Experimental work) (Practical work) (Research)			ECTS 5 5 8	
Remark	This course can be used for final thesis theme				

Code WEB/ISVU	26530/215757	**ECTS**	18	**Academic year**	2020/2021
Name	Thesis				
Status	4th semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course4th semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				0+120 (0+0+120+0) 420
Teachers	Seminar exercises:1. Vesna Alić-Kostešić dipl.ing.stroj.				
Course objectives	Connecting the acquired knowledge in independent solving of an engineering task				
Learning outcomes:	1.2. distribute the problem situation into its component parts. Level:6,7 2.1. identify the problem. Level:7 3.3. distribute the problem situation into its component parts. Level:6,7 4.4 integrate existing scientific knowledge into the solution of the identified problem. Level:6,7 5.5. Build a practical solution to the problem. Level:6,7 6.6. conclude the scope and possibility of generalization for your work. Level:6,7 7.7.. present the results of your work. Level:6				
Methods of carrying out seminars	Traditional literature analysis Data mining and knowledge discovery on the Web Mind mapping				
Course content seminars	1.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:1 2.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:2,3 3.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:3 4.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:4 5.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:5 6.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:6 7.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:7 8.consultations with a mentor, preparation of a diploma thesis, 2h 9. 10. , 2h 11. 12. 13. 14. 15.				
Required materials	Operating supplies depending on the type of work, literature				
Exam literature	po izboru				
Students obligations	consultations with a mentor, independent work				
Knowledge evaluation during semester	consultations				
Knowledge evaluation after semester	defense before the graduate thesis committee				
Student activities:	Aktivnost (Experimental work) (Practical work) (Research)			ECTS 5 5 8	
Remark	This course can be used for final thesis theme				

Code WEB/ISVU	26538/215765	**ECTS**	18	**Academic year**	2020/2021
Name	Thesis				
Status	4th semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course4th semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				0+120 (0+0+120+0) 420
Teachers					
Course objectives	Connecting the acquired knowledge in independent solving of an engineering task				
Learning outcomes:	1.2. distribute the problem situation into its component parts. Level:6,7 2.1. identify the problem. Level:7 3.3. distribute the problem situation into its component parts. Level:6,7 4.4 integrate existing scientific knowledge into the solution of the identified problem. Level:6,7 5.5. Build a practical solution to the problem. Level:6,7 6.6. conclude the scope and possibility of generalization for your work. Level:6,7 7.7.. present the results of your work. Level:6				
Methods of carrying out seminars	Traditional literature analysis Data mining and knowledge discovery on the Web Mind mapping				
Course content seminars	1.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:1 2.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:2,3 3.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:3 4.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:4 5.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:5 6.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:6 7.consultations with a mentor, preparation of a diploma thesis, 2h, Learning outcomes:7 8.consultations with a mentor, preparation of a diploma thesis, 2h 9. 10. , 2h 11. 12. 13. 14. 15.				
Required materials	Operating supplies depending on the type of work, literature				
Exam literature	po izboru				
Students obligations	consultations with a mentor, independent work				
Knowledge evaluation during semester	consultations				
Knowledge evaluation after semester	defense before the graduate thesis committee				
Student activities:	Aktivnost (Experimental work) (Practical work) (Research)			ECTS 5 5 8	
Remark	This course can be used for final thesis theme				

Code WEB/ISVU	26527/215754	**ECTS**	6	**Academic year**	2020/2021
Name	Waste gas treatment and air protection				
Status	3rd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course3rd semester - Undergraduate professional study in mechanical engineering (NOVI Redovni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (20+0+10+0) 120
Teachers	Lectures:1. Mario Panjičko Lectures: Vesna Alić-Kostešić dipl.ing.stroj. Lectures: Goran Lukić Auditory exercises: Goran Lukić Auditory exercises: Mario Panjičko Seminar exercises: Goran Lukić Seminar exercises: Mario Panjičko				
Course objectives	aim to acquaint students with the most important sources of air pollution, legislation and methods of air pollution control in the case of stationary and other sources of emissions				
Learning outcomes:	1.To determine the basic concepts and characteristics of air pollutants,. Level:6 2.3. assess the effects of various air pollutants,. Level:6,7 3.2. classify sources of air pollution. Level:6,7 4.4. envisage the production of gaseous emissions, reduction of greenhouse gas emissions and access to industrial ecology, legislation in the field of environmental protection and air protection.. Level:6,7 5.5. Determine the mode of diffusion and dilution of emissions in the atmosphere. Level:7 6.6. Choose methods to control air pollution emissions.. Level:7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Simulations				
Methods of carrying out auditory exercises	Laboratory exercises on laboratory equipment Data mining and knowledge discovery on the Web Discussion, brainstorming				
Methods of carrying out seminars	Traditional literature analysis Data mining and knowledge discovery on the Web Essay writing				
Course content lectures	1.Introduction to waste gas treatment and air protection (review, sources and effects, emission standards, unit conversion, Air Quality Index, etc.),, 2h, Learning outcomes:1 2.Introduction to waste gas treatment and air protection (review, sources and effects, emission standards, unit conversion, Air Quality Index, etc.),, 2h, Learning outcomes:1 3.Heat treatment and incineration technologies, 2h, Learning outcomes:1 4.Heat treatment and incineration technologies, 2h, Learning outcomes:1 5.Combustion emissions, 2h, Learning outcomes:2 6.3. Major pollutants during the incineration process,, 2h, Learning outcomes:2 7.3. Major pollutants during the incineration process,, 2h, Learning outcomes:2 8.4. Engineering approach to air quality control,, 2h, Learning outcomes:4 9.4. Engineering approach to air quality control,, 2h, Learning outcomes:4 10.5. Waste gas treatment technologies (control and treatment of solid particles, characteristics and control of volatile organic compounds and hydrocarbons, characteristics and control of sulfur and nitrogen oxides) - starting points for design,, 2h, Learning outcomes:4 11.5. Waste gas treatment technologies (control and treatment of solid particles, characteristics and control of volatile organic compounds and hydrocarbons, characteristics and control of sulfur and nitrogen oxides) - starting points for design,, 2h, Learning outcomes:4,5 12.6. Meteorology of air pollution and control of air pollution,, 2h, Learning outcomes:5,6 13.6. Meteorology of air pollution and control of air pollution,, 2h, Learning outcomes:5,6 14.7. Legislation related to air protection in the Republic of Croatia and the EU., 2h, Learning outcomes:6 15.7. Legislation related to air protection in the Republic of Croatia and the EU., 2h, Learning outcomes:6				
Course content auditory	1.steuvid u suvremene tehnologije obrade otpadnih plinova, 5h, Learning outcomes:1,2,3,4,5,6 2.insight into modern waste gas treatment technologies, 5h, Learning outcomes:1,2,3,4,5,6 3.insight into modern waste gas treatment technologies, 5h, Learning outcomes:1,2,3,4,5,6 4.insight into modern waste gas treatment technologies, 5h, Learning outcomes:1,2,3,4,5,6 5. , Learning outcomes:6 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.				
Course content	1.				

seminars	2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.guidelines for seminar work, 5h, Learning outcomes:1,2,3,4,5,6 15.guidelines for seminar work, 5h, Learning outcomes:1,2,3,4,5,6
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory
Exam literature	M. Kaštelan Macan, M. Petrović, Analitika okoliša, HINUS Fakultet kemijskog inženjerstva i tehnologije, Zagreb (2013)
Students obligations	regular class attendance
Knowledge evaluation during semester	colloqium
Knowledge evaluation after semester	exam and / or seminar paper
Student activities:	Aktivnost — ECTS (Classes attendance) — 1 (Activity in class) — 2 (Seminar Work) — 3
Remark	This course can be used for final thesis theme

Code WEB/ISVU	26547/215806	**ECTS**	6	**Academic year**	2020/2021
Name	Waste treatment and recycling technologies and plants				
Status	2nd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+20+10+0) 120
Teachers	Lectures:1. Mario Panjičko Laboratory exercises: Mario Panjičko Seminar exercises: Mario Panjičko				
Course objectives	Adopt specific knowledge of waste management, understanding of waste generation and their flows, legal requirements and restrictions on waste management, identification of key parameters for designing waste treatment facilities				
Learning outcomes:	1.Identify key sources, generated quantities, composition and properties of mixed communal and hazardous waste. Level:6 2.Identify important concepts in waste management, such as waste hierarchy, waste prevention, recycling and recovery, mixed communal waste, hazardous waste, etc.. Level:6 3.formulate the processes to the extent necessary for dimensioning processing plants and associated facilities. Level:6,7 4.Suggest appropriate technical solutions for biological and thermal waste treatment. The student should also be able to present the shortcomings and preconditions for the chosen technical solution. Level:6,7 5.calculate key process parameters for sizing the waste treatment plant. Level:6 6.Recommend key waste management legislation in the Croatia and the EU. Level:7 7.Calculate different waste treatment processes, create mass and energy balances, valorize waste management economics. Level:6				
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion				
Methods of carrying out laboratory exercises	Group problem solving Discussion, brainstorming Computer simulations				
Methods of carrying out seminars	Group problem solving Data mining and knowledge discovery on the Web Essay writing Discussion, brainstorming Workshop				
Course content lectures	1.Introduction and acquaintance with subject content, students' obligations, 2h 2.Sources, flows, quantities produced and physico-chemical properties of mixed communal and hazardous waste, 2h, Learning outcomes:1 3.Types of waste and waste classification, 2h, Learning outcomes:1 4.Waste management system hierarchy, 2h, Learning outcomes:2 5.Waste treatment and handling, biological and thermal processing methods, waste disposal, 2h, Learning outcomes:2 6.disposal of hazardous waste, 2h, Learning outcomes:2 7.Waste Disposal, Types of Landfill, 2h, Learning outcomes:2 8.Hazardous waste, 2h, Learning outcomes:2 9.Knowledge test, 2h, Learning outcomes:1,2 10.Initial basis for the technological dimensioning of waste processing facilities (loading stations, sorting plants, recycling facilities, mechanical-biological processing plants, waste disposal sites,, 2h, Learning outcomes:3,4,5 11.Starting Basics for Construction Design and Dimensioning of Waste Processing Facilities (Transfer Stations, Distillery, Recycling Facilities, Mechanical-Biological Processing Facilities, Waste Landfills, 2h, Learning outcomes:3,4,5 12.Starting Basics for Mechanical Design and Dimensioning of Waste Processing Facilities (Transfer Stations, Distilleries, Recycling Facilities, Mechanical-Biological Processing Facilities, Waste Disposal Facilities, 2h, Learning outcomes:3,4,5 13.Relevant Environmental and Waste Management Regulations in the Republic of Croatia and the EU, Legal and Economic Control of Waste Management, 2h, Learning outcomes:6 14.Economics of Waste Management, 2h, Learning outcomes:7 15.Knowledge test, 1h, Learning outcomes:3,4,5,6,7 Professional visit to the waste treatment plant, 1h, Learning outcomes:1,2,4				
Course content laboratory	1.Solving tasks related to the sizing of waste treatment facilities: Waste streams, 2h, Learning outcomes:3,5,7 2.Solving tasks related to the sizing of waste processing facilities: collection, 2h, Learning outcomes:3,5,7 3.Resolving tasks related to the sizing of waste processing facilities: transport, 2h, Learning outcomes:3,5,7 4.Resolving tasks related to the sizing of waste processing facilities: recycling, 2h, Learning outcomes:3,5,7 5.Resolving tasks related to the sizing of waste processing facilities: processing, 2h, Learning outcomes:3,5,7 6.Resolving tasks related to the sizing of waste processing facilities: recovery, 2h, Learning outcomes:3,5,7 7.Resolving tasks related to the sizing of waste processing facilities: disposal, 2h, Learning outcomes:3,5,7 8.Professional visit to the waste treatment plant, 2h, Learning outcomes:2,4 9.Professional visit to the waste treatment plant, 2h, Learning outcomes:2,4 10.Professional visit to the waste treatment plant, 2h, Learning outcomes:2,4 11.No classes 12.No classes 13.No classes 14.No classes 15.No classes				

Course content seminars	1.no classes 2.no classes 3.no classes 4.no classes 5.no classes 6.no classes 7.no classes 8.Create a budget for various waste treatment processes, make mass and energy balances, valorize the values of economic management of waste., 2h, Learning outcomes:7 9.work on seminar, 1h, Learning outcomes:6,7 10.work on seminar, 1h, Learning outcomes:6,7 11.work on seminar, 1h, Learning outcomes:6,7 12.work on seminar, 1h, Learning outcomes:6,7 13.work on seminar, 1h, Learning outcomes:6,7 14.work on seminar, 1h, Learning outcomes:6,7 15.turning in seminar papers, 2h, Learning outcomes:6,7
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory Whiteboard with markers Overhead projector
Exam literature	Sofilić, T., Brnardić, I.: Gospodarenje otpadom, Sveučilište u Zagrebu, Metalurški fakultet, Sisak, 2013. Regionalni centar zaštite okoliša: EU i zaštita okoliša gospodarenje otpadom na lokalnoj razini, Znanje d.d., Zagreb, 2009. Ivković, E.: Zbrinjavanje otpada, 2012.
Students obligations	Attendance with the permitted number of absences according to the Studying Rulebook
Knowledge evaluation during semester	colloquium - numerical tasks, colloquia - theoretical questions, seminar paper 1st class - tasks of numeric type max 50 points - min 30 2nd class - objective type tasks max 50 points - min 30 3. Seminar work max 50 points - min 30 total max 150 points - min 90 points and ratings: 0-89 inadequate 90-105 sufficient 106-120 good 121-135 very good 136-150 excellent
Knowledge evaluation after semester	Written exam, Seminar paper score and grade: 0-89 inadequate 90-105 sufficient 106-120 good 121-135 very good 136-150 excellent
Student activities:	Aktivnost — ECTS (Practical work) — 1 (Constantly tested knowledge) — 1 (Seminar Work) — 1 (Written exam) — 1 (Activity in class) — 1 (Classes attendance) — 1
Remark	This course can be used for final thesis theme
ISVU equivalents:	200527;
Proposal made by	Mario Panjičko , 11.6.2019

Code WEB/ISVU	26549/215809	**ECTS**	6	**Academic year**	2020/2021
Name	Wastewater treatment technologies and plants				
Status	2nd semester - Undergraduate professional study in mechanical engineering (NOVI Izvanredni specijalisti strojarstva) - elective course				
Department					
Teaching mode	Lectures + exercises (auditory + laboratory + seminar + metodology + construction) work at home				30+30 (0+20+10+0) 120
Teachers	Lectures:1. Mario Panjičko Laboratory exercises: Mario Panjičko Seminar exercises: Mario Panjičko				
Course objectives	Understand methods and procedures in wastewater treatment, understanding technological parameters, knowing key process parameters, and accounting procedures for sizing wastewater treatment plants and sludge treatment.				
Learning outcomes:	1.Choose key technological waste water parameters. Level:7 2.Identify the basics of biological, chemical and physical wastewater treatment processes. Level:7 3.Select engineering approaches used in technological, construction and mechanical design of biological, chemical and physical waste water treatment processes. Level:7 4.Identify microbiological processes in the process of active sludge. Level:7 5.Select the calculations of various wastewater treatment processes and make mass and energy balance of processes. Level:7 6.Calculate the process parameters and dimension the wastewater treatment plants. Level:6 7.Self-assess the procedure within the legislative framework for the protection of wastewater treatment in Croatia and the EU. Level:7				
Methods of carrying out lectures	Ex cathedra teaching Case studies Discussion				
Methods of carrying out laboratory exercises	Laboratory exercises on laboratory equipment Group problem solving Workshop				
Methods of carrying out seminars	Group problem solving Data mining and knowledge discovery on the Web Essay writing Workshop				
Course content lectures	1.Definition of technological water quality parameters, 2h, Learning outcomes:1 2.Production of wastewater (communal and industrial waste water), 2h, Learning outcomes:1 3.Treatment of municipal waste water: mechanical treatment of waste water, 2h, Learning outcomes:2,3,4 4.Treatment of municipal waste water: chemical treatment of wastewater treatment, 2h, Learning outcomes:2,3,4 5.Treatment of municipal waste water: modern and combined wastewater treatment processes, 2h, Learning outcomes:2,3,4 6.Treatment of municipal wastewater: anaerobic and aerobic biological wastewater treatment (degradation kinetics, aeration requirements, biogas production, microbial biomass growth), 2h, Learning outcomes:2,3,4 7.Treatment of industrial waste water, 2h, Learning outcomes:2,3,4 8.Sewage treatment plants sewage management, 2h, Learning outcomes:4 9.Calculation of technological parameters of wastewater treatment, 2h, Learning outcomes:5 10.Dimensioning of sewage treatment plants, 2h, Learning outcomes:5,6 11.An overview of modern wastewater treatment processes: algae technology, 2h, Learning outcomes:2,3 12.An overview of modern wastewater treatment processes: microbiological fuel cells, 2h, Learning outcomes:2,3 13.An overview of modern waste water treatment processes: electrochemical procedures, 2h, Learning outcomes:2,3 14.An overview of modern waste water treatment processes: Advanced Oxidation Procedures, 2h, Learning outcomes:2,3 15.Review of the legal framework for water and wastewater treatment in the Croatia and the EU, 2h, Learning outcomes:7				
Course content laboratory	1.Solving practical problems with active participation of students and independent work, 2h, Learning outcomes:1,3,5,6 2.Solving practical problems with active participation of students and independent work, 2h, Learning outcomes:1,3,5,6 3.Solving practical problems with active participation of students and independent work, 2h, Learning outcomes:1,3,5,6 4.Solving practical problems with active participation of students and independent work, 2h, Learning outcomes:1,3,5,6 5.Solving practical problems with active participation of students and independent work, 2h, Learning outcomes:1,3,5,6 6.Solving practical problems with active participation of students and independent work, 2h, Learning outcomes:1,3,5,6 7.Solving practical problems with active participation of students and independent work, 2h, Learning outcomes:1,3,5,6 8.sampling and analysis of waste water parameters, 2h, Learning outcomes:1,2,4,5,6 9.sampling and analysis of waste water parameters, 2h, Learning outcomes:1,2,4,5,6 10.sampling and analysis of waste water parameters, 2h, Learning outcomes:1,2,4,5,6 11.No classes 12.No classes 13.No classes 14.No classes 15.No classes				
Course content seminars	1.no classes 2.no classes 3.no classes 4.no classes				

	5.no classes 6.no classes 7.no classes 8.Calculation of model wastewater treatment plant, 2h, Learning outcomes:3,5,6,7 9.work on seminar, 1h, Learning outcomes:3,5,6,7 10.work on seminar, 1h, Learning outcomes:3,5,6,7 11.work on seminar, 1h, Learning outcomes:3,5,6,7 12.work on seminar, 1h, Learning outcomes:3,5,6,7 13.work on seminar, 1h, Learning outcomes:3,5,6,7 14.work on seminar, 1h, Learning outcomes:3,5,6,7 15.turning in seminar papers, 2h, Learning outcomes:3,5,6,7
Required materials	Basic: classroom, blackboard, chalk... Special purpose laboratory Whiteboard with markers Overhead projector
Exam literature	TCHOBANOGLOUS, G., BURTON, F., L., 2004. Wastewater Engineering Treatment, Disposal, and Reuse. Third Edition. Metcalf Eddy, Inc. McGraw Hill Series in Water Resources and Water Engineering
Students obligations	Attendance with the permitted number of absences according to the Studying Rulebook
Knowledge evaluation during semester	colloquium - numerical tasks, colloquia - theoretical questions, seminar paper 1st class - tasks of numeric type max 50 points - min 30 2nd class - objective type tasks max 50 points - min 30 3. Seminar work max 50 points - min 30 total max 150 points - min 90 points and ratings: 0-89 inadequate 90-105 sufficient 106-120 good 121-135 very good 136-150 excellent
Knowledge evaluation after semester	Written exam, Seminar paper score and grade: 0-89 inadequate 90-105 sufficient 106-120 good 121-135 very good 136-150 excellent
Student activities:	Aktivnost — ECTS (Classes attendance) — 2 (Written exam) — 1 (Seminar Work) — 1 (Experimental work) — 1 (Constantly tested knowledge) — 1
Remark	This course can not be used for final thesis theme
ISVU equivalents:	200528;
Proposal made by	Hrvoje Rakić, lecturer, 15.6.2019