Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Application and Control of Electrical Drives**	
Course status	Mandatory	
Year	1.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+30+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

Acquiring knowledge about the operation of electrical drives of different designs, optimizing the drive with transients and external errors. Parameterization of the system for adjusting the power supply and use for electrical motors.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Classify the essential characteristics of electric motors,
2. Determine suitable power supplies for electrical drives,
3. Select the parameters of the frequency converter,
4. Connect the motor, converter and sensors as an electric drive,
5. Create a model of the electric motor drive in the Matlab Simulink software,
6. Determine the modulation parameters of electric motor control,
7. Selection of appropriate transients for the drive at different loads,
8. Determine the appropriate characteristics of the drive for transportation systems,
9. Determine the appropriate characteristics of the drive for the manufacturing industry

1.4. Course content

1. Introduction to control of electrical drives,
2. Nominal values and directions of physical quantities in electrical drives,
3. Control of electrical drives,
4. Working principles and development of electric drives,
5. Control model of electrical drive in Simulink,
6. Current control of the electrical drive,
7. Battery and electrical energy converters,
8. Spatial vector modulation method,
9. Control of the brushless motor drive,
10. Starting the brushless motor and changing the modulation parameters,
11. Start-up of the asynchronous motor and the use of the "Soft starter" for the electrical drive,
12. Transient characteristic of a motor powered by a frequency converter,
13. Application of electric drives for transport systems,

14. Application of electric drives in the manufacturing industry

14.1. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ distance learning	☐ individual exercises ☐ multimedia and network ☒ laboratory ☐ mentoring work ☐ other _____

14.2. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

14.3. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Written verification 1	Written verification 2	Laboratory exercises	Oral exam	Min	Max
LO1	1%	5%	-	-	5%	5.5%	11%
LO2	1%	5%	-	-	5%	5.5%	11%
LO3	1%	5%	-	5%	-	5.5%	11%
LO4	2%	5%	-	5%	-	6%	12%
LO5	1%	-	5%	-	-	3%	6%
LO6	1%	-	5%	5%	5%	8%	16%
LO7	1%	-	-	5%	5%	5.5%	11%
LO8	1%	-	5%	-	5%	5.5%	11%
LO9	1%	-	5%	-	5%	5.5%	11%
Share in ECTS	0.5	1	1	1	1.5	-	5
Total	10%	20%	20%	20%	30%	50%	100%

Final Exam:

Learning outcome	Written Exam	Oral Exam	Min	Max
LO1	6%	5%	5.5%	11%
LO2	7%	4%	5.5%	11%
LO3	11%	-	5.5%	11%
LO4	12%	-	6%	12%
LO5	6%	-	3%	6%
LO6	6%	10%	8%	16%
LO7	-	11%	5.5%	11%
LO8	6%	5%	5.5%	11%
LO9	6%	5%	5.5%	11%
Share in ECTS	3	2	-	5
Total	60%	40%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

14.4. Obligatory literature

1. D. W.J. Pulle, P. Darnell, A. Veltman, Applied Control of Electrical Drives, 2015.
2. W. Leonhard, Control of Electrical Drives 3rd Edition, 2001.
3. T. J. Eastham Miller, Brushless permanent-magnet and reluctance motor drives, 1989.

14.5. Additional literature

1. D. O. Neacsu, Automotive Power Systems, 2021.
2. C. Kong Tse, Complex Behavior of Switching Power Converters, 2004.

14.6. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
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di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Materials Engineering**	
Course status	Mandatory	
Year	1.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+30+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

The aim of the course is to acquaint students with various groups of materials (structural and tool steels, cast irons, light and non-ferrous metals, ceramics, polymers, composites, and other technical materials) in order for them to gain knowledge about the types, properties, and applications of different materials in engineering. It is essential to develop an understanding of the relationship between the microstructure of different materials and their properties in application. The goal of the course is to familiarize students with material testing procedures and methods for modifying the microstructure of materials and influencing their application properties. Students will learn about the relationship between the structure and properties of materials as an important prerequisite for understanding material behaviour in selection, application, and development of materials with targeted properties. They will know how to conduct material testing in the laboratory, as well as the process of preparing material reports and material selection procedures. They will gain knowledge about the structure, mechanical, and tribological properties of materials, as well as iron-carbon phase diagrams, and become acquainted with basic methods of heat treatment and surface treatment.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. To be able to compare the structure of different types of materials and manufacturing processes suitable for each material, as well as material properties important for machine elements and construction.
2. To be able to develop basic procedures for testing the chemical, mechanical, and microstructural properties of materials with applied tasks and report preparation, aiming for a more accurate description of the structure and properties of materials.
3. To be able to propose the type of material for different applications.
4. To be able to determine the causes of deformations in materials and how to prevent them.
5. To be able to connect the type and cause of material corrosion and, accordingly, predict the method of surface protection.
6. To be able to develop communication skills in the field of the profession and teamwork.

1.4. Course content

1. Introduction to materials and material structure.
2. Testing of chemical properties of materials.

3. Testing of mechanical properties of materials.
4. Microstructural characteristics of materials.
5. Processes of obtaining and manufacturing materials.
6. Material processing procedures.
7. Surface modification procedures.
8. Material corrosion. Basic principles of corrosion protection.
9. Nanomaterials and nanotechnologies.
10. Metallic materials – types, properties, applications.
11. Polymeric materials – types, properties, applications.
12. Ceramics and technical ceramics – types, properties, applications.
13. Composite materials – types, properties, applications.
14. Advanced materials – types, properties, applications. Materials of the future.
15. Materials as waste.

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☒ distance learning	☒ individual exercises ☐ multimedia and network ☒ laboratory ☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Project assignment	Laboratory exercises	Written test	Min	Max
LO1	2%	-	-	10%	6%	12%
LO2	2%	-	30%	-	16%	32%
LO3	-	20%	-	-	10%	20%
LO4	2%	-	-	10%	6%	12%
LO5	4%	-	-	10%	7%	14%
LO6	-	10%	-	-	5%	10%
Share in ECTS	0.5	1.5	1.5	1.5	-	5
Total	10%	30%	30%	30%	50%	100%

Final Exam:

Learning outcome	Written Exam	Oral Exam	Min	Max
LO1	10%	2%	6%	12%
LO2	20%	12%	16%	32%
LO3	20%	5%	12,5%	25%
LO4	10%	2%	6%	12%
LO5	10%	4%	7%	14%

LO6	-	5%	2.5%	5%
Share in ECTS	3.5	1.5	-	5
Total	70%	30%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. E-learning materials (lectures and exercises)
2. Dowling, N.E., Mechanical Behavior of Materials (1993)
3. Cukor, G., Manufacturing Technologies, University of Rijeka, Faculty of Engineering (2008)

1.9. Additional literature

1. Gabrić, I., Šitić, S., Materials I, University of Split (2012)
2. Katavić, I., Introduction to Materials, Faculty of Engineering, University of Rijeka (2008)
3. Kraut, B., Mechanical Engineering Handbook, Technical Book Zagreb, 9th edition (1988)
4. Callister, W.D., Rethwisch, D.G., Materials Science and Engineering An Introduction, 8th edition (2011)
5. Franz, M., Mechanical Properties of Materials, Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb (1988)
6. Smoljan, B., Heat Treatment of Steel, Gray and Nodular Cast Iron, University of Rijeka, Faculty of Engineering (1999)
7. Povrzanović, A., Metal Forming Processing, University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture (1996)
8. Bauer, B., Mihalić, I., Basics of Casting Technology, University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture (2012)
9. Math, M., Introduction to Forming Technology, University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture (1999)
10. Cebalo, R., Machine Tools – Selected Chapters, University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture (2000)
11. Šuvar, Š., Particle Separation Processing, Školska knjiga, Zagreb (1991)
12. Bošnjakovič, M., Numerically Controlled Machine Tools, Školska knjiga, Zagreb
13. Raos, P., Šercer, M., Production and Application of Polymer Products, University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture

1.10. Quality monitoring method

Teaching evaluations; student survey.

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Mathematics in Engineering**	
Course status	Mandatory	
Year	1.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	45+30+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

The student should acquire basic mathematical knowledge, skills and processes and be trained to solve mathematical problems and apply mathematics in different contexts

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Apply the derivative to functions of two variables
2. Determine the extreme values of the two variables
3. Apply double integrals
4. Valorise the area of the shapes, the body volumes
5. Evaluate line integrals
6. Determine Taylor's and Fourier's series

1.4. Course content

1. Basic concepts of function of several variables
2. Continuous function
3. Partial derivatives, total differential of function
4. Derivative of composite functions
5. Derivative and differentials of higher orders. Derivative of an implicit function
6. Tangential plane and normal to the surface
7. Taylor's formula for functions of several variables
8. Extremes of functions of several variables
9. Arc length of space curve
10. Double integrals in rectangular coordinates
11. Changing of variables in double integrals
12. Calculating the area of shapes
13. Calculation of body volume
14. Calculation of area of the surface
15. Application of the double integral in mechanics

16. Improper integrals. Improper multiple integrals
17. Line integrals
18. Numerical series
19. Function series
20. Taylor series
21. Fourier series

1.5. Teaching methods	☒ lectures ☒ seminars and workshops ☒ exercises ☐ distance learning	☒ individual exercises ☐ multimedia and network ☐ laboratory ☐ mentoring work ☐ other _____

1.6. Students' obligations

During the semester, students are required to fulfil the following obligations in order to be entitled to take the final exam:

Submit homework on time.

Submit the seminar paper until due date (by January 15) and present it to other students in the 15th week.

After participating in the classes, take in preliminary exam.

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity and homework	Written verification 1	Written verification 2	Seminar paper	Min	Max
LO1	1%	10%	-		5.5%	11%
LO2	2%	10%	-	5%	8.5%	17%
LO3	2%	10%	-	10%	11%	22%
LO4	2%	-	10%	5%	8.5%	17%
LO5	2%	-	10%	5%	8.5%	17%
LO6	1%	-	10%	5%	8%	16%
Share in ECTS	0.5	1.5	1.5	1.5	-	5
Total	10%	30%	30%	30%	50%	100%

Final Exam:

Learning outcome	Written Exam	Oral Exam	Min	Max
LO1	10%	5%	7.5%	15%
LO2	10%	5%	7.5%	15%
LO3	15%	5%	10%	20%
LO4	15%	5%	10%	20%
LO5	-	15%	7.5%	15%

LO6	-	15%	7.5%	15%
Share in ECTS	2.5	2.5	-	5
Total	50%	50%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. B. P. Demidovič. Zadaci i rješeni primjeri iz više matematike, Danjar, Zagreb, 1995.

1.9. Additional literature

1. Raymond A. Barnett, Michael R. Ziegel, Karl E. Byleen : Primijenjena matematika
2. L. Krnić, Z. Šikić. Račun diferencijalni i integralni, I dio, Školska knjiga, Zagreb, 1992.
3. V. Devide. Riješeni zadaci iz više matematike, svezak i i II, Školska knjiga, Zagreb, 1985.
4. T. Bradić, R. Roki, J. Pečarić, M. Strunje. Matematika za tehničke fakultete, Multigraf, Zagreb, 1994.

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
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Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Strength of Materials**	
Course status	Mandatory	
Year	1.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+45+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

Developing knowledge and skills for autonomous stress/strain analyses and determining dimensions and materials of load-carrying structures and their components.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Evaluate Cauchy's and Navier's equilibrium equations, the gradient of the displacement vector and the small strain tensor, as well as the constitutive equations.
2. Estimate the strain potential energy and displacements of the structure using energy methods.
3. Write the three-moment equation and the distribution of internal forces for continuous beams.
4. Assess the internal forces, stresses and strains on curved beams.
5. Determine the types of dynamic stress, characteristics of a stress cycle, the concept of fatigue strength, and types of dynamic loads.
6. Explain the concepts of geometric and material nonlinearities, constitutive equations for materially nonlinear problems, idealized stress-strain diagrams, and the ultimate limit-load of structures.
7. Solve the given practical problems.

1.4. Course content

1. Stress.
2. Strain.
3. Constitutive equations.
4. Energy methods.
5. Continuous beams.
6. Curved beams.
7. Dynamic stresses.
8. Elastic-plastic analysis of structures.
9. Practical exercises: solving project tasks

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☒ distance learning	☒ individual exercises ☐ multimedia and network ☒ laboratory ☐ mentoring work

		☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Project task	Written verification	Oral exam	Min	Max
LO1	-	5%	2%	3,5%	7%
LO2	-	10%	4%	7%	14%
LO3	-	10%	4%	7%	14%
LO4	-	5%	2%	3,5%	7%
LO5	-	10%	4%	7%	14%
LO6	-	10%	4%	7%	14%
LO7	30%	-	-	15%	30%
Share in ECTS	1.5	2.5	1	-	5
Total	30%	50%	20%	50%	100%

Final Exam:

Learning outcome	Project task	Written exam	Oral exam	Min	Max
LO1	-	5%	2%	3,5%	7%
LO2	-	10%	4%	7%	14%
LO3	-	10%	4%	7%	14%
LO4	-	5%	2%	3,5%	7%
LO5	-	10%	4%	7%	14%
LO6	-	10%	4%	7%	14%
LO7	30%	-	-	15%	30%
Share in ECTS	1,5	2,5	1	-	5
Total	30%	50%	20%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E

60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Materials from e-learning.
2. Brnić, J., Turkalj, G. – Nauka o čvrstoći II, Zigo, Rijeka, 2006.
3. Brnić, J., Turkalj, G. – Nauka o čvrstoći I, Sveučilište u Rijeci, Tehnički fakultet, Rijeka, 2004.
4. Alfirević, I. – Nauka o čvrstoći, Tehnička enciklopedija, 9. sv., LZ Miroslav Krleža, Zagreb, 1984.
5. Alfirević, I. – Teorija plastičnosti, Tehnička enciklopedija, 12. sv., LZ Miroslav Krleža, Zagreb, 1992.

1.9. Additional literature

1. Šimić, V. – Otpornost materijala II, Školska knjiga, Zagreb, 1995.
2. Šimić, V. – Otpornost materijala I, Školska knjiga, Zagreb, 1992.
3. Belyaev, N.M. – Strength of Materials, MIR Publishers, Moscow, 1979.
4. Gere, J. M., Goodno, B. J. – Mechanics of Materials, 9th edition, Cengage Learning, Stamford, 2018.
5. Boresi, A.P., Schmidt, R.J. – Advanced Mechanics of Materials, 6th edition, John Wiley & Sons, New York, 2003.

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
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Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Thermodynamics**	
Course status	Mandatory	
Year	1.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+30+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

Obtaining theoretical knowledge and develop skills to solve practical problems in the field of thermodynamics.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Define the first and second laws of thermodynamics and the concept of thermal conditions.
2. Describe the equation of state and state changes of an ideal gas and gas mixtures.
3. Compare thermodynamic cycles, reversible processes and irreversible processes.
4. Describe state changes during evaporation, condensation and the processes of steam plants.
5. Determine the thermal behavior during combustion.
6. Review the exchange of energy in the flow through the nozzle.
7. Compare the basic types of heat transfer and describe the heat transfer within the heat exchanger.
8. Determine the changes and processes with humid air.
9. Solve given thermodynamic tasks (practical problems).

1.4. Course content

The historical development of energy use. Thermal state. The first law of thermodynamics. Ideal and real gas. Equation of state. Work. pV-diagram. Specific heat capacity. Gas mixtures. Ideal gas state changes. Thermodynamic cycles. Carnot cycle. Reversible and irreversible processes. Irreversibility and work. Entropy and irreversibility. The second law of thermodynamics. Technical work. Maximum work. Damping. Enthalpy. Mixing of gases. Mixing of gases irreversibility. Losses due to the irreversibility. Evaporation and condensation. The heat exchange during evaporation. State changes of saturated steam. Superheated steam. Processes of steam plants. Mollier hs-diagram. Exergy. Combustion. Thermal phenomena during combustion. Processes of internal combustion engines. Energy exchange in the flow. De Laval nozzle. Heat transfer. Heat conduction. Heat transfer by convection. Heat transfer by radiation. Overall heat transfer coefficient. Heat exchangers. Humid air. Mollier hx-diagram. Humid air state changes.

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☒ distance learning	☒ individual exercises ☐ multimedia and network ☒ laboratory ☐ mentoring work

		☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Project task	Written verification	Oral exam	Min	Max
LO1	-	6%	2.5%	4.25%	8.5%
LO2	-	6%	2.5%	4.25%	8.5%
LO3	-	6%	2.5%	4.25%	8.5%
LO4	-	6%	2.5%	4.25%	8.5%
LO5	-	7%	2.5%	4.25%	8.5%
LO6	-	6%	2.5%	4.25%	8.5%
LO7	-	7%	2.5%	4.25%	8.5%
LO8	-	6%	2.5%	4.25%	8.5%
LO9	30%	-	-	15%	30%
Share in ECTS	1.5	2.5	1	-	5
Total	30%	50%	20%	50%	100%

Final Exam:

Learning outcome	Project task	Written exam	Oral exam	Min	Max
LO1	-	6%	2.5%	4.25%	8.5%
LO2	-	6%	2.5%	4.25%	8.5%
LO3	-	6%	2.5%	4.25%	8.5%
LO4	-	6%	2.5%	4.25%	8.5%
LO5	-	7%	2.5%	4.25%	8.5%
LO6	-	6%	2.5%	4.25%	8.5%
LO7	-	7%	2.5%	4.25%	8.5%
LO8	-	6%	2.5%	4.25%	8.5%
LO9	30%	-	-	15%	30%
Share in ECTS	1,5	2,5	1	-	5
Total	30%	50%	20%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Materials from e-learning.
2. Bošnjaković, F. – Nauka o toplini, sv. I., II. i III. (reprint of the edition from 1978., 1976. and 1986.), Graphis d.o.o., Zagreb, 2012.
3. Brlek, V. – Termodinamika, Tehnička enciklopedija, 13. sv., LZ Miroslav Krleža, Zagreb, 1997.

1.9. Additional literature

1. Ražnjević, K. – Termodinamičke tablice, Narodna Tehnika Hrvatske, Zagreb, Svjetlost, Sarajevo, 1989.
2. Oprešnik, M. – Zadaci i rješenja iz termodinamike, Tehnička knjiga, Zagreb, 1968.
3. Cengel, Y.A., Boles, M.A. – Thermodynamics: An Engineering Approach, 7th edition, McGraw-Hill, New York, 2011.
4. Cengel, Y.A. – Heat and Mass Transfer: A Practical Approach, 3rd edition (SI Units), McGraw-Hill, New York, 2007.

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Vibrations**	
Course status	Mandatory	
Year	1.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+15+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

Obtaining theoretical and practical knowledge of mechanical system vibration analysis. To understand the importance of vibration analysis with the goal of reducing its harmful influence on durability of machines and structures.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Explain the basic concepts of kinematics vibrational motion.
2. Distinguish different ways of expressing the amplitude of vibration.
3. Make transformation of nonharmonic periodic functions in Fourier's order.
4. Time and frequency domain representation of the vibration signal.
5. To analyze the problem of free vibration of single degree of freedom–SDOF system.
6. Distinguish undamped from damped vibrations.
7. Harmonic excitation of the SDOF system.
8. Define equations of motion of the single and two DOFs and calculate their natural frequencies and modes of vibrations.
9. Perform reduction of continuous system on a lumped mass system – Jeffcott (Laval rotor).
10. Specify and describe measuring devices and sensors for vibration measurements. Indicate measures for reduction of vibration, passive and active approach.

1.4. Course content

1. Vibration kinematics.
2. Fourier analysis and frequency spectra.
3. Vibration dynamics of the SDOF system: free and forced vibrations of undamped and damped systems.
4. Different types of excitations: harmonic, rotating unbalance and support excitation.
5. Jeffcott – Laval rotor model.
6. Vibration isolation.
7. System response on general periodic and nonperiodic excitation.
8. System with two and more (multiple) DOF: free and forced vibration.
9. Lumped mass modelling of distributed masses.
10. Finite element method in vibration problems.

11. Vibration measurements: sensors and equipment. Durability of structure and measures for vibration reduction. Response on seismic excitation.

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ distance learning	☒ individual exercises ☐ multimedia and network ☒ laboratory ☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.
Course attendance, activity, student laboratory reports, studying.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Written verification	Seminar paper	Laboratory exercises	Min	Max
LO1	5%	-	-	-	2.5%	5%
LO2	5%	5%	-	-	5%	10%
LO3	-	5%	-	-	2.5%	5%
LO4	5%	5%	-	-	5%	10%
LO5	5%	-	5%	-	5%	10%
LO6	-	5%	-	-	2.5%	5%
LO7	-	-	10%	10%	10%	20%
LO8	-	10%	-	-	5%	10%
LO9	-	-	5%	10%	7.5%	15%
LO10	-	-	10%	-	5%	10%
Share in ECTS	1	1.5	1.5	1	-	5
Total	20%	30%	30%	20%	50%	100%

Final Exam:

Learning outcome	Written Exam	Min	Max
LO1	5%	2.5%	5%
LO2	10%	5%	10%
LO3	5%	2.5%	5%
LO4	10%	5%	10%
LO5	10%	5%	10%
LO6	5%	2.5%	5%
LO7	20%	10%	20%
LO8	10%	5%	10%
LO9	15%	7.5%	15%
LO10	10%	5%	10%
Share in ECTS	5	-	5
Total	100%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Krpan, M., Butković, M., Žigulić, R., Braut, S., Franulović, A.: Dynamics, Theory and application, TFR, Rijeka, 2001. (in Croatian)
2. Stegić, M.: Theory of vibration, FSB Zagreb, 1996 (in Croatian)

1.9. Additional literature

1. Pustaić, D., Wolf, H., Tonković, Z.: Uvod u analitičku mehaniku s osnovama teorije vibracija, Golden marketing / Tehnička knjiga, Zagreb, 2005.
2. Benaroya, H., Nagurka, M.L.: Mechanical Vibration; Analysis, Uncertanties and Control, 3rd edition, CRC Press, Boca Raton, 2010.

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Advanced Programming**	
Course status	Mandatory	
Year	1.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+30+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

Introduce students to fundamental abstract data types and the mechanisms used for their implementation, as well as basic methods for designing and techniques for analysing algorithms. Familiarize students with the fundamental concepts of object-oriented programming and implement applications based on object-oriented principles.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Compare different implementations of abstract data types.
2. Determine the most appropriate implementation of abstract data types and algorithms according to quality evaluation criteria for software solutions.
3. Relate techniques for calculating algorithm complexity.
4. Utilize static and dynamic data structures in solving problem tasks.
5. Develop fundamental concepts of object-oriented programming.
6. Develop custom simpler classes and templates with an emphasis on using templates or algorithms from the standard library to solve specific problems.
7. Implement applications based on object-oriented principles.
8. Evaluate the quality of solutions for individual problem tasks.

1.4. Course content

1. Data types, abstract data types, and data structures. Elements for constructing data structures.
2. Algorithm complexity analysis.
3. List, stack, queue.
4. Hierarchical abstract data types.
5. Hash table. Undirected mathematical graph.
6. Basic concepts of object-oriented programming.
7. Class and object. Access specifiers. Encapsulation.
8. Access to class members. The this pointer. Data hiding.
9. Constructor and destructor. Linked list of objects. Inheritance.
10. Semantic relationships among classes.
11. Multiple inheritance. Virtual methods and polymorphism.
12. Function and class templates. Generic programming.

13. Linked list template, indexed file. Standard Template Library (STL).
14. Exception handling.
15. Object-oriented approach to implementing abstract data types.

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☒ distance learning	☒ individual exercises ☒ multimedia and network ☒ laboratory ☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Written verification 1	Written verification 2	Project assignment	Min	Max
LO1	-	10%	-	-	5%	10%
LO2	5%	5%	-	-	5%	10%
LO3	5%	5%	-	-	5%	10%
LO4	-	10%	-	10%	10%	20%
LO5	-	-	10%	-	5%	10%
LO6	5%	-	5%	-	5%	10%
LO7	5%	-	10%	10%	12.5%	25%
LO8	-	5%	-	-	2.5%	5%
Share in ECTS	1	1.75	1.25	1	-	5
Total	20%	35%	25%	20%	50%	100%

Final Exam:

Learning outcome	Written Exam	Project assignment	Min	Max
LO1	10%	-	5%	10%
LO2	5%	-	2.5%	5%
LO3	5%	-	2.5%	5%
LO4	10%	20%	15%	30%
LO5	10%	-	5%	10%
LO6	5%	-	2.5%	5%
LO7	10%	20%	15%	30%
LO8	5%	-	2.5%	10%
Share in ECTS	3	2	-	5
Total	60%	40%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the

defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Lippman, S. B., Lajoie, J., & Moo, B. E. (2012). C++ Primer (5th ed.). Boston, MA: Addison-Wesley Educational.

1.9. Additional literature

1. Stroustrup, B. (2023). Programming: Principles and Practice Using C++ (3rd ed.). Boston, MA: Addison Wesley.
2. https://www.learncpp.com/

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Embedded Systems Programming**	
Course status	Mandatory	
Year	1.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	15+45+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

The goal of the course is to ensure the acquisition of basic and practical knowledge and skills related to the programming of built-in systems and their integration into modern automated systems.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Compare embedded systems and their applications and typical applications.
2. Assess the properties, limitations, required resources and system architecture for the given application.
3. Integrate program libraries and application program interfaces for the given application.
4. Design operational and development tools for use in embedded applications and the Internet of Things.
5. Create embedded solutions with application in plant and process automation based on machine and human incentives.

1.4. Course content

1. Introduction to embedded systems programming. Embedded computer system architecture.
2. Operating systems for embedded systems. Interfaces and protocols for communication.
3. Programming solutions based on the Raspberry pi embedded system.
4. Advanced programming techniques in C. Pointers and memory allocation.
5. Libraries and programming interfaces. Communication protocols.
6. Debugging and program execution for embedded systems with limited resources.
7. Platform-independent solutions.
8. Application of built-in systems in plant and process automation. Built-in system as a digital control system.
9. System integration and the Internet of Things.
10. Introduction to distributed algorithms.

1.5. Teaching methods	☒ lectures ☒ seminars and workshops ☒ exercises ☐ distance learning	☐ individual exercises ☐ multimedia and network ☒ laboratory ☐ mentoring work

		☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Programming task	Seminar paper	Oral presentation	Min	Max
LO1	2%	-	10%	5%	8,5%	17%
LO2	2%	20%	-	-	11%	22%
LO3	2%	10%	-	-	6%	12%
LO4	2%	10%	-	-	6%	12%
LO5	2%	20%	10%	5%	18.5%	37%
Share in ECTS	0.5	3	1	0.5	-	5
Total	10%	60%	20%	10%	50%	100%

Final Exam:

Learning outcome	Oral Exam	Min	Max
LO1	20%	10%	20%
LO2	20%	10%	20%
LO3	10%	5%	10%
LO4	10%	5%	10%
LO5	40%	20%	40%
Share in ECTS	5	-	5
Total	100%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
Learning outcomes that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature
1. J. Corbet, A. Rubini, G. Kroah-Hartman: Linux device drivers. O'Reilly Media, Inc, 2005
1.9. Additional literature
1. M.Barr, A. Massa: Programming Embedded Systems, O'Reilly, 2015 2. E. Lee: Introduction to Embedded Systems, Second Edition: A Cyber-Physical Systems Approach, O'Reilly, 2013
1.10. Quality monitoring method
Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Industrial Metrology**	
Course status	Elective	
Year	1.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+30+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

The goal of this course is to establish fundamental knowledge in the field of metrology, with a special emphasis on measurements in mechatronics and manufacturing.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. To be able to differentiate basic metrological terms and methods as well as measurement quantities and SI units, with the ability to convert measurement units.
2. To be able to determine the capability of the measurement system and verify the results of comparative measurements.
3. To be able to differentiate individual measurements in production.
4. To be able to conduct various measurements in the laboratory.
5. To be able to propose measurement procedures in a specific manufacturing process.

1.4. Course content

1. Introduction to metrology, categories of metrology. Metrological infrastructure in Croatia.
2. Measurement systems, measurement units, measurement. International System of Units.
3. Metrological conditions. Measurement traceability. Standards. Measurement errors and evaluation of the measurement system. Expression of measurement results and evaluation of measurement uncertainty.
4. Measuring equipment. Precision engineering and measuring instruments. Analog and digital measuring devices. Optical and laser measurements.
5. Coordinate measuring machines. Computer-controlled coordinate measuring machines (CMMs).
6. Measurement of length, mass, and volume.
7. Measurement of microgeometry. Measurement of roughness. Measurement of shape deviations.
8. Temperature measurement.
9. Measurement of torque. Measurement of revolutions.
10. Measurement of fluid speed and flow.
11. Ultrasonic measurements.
12. Application of radiography in industry.
13. Noise measurement in industrial conditions.
14. 3D scanning.

15. Measurement automation. Other measurements in production.

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☒ distance learning	☒ individual exercises ☐ multimedia and network ☒ laboratory ☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Project assignment	Laboratory exercises	Written test	Min	Max
LO1	2%	-	-	10%	6%	12%
LO2	2%	30%	-	-	16%	32%
LO3	2%	-	-	10%	6%	12%
LO4	2%	-	30%	-	16%	32%
LO5	2%		-	10%	6%	12%
Share in ECTS	0.5	1.5	1.5	1.5	-	5
Total	10%	30%	30%	30%	50%	100%

Final Exam:

Learning outcome	Written Exam	Oral Exam	Min	Max
LO1	10%	2%	6%	12%
LO2	20%	12%	16%	32%
LO3	10%	2%	6%	12%
LO4	20%	12%	16%	32%
LO5	10%	2%	6%	12%
Share in ECTS	3.5	1.5	-	5
Total	70%	30%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade

0,00-49,99	insufficient (1)	FX, F	
50,00-59,99	sufficient (2)	D, E	
60,00-74,99	good (3)	C	
75,00-89,99	very good (4)	B	
90,00-100,00	excellent (5)	A	

1.8. Obligatory literature

1. E-learning materials (lectures and exercises)
2. Brezinšćak, M., Measurement and Calculation in Engineering and Science, Tehnička knjiga, Zagreb (1971)
3. Anthony, D.M., Engineering Metrology, Pergamon Press, New York (1986)

1.9. Additional literature

1. Juran, J.M., Quality Control Handbook, McGraw-Hill, New York (1989)

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Machine Elements**	
Course status	Mandatory	
Year	1.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+45+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

Students are trained to independently carry out calculations and apply the basic elements of machines.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Evaluate the basic sizes of couplings, bearings, mechanical power transmissions and pipelines.
2. Calculate the loads of couplings, bearings, mechanical power transmissions and pipelines.
3. Choose criteria for dimensioning and design of couplings, bearings, mechanical power transmissions and pipelines.
4. Construct elements of clutches, bearings, mechanical power transmissions and pipelines.
5. Solve given construction problems.

1.4. Course content

1. Couplings: purpose, forms, selection, calculation and construction.
2. Roller bearings: shapes, load capacity, service life, lubrication, calculation and construction.
3. Sliding bearings: shapes, dimensions, calculation and construction.
4. Gears: shapes, geometry, load capacity, calculation and construction.
5. Belt and chain power transmissions: forms, basic characteristics, calculation and construction.
6. Gaskets and sealing, introduction to pipelines.

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☒ distance learning	☒ individual exercises ☐ multimedia and network ☐ laboratory ☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

Solving project tasks in class and at home, independent study

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Project exam	Written verification 1	Oral exam	Min	Max
LO1	-	2%	5%	3,5%	7%
LO2	-	2%	5%	3,5%	7%
LO3	-	3%	5%	4%	8%
LO4	-	3%	5%	4%	85
LO5	70%	-	-	35%	70%
Share in ECTS	3.5	0.5	1	-	5
Total	70%	10%	20%	50%	100%

Final Exam:

Learning outcome	Written Exam	Min	Max
LO1	7%	3.5%	7%
LO2	7%	3.5%	7%
LO3	8%	4%	8%
LO4	8%	4%	85%
LO5	70%	35%	70%
Share in ECTS	5	-	5
Total	100%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. e-learning materials
2. Decker, K.-H. – Elementi strojeva, Golden marketing - Tehnička knjiga, Zagreb, 2006.
3. Jelaska, D. – Elementi strojeva, FESB, Split, 2005.
4. Oberšmit, E., Taubkin, Đ. – Elementi strojeva, Tehnička enciklopedija, 5. sv., LZ Miroslav Krleža, Zagreb, 1976

1.9. Additional literature

1. Different authors - Krautov strojarski priručnik, Sajema, Zagreb, 2009.
2. Budynas, R.G., Nisbett, J.K. - Shigley's Mechanical Engineering Design, McGraw-Hill, New York, 2008.

3. Manufacturers catalogs with machine elements connected to the course 4. ISO, EN, DIN, HRN norms connected to the course
1.10. Quality monitoring method
Teaching evaluations; student survey.

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Neural Networks**	
Course status	Mandatory	
Year	1.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	45+15+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

The goal of the course is to ensure the acquisition of basic knowledge necessary for the independent creation of artistic neural networks for computer simulation of the decision-making process.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Classify the working concepts of artificial neural networks and list their applications.
2. Build a neural network in the Python program.
3. To train the neural network in the Python program.
4. Validate the neural network in the Python program.
5. Present the neural network and its application to the expert and non-expert public.

1.4. Course content

1. Introduction to neural networks.
2. Python.
3. Learning process.
4. Associative memory.
5. Single layer perceptron.
6. Multilayer perceptrons.
7. Non-linear mapping.
8. Radial networks.
9. Recursive networks.
10. Self-organizing networks.
11. Genetic algorithms.
12. Neural network programming (implementation).
13. Neural network programming (learning).
14. Neural network programming (validation).

1.5. Teaching methods	☒ lectures ☒ seminars and workshops ☒ exercises	☒ individual exercises ☐ multimedia and network ☐ laboratory

	☐ distance learning	☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Programming task	Seminar paper	Oral presentation	Min	Max
LO1	2%	-	5%	-	3.5%	7%
LO2	2%	20%	5%	-	13.5%	27%
LO3	2%	5%	10%	-	8.5%	17%
LO4	2%	5%	10%	-	8.5%	17%
LO5	2%	-	-	30%	16%	32%
Share in ECTS	0.5	1.5	1.5	1.5	-	5
Total	10%	30%	30%	30%	50%	100%

Final Exam:

Learning outcome	Oral Exam	Min	Max
LO1	10%	5%	10%
LO2	10%	5%	10%
LO3	30%	15%	30%
LO4	10%	5%	10%
LO5	40%	20%	40%
Share in ECTS	5	-	5
Total	100%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
Learning outcomes that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.
The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Gurney, K. (1997.): An introduction to neural networks, UCL Press.
2. Anis, D. (2020.): Ultimate Step by Step Guide to Deep Learning Using Python: Artificial Intelligence and Neural Network Concepts Explained in Simple Terms (Ultimate Step by Step Guide to Machine Learning).

1.9. Additional literature

1. Picton, P. (1994.): Neural Networks, Pylgrave.
2. Rojas, R. (1996.): Neural NetworksA Systematic Introduction, Springer.

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Numerical Methods**	
Course status	Elective	
Year	1.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	45+30+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

To enable students to acquire basic knowledge of vector analysis and solving nonlinear and differential equations.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Connect interpolation and approximation and evaluate the error.
2. Generate the physical meaning of curve and area integrals.
3. Determine the basic concepts and theorems of vector analysis.
4. Generate the physical meaning of typical partial differential equations, scalar gradient and divergence and rotor vector fields.
5. Relate probability theory to solving problems with a random variable.
6. Evaluate appropriate regression analysis methods.

1.4. Course content

1. Tensors.
2. Methods of function approximation and interpolation.
3. Numerical differentiation.
4. Integrals of functions. Area and curve integrals.
5. Vector analysis. Lessons from Gauss, Stokes and Helmholtz.
6. Numerical integration.
7. Partial differential equations (PDJ). Self-association and integrability.
8. Green's theorems. Betti-Maxwell theorem.
9. Green's functions of Laplace, Poisson and Navier PDJ.
10. Random variables and random processes.
11. Probability density. Binomial and normal distribution.
12. Expectation. Covariance, variance, deviation and correlation.
13. Random error and uncertainty. Confidence level.
14. Random error progression.
15. Regression analysis (linear, polynomial, logarithmic, exponential).

1.5. Teaching methods	☒ lectures	☒ individual exercises

	☒ seminars and workshops ☒ exercises ☐ distance learning	☐ multimedia and network ☐ laboratory ☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity and homework	Written verification 1	Written verification 2	Seminar	Min	Max
LO1	1%	10%			5.5%	11%
LO2	2%	10%		5%	8.5%	17%
LO3	2%	10%		10%	11%	22%
LO4	2%		10%	5%	8.5%	17%
LO5	2%		10%	5%	8.5%	17%
LO6	1%		10%	5%	8%	16%
Share in ECTS	10%	30%	30%	30%		
Total	0.5	1.5	1.5	1.5	50%	100%

Final Exam:

Learning outcome	Written Exam	Oral exam	Min	Max
LO1	10%	5%	7.5%	15%
LO2	10%	5%	7.5%	15%
LO3	15%	5%	10%	20%
LO4	15%	5%	10%	20%
LO5		15%	7.5%	15%
LO6		15%	7.5%	15%
Share in ECTS	50%	50%		
Total	2.5	2.5	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E

60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Kamenarović, I.: Inženjerska matematika I, Tehnički fakultet Sveučilišta u Rijeci, 1997.
2. Elezović N.: Vjerojatnost i statistika, Zagreb, Element, 2018, ISBN:978- 953-197-591-9

1.9. Additional literature

1. Obsieger, B., Numerical Methods I - Basis and Fundamentals, Rijeka, Tehnički fakultet, 2011.
2. Obsieger, B., Numerical Methods III - Approximation of Functions, Rijeka, Tehnički fakultet, 2013.

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Power Electronics**	
Course status	Mandatory	
Year	1.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+30+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

Acquisition of specialist knowledge and skills in power electronics and the ability to independently apply acquired skills.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Evaluate individual types of converters.
2. Review the connections of the DC converters.
3. Review the connections of the rectifier.
4. Argue the influence of individual rectifiers on the distribution network.
5. Evaluate the connections of autonomous exchangers.
6. To create a power electronics device in energy transmission.

1.4. Course content

Energy converters and their properties. Constituent components and structure of energy converters. Semiconductor power valves. Realization of uncontrollable switches, current one-way switches, voltage one-way switches, two-way switches. DC converters: direct, indirect, with galvanic isolation. Uncontrollable rectifiers: inductively loaded single-phase bridge connection, inductively and capacitively loaded single-phase bridge connection, inductively loaded three-phase rectifier. Feedback effects of the rectifier on the supply network and their reduction. Autonomous exchangers with voltage input.

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☒ distance learning ☒ field work	☒ individual exercises ☐ multimedia and network ☒ laboratory ☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Written verification 1	Written verification 2	Laboratory exercises	Min	Max
LO1	-	10%	-	-	5%	10%
LO2	-	10%	-	5%	7.5%	15%
LO3	5%	10%	-	5%	10%	20%
LO4	-	-	10%	5%	7.5%	15%
LO5	-	-	10%	5%	7.5%	15%
LO6	5%	-	20%		12.5%	25%
Share in ECTS	0.5	1.5	2	1	-	5
Total	10%	30%	40%	20%	50%	100%

Final Exam:

Learning outcome	Written Exam	Min	Max
LO1	10%	5%	10%
LO2	15%	7.5%	15%
LO3	20%	10%	20%
LO4	15%	7.5%	15%
LO5	15%	7.5%	15%
LO6	25%	12.5%	25%
Share in ECTS	5	-	5
Total	100%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. I. Flegar, Elektronički energetski pretvarači, Kigen, Zagreb, 2010
2. Presentations from lectures and exercises and other teaching materials - available online through the Merlin e-learning system

1.9. Additional literature
1. K. Thorborg, Power electronics, Prentice Hall, New York, 1988 2. R. W. Erickson, D. Maksimovic, Fundamentals of power electronics, Springer, 2001 3. Kassakian J. G i dr.: Osnove učinske elektronike, I. dio Graphis, zagreb, 2000. 4. I. Flegar, Sklopovi energetske elektronike, Graphis, Zagreb, 1996.
1.10. Quality monitoring method
Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Project Management**	
Course status	Elective	
Year	1.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	45+30+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

The goal of the course is to understand and adopt the basic concepts of project management, and to prepare students for planning and creating projects, as well as for managing simple projects. Prepare students for leading and coordinating project activities with the aim of successful project implementation by applying the acquired knowledge and skills.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Determine the basic elements and characteristics of projects;
2. Determine the basic elements and phases of project implementation;
3. Connect techniques in project management and project activities;
4. Create and propose a project application, project budget and methods for quality project management.

1.4. Course content

Basic terms:

1. Definition of project and project management;
2. Basic terms;
3. Characteristics of project objectives;
4. Elements of project management;
5. Phases of project management;
6. Life cycle of the project;
7. Areas of project management;
8. Characteristics of EU projects;
9. Application of projects to EU fund programs.;

1.5. Teaching methods	☒ lectures ☒ seminars and workshops ☒ exercises ☒ distance learning	☒ individual exercises ☐ multimedia and network ☐ laboratory ☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

- Active participation in the creation and presentation of 2 exercises
- Create a project application

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Exercise 1	Exercise 2	Fulfilling project application	Min	Max
LO1	3%	7%	-	-	5%	10%
LO2	3%	7%	-	-	5%	10%
LO3	3%	-	7%	-	5%	10%
LO4	5%	-	9%	56%	35%	70%
Share in ECTS	0.7	0.7	0.8	2.8	-	5
Total	14%	14%	16%	56%	50%	100%

Final Exam:

Learning outcome	Fulfilling project application	Written Exam	Min	Max
LO1	-	10%	5%	10%
LO2	-	10%	5%	10%
LO3	-	10%	5%	10%
LO4	56%	14%	35%	70%
Share in ECTS	2.8	2.2	-	5
Total	56%	44%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Materials from Merlin e-learning system;
2. Dujanić, M. Projektni menadžment. Rijeka : Veleučilište, 2010.

1.9. Additional literature
1. Zekić, Z. Projektni menadžment : upravljanje razvojnim promjenama. Rijeka : Ekonomski fakultet ; Opatija : Conefing grupa, 2010. 2. Omazić, M.A. Projektni menadžment. Zagreb : Sinergija nakladništvo, 2005.
1.10. Quality monitoring method
Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Testing of Materials and Fractography**	
Course status	Elective	
Year	1.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	15+30+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

The goal of the course is to familiarize students with non-destructive and destructive mechanical methods of material testing and to train students to work with specific methods, while understanding the basics of fracture analysis of materials as well as the causes and mechanisms of crack growth under different loading conditions.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. To be able to describe and explain the basic properties of materials with an understanding of brittle and ductile fracture.
2. To be able to connect basic concepts and principles of fracture analysis and explain the phenomenon of metal fatigue from the perspective of fracture.
3. To be able to classify brittle materials and assess the lifespan of materials/products under fatigue conditions or variable loading.
4. To be able to differentiate and determine the causes and mechanisms of crack initiation and growth under different loading conditions and through specific practical examples.
5. To be able to propose an appropriate method and perform specific procedures for mechanical testing of materials and analyse the test results.

1.4. Course content

1. Technical materials and properties of technical materials.
2. Definition of deformation and fracture. Causes of deformation and fracture. Types of fractures.
3. Brittle and ductile fracture. Mechanisms of brittle fracture. Theories, criteria, critical values.
4. Crack propagation during material fatigue.
5. Probabilistic mechanical characterization of brittle materials.
6. Static tensile test. Tests at different temperatures.
7. Testing the impact energy of fracture at different temperatures. Definition of fracture toughness.
8. Macro and micro analysis of material damage.
9. Non-destructive testing methods in the analysis of material damage.
10. Fractography and fracture analysis.

1.5. Teaching methods	☒ lectures	☒ individual exercises

	☐ seminars and workshops ☒ exercises ☒ distance learning	☐ multimedia and network ☒ laboratory ☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Project assignment	Laboratory exercises	Min	Max
LO1	2%	-	-	1%	2%
LO2	2%	-	-	1%	2%
LO3	2%	-	-	1%	2%
LO4	2%	45%	-	23.5%	47%
LO5	2%	-	45%	23.5%	47%
Share in ECTS	0.5	2.25	2.25	-	5
Total	10%	45%	45%	50%	100%

Final Exam:

Learning outcome	Written Exam	Oral Exam	Min	Max
LO1	10%	5%	7.5%	15%
LO2	10%	5%	7.5%	15%
LO3	10%	5%	7.5%	15%
LO4	20%	5%	12.5%	25%
LO5	20%	10%	15%	30%
Share in ECTS	3.5	1.5	-	5
Total	70%	30%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B

90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. E-learning materials (lectures and exercises)
2. ASM Handbook, Volume 8, Mechanical Testing and Evaluation, ASM International, Materials Park, OH (2000)

1.9. Additional literature

1. Franz, M., Mechanical Properties of Materials, FSB, Zagreb (1998)
2. Callister, W. D., Jr., Materials Science and Engineering: An Introduction, John Wiley & Sons, New York, Chichester, etc. (1996)
3. Križan, B., Fundamentals of Design and Calculation of Structural Elements, Zagreb: Školska knjiga (2008)
4. Dieter, George E., Mechanical Metallurgy, McGraw-Hill Book Company, London, etc. (1986)
5. Hosford, William F., Mechanical Behavior of Materials, Cambridge University Press, Cambridge, etc. (2010)
6. Roesler, J., Mechanical Behaviour of Engineering Materials: Metals, Ceramics, Polymers, and Composites, Springer, Berlin, New York (2007)

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Advanced Technical Materials**	
Course status	Elective	
Year	2.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	45+15+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

Explore various groups of advanced materials and the key mechanisms driving their development. Enhance knowledge in material science to establish criteria for the selection, application, and modification of properties of technical and specialized materials. Assess and evaluate the lifecycle and environmental impacts of new materials.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Enhance skills in analyzing and critically evaluating professional literature related to advanced materials.
2. Analyze and assess the key driving mechanisms in the development and innovation of technical materials.
3. Understand the specific structural characteristics and foundations of selected advanced technical materials.
4. Assess the environmental impact across the material lifecycle and identify key development trends.
5. Critically evaluate various methods of material characterization and establish criteria for their selection.

1.4. Course content

1. Develop skills in utilizing and critically analyzing professional literature related to advanced materials.
2. Study of advanced polymers, nanomaterials, nanocomposites, and carbon-based nanomaterials.
3. Examination of metal foams, shape memory alloys, and superalloys.
4. Explore of advanced ceramics, including high-temperature ceramics, structural ceramics, electroceramics, and composites (PMC, CMC, CCC).
5. Investigate advanced electronic materials, superconductors, and materials for solar and fuel cells.

1.5. Teaching methods	☒ lectures ☒ seminars and workshops ☒ exercises	☒ individual exercises ☐ multimedia and network ☐ laboratory

	☒ distance learning	☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

Regularly attend and actively participate in lectures and exercises. Attendance is mandatory for at least 70% of the total lecture and exercise hours to ensure successful learning and engagement.

After completing the first instructional unit (approximately half of the course material), students must take a midterm exam in the form of a written test. The results will significantly contribute to the final grade evaluation, helping to gauge progress and understanding of the material.

Independently prepare and defend seminar papers by the end of the semester. Topics are chosen from several provided options. The papers must be submitted in written form and presented orally, following specific guidelines on length, format, and presentation criteria.

When the above obligations are fulfilled student can take the final exam, consisting of both written (problem-solving) and oral components. The final exam will be graded positively if the student achieves at least 50% correct answers. Detailed grading criteria for both components will be provided to ensure transparency and fairness.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Written verification 1	Written verification 2	seminar paper and presentation	Min	Max
LO1	2%	10%	-	5%	8.5%	17%
LO2	2%	10%	-	5%	8.5%	17%
LO3	2%	15%	-	5%	11%	22%
LO4	2%	-	15%	5%	11%	22%
LO5	2%	-	15%	5%	11%	22%
Share in ECTS	0.5	1.75	1.5	1.25	-	5
Total	10%	35%	30%	25%	50%	100%

Final Exam:

Learning outcome	Written Exam	Min	Max
LO1	17%	8.5%	17%
LO2	17%	8.5%	17%
LO3	22%	11%	22%
LO4	22%	11%	22%
LO5	22%	11%	22%
Share in ECTS	5	-	5
Total	100%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.

The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Callister, W.D., Rethwisch, D.G. Materials science and engineering - an introduction. Wiley, Hoboken, USA , 2018.
2. Asthana, R., Tatsuki, O., Mrityunjay, S. Green and Sustainable Manufacturing of Advanced Materials. Elsevier, Amsterdam, Netherlands, Oxford OX5 1GB, UK.
3. Pucić, I. Lecture presentations

1.9. Additional literature

1. Ortiz Ortega, E., Hosseinian, H., Aguilar Meza, I.B., Rosales López, M.J., Rodríguez Vera, A., Hosseini, S. Material Characterization Techniques and Applications (Progress in Optical Science and Photonics, 19). Springer Nature Singapore Pte Ltd. 2022

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Artificial Intelligence**	
Course status	Mandatory	
Year	2.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+30+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

Artificial intelligence aims to enable systems to make decisions and act like humans. Autonomous devices, such as robots, use machine learning approaches to combine algorithms with experiences. The powerful combination of mechatronics and artificial intelligence opens the door to entirely new automation possibilities.

The goal of this course is to familiarize students with various approaches and provide an overview of methods for solving artificial intelligence problems, including methods for knowledge representation, problem-solving through search, automated reasoning, learning, and optimization related to intelligent mechatronics. This enables the creation of sophisticated systems capable of performing useful physical tasks applicable in many industries (application of machine learning in manufacturing, service robotics, industrial automation, condition monitoring, virtual reality).

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Formulate basic AI concepts and procedures.
2. Propose algorithms for state space search.
3. Suggest formal languages for knowledge representation and reasoning.
4. Determine the most suitable AI approaches and algorithms for different categories of engineering problems, including computer vision, energy consumption prediction, industrial quality control, engineering design, and biomedical engineering.
5. Use machine learning algorithms to solve specific problems.
6. Identify the possibilities and limitations of artificial intelligence in engineering applications.

1.4. Course content

1. Introduction to Artificial Intelligence
2. State space search
3. Heuristic search. A-star algorithm
4. Logic and reasoning
5. Rule-based systems
6. Introduction to machine learning
7. Computer vision
8. Decision trees

9. Linear and logistic regression
10. Naive Bayes
11. Support vector machines
12. Overview of artificial neural networks
13. Deep learning
14. Limitations of artificial intelligence

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☒ distance learning	☒ individual exercises ☒ multimedia and network ☒ laboratory ☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Written verification 1	Written verification 2	Project assignment	Min	Max
LO1	-	10%	-	-	5%	10%
LO2	5%	10%	-	-	7.5%	15%
LO3	5%	10%	-	-	7.5%	15%
LO4	-	-	10%	10%	10%	20%
LO5	-	-	10%	10%	10%	20%
LO6	10%	-	10%	-	10%	20%
Share in ECTS	1	1.5	1.5	1		5
Total	20%	30%	30%	20%	50%	100%

Final Exam:

Learning outcome	Written Exam	Project assignment	Min	Max
LO1	10%	-	5%	10%
LO2	10%	-	5%	10%
LO3	10%	-	5%	10%
LO4	10%	20%	15%	30%
LO5	10%	20%	15%	30%
LO6	10%	-	15%	30%
Share in ECTS	3	2	-	5
Total	60%	40%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.

The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Russell, S., & Norvig, P. (2021). Artificial intelligence: A modern approach, global edition (4th ed.). London, England: Pearson Education**.**

1.9. Additional literature

1. http://aima.cs.berkeley.edu/global-index.html
2. George F. Luger. (2009) Artificial Intelligence: Structures and Strategies for Complex Problem Solving. Addison-Wesley.

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Entrepreneurship**	
Course status	Elective	
Year	2.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+15+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

The aim of the course is to understand and adopt the basic methodological concepts and train students for independent implementation of simple research and writing, presentation and presentation of seminar and final papers. The goal of the course is to acquaint students with the importance of small and medium-sized enterprises for the overall economic and social development of the region and the country as a whole.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Define the term entrepreneurship and entrepreneur;
2. Entrepreneurship in different contexts, entrepreneurship in the SME sector, corporate entrepreneurship, social / social entrepreneurship
3. Define the importance and basic types of business infrastructure;
4. Judge the success of the business idea based on the business plan;
5. Design an entrepreneurial project and a way to obtain funds from institutions to encourage entrepreneurship;

1.4. Course content

1. Introduction to the course and presentation of the Syllabus,
2. What is entrepreneurship,
3. Encouraging entrepreneurship, entrepreneurial support institutions,
4. Creating a business plan,
5. Applying the entrepreneurial idea to contests to encourage entrepreneurship.

1.5. Teaching methods	☒ lectures ☒ seminars and workshops ☐ exercises ☐ distance learning	☒ individual exercises ☐ multimedia and network ☐ laboratory ☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Written verification 1	Seminar paper	Min	Max
LO1	2%	10%	-	6%	12%
LO2	2%	10%	-	6%	12%
LO3	2%	-	20%	11%	22%
LO4	2%	-	20%	11%	22%
LO5	-	-	32%	16%	32%
Share in ECTS	0.4	1	3.6	-	5
Total	8%	20%	72%	50%	100%

Final Exam:

Learning outcome	Written Exam	Min	Max
LO1	30%	15%	30%
LO2	30%	15%	30%
LO3	12%	6%	12%
LO4	16%	8%	16%
LO5	12%	6%	12%
Share in ECTS	5	-	5
Total	100%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Kolaković, M. (2006). Poduzetništvo u ekonomiji znanja, Zagreb. Sinergija
2. Škrtić M., Mikić M., Poduzetništvo, Sinergija, 2011.

1.9. Additional literature

1. Timmons, J.A. Spinelli, S. New Venture Creation: Entrepreneurship for 21st century, International Edition: McGraw Hill. 2. Hisrich R.D., Peters, M.P., Shepherd., D.A., Poduzetništvo, sedmo izdanje, MATE d.o.o., Zagreb, 2011.
2.1. Quality monitoring method
Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Industrial and Mobile Robotics**	
Course status	Mandatory	
Year	2.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+30+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

The aim of the course is to provide fundamental and practical contemporary knowledge and skills necessary for designing and maintaining systems incorporating industrial and mobile robots.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Compare different types of industrial and mobile robots.
2. Determine the kinematics of industrial and mobile robots.
3. Evaluate the dynamics of industrial and mobile robots.
4. Review path planning techniques for industrial and mobile robots, including those based on evolutionary algorithms and machine learning.
5. Justify the integration of industrial and mobile robots in flexible manufacturing systems.

1.4. Course content

1. Types and configurations of industrial and mobile robots.
2. Forward and inverse kinematics of robots. Denavit-Hartenberg method.
3. Robot dynamics. Lagrange-Euler and Newton-Euler methods.
4. Trajectory planning for industrial and mobile robots.
5. Application of evolutionary algorithms for trajectory optimization and obstacle avoidance.
6. Simulation of industrial and mobile robots using CoppeliaSim tool.
7. Validation of developed solutions in laboratory conditions using the FANUC industrial robot arm ER4IA-30P-M-EDU4.
8. Simulation of the application of mobile and industrial robots in flexible manufacturing systems.

1.5. Teaching methods	☒ lectures ☒ seminars and workshops ☒ exercises ☐ distance learning	☒ individual exercises ☐ multimedia and network ☒ laboratory ☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Project assignment	Seminar Paper	Oral Presentation	Min	Max
LO1	2%	-	10%	5%	8.5%	17%
LO2	2%	15%	-	-	8.5%	17%
LO3	2%	15%	-	-	8.5%	17%
LO4	2%	15%	-	5%	11%	22%
LO5	2%	-	20%	5%	13.5%	27%
Share in ECTS	0.5	2.25	1.5	0.75	-	5
Total	10%	45%	30%	15%	50%	100%

Final Exam:

Learning outcome	Written Exam	Min	Max
LO1	10%	5%	10%
LO2	20%	10%	20%
LO3	20%	10%	20%
LO4	10%	5%	10%
LO5	40%	20%	40%
Share in ECTS	5	-	5
Total	100%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. T. Yoshikawa: Foundations of robotics: analysis and control, University of Tokyo, 2000
2. Siegwart, R., Nourbakhsh, I. R., & Scaramuzza, D.: Introduction to autonomous mobile robots, MIT press, 2011

1.9. Additional literature
1. Z. Kovačić, S. Bogdan, V. Krajčí: Osnove robotike, Graphis, Zagreb, 2002. 2. R. Mittle, I. Nagrath "Robotics and Control"; McGraw Hill Education, 2017 3. U. Rembold, "Robot technology and applications"; CRC Press, 2020 4. S. Thrun: Probabilistic Robotics"; ACM, 2002
1.10. Quality monitoring method
Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Marketing for Engineers**	
Course status	Elective	
Year	2.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+30+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

Equip students to understand the concept of marketing and to apply a marketing approach in the development and design of products.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Argue the fundamental concepts of marketing and the elements of the marketing process.
2. Evaluate the importance of consumers, desired value, competitiveness, and technology from a marketing perspective in the realm of modern industry.
3. Argue the logical connection between the elements of the marketing process from the identification of market needs to the definition of the product design plan.
4. Synthesize the elements of the marketing process.
5. Evaluate the feasibility of applying a marketing approach in product design.
6. Create a solution in the form of a product design plan.

1.4. Course content

1. Introductory lecture. Introduction to marketing.
2. Marketing orientation and consumer orientation.
3. Market and market needs. Market competitiveness. Challenges in the globalized market. B2B and B2C markets – differences and characteristics.
4. Values – the foundation of marketing exchange, the importance of value for the consumer, quantification of value.
5. Market segmentation. Marketing strategy and marketing mix – 4P. Product – definition, importance, classification, characteristics.
6. Connection between marketing and product design. The process of converting benefits into product features. Market needs-based product design.

Exercises follow the topics from the lectures.

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises	☒ individual exercises ☐ multimedia and network ☐ laboratory

	☐ distance learning	☐ mentoring work ☒ other: Team project task

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Critical review / presentation	Team project task / presentation	Min	Max
LO1	-	10%	5%	10%
LO2	30%	-	15%	30%
LO3	-	20%	10%	20%
LO4	-	20%	10%	20%
LO5	-	-		
LO6	-	20%	10%	20%
Share in ECTS	1.5	3.5	-	5
Total	30%	70%	50%	100%

Final Exam:

Learning outcome	Written Exam	Min	Max
LO1	-	-	-
LO2	-	-	-
LO3	-	-	-
LO4	-	-	-
LO5	100%	50%	100%
LO6	-	-	-
Share in ECTS	5	-	5
Total	100%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. McDonald, M.: „Marketinški planovi – kako ih pripremiti, kako ih koristiti", Masmedia, Zagreb 2004.
2. godina (odabrana poglavlja);
3. 2. Kotler, P.; Keller K.L., Martinović, M.: „Upravljanje marketingom, 14. izdanje", Mate d.o.o., Zagreb
4. 2014. godina (odabrana poglavlja);
5. 3. Bayus, B. L. & Shane, S. (2008). Understanding customer needs. Handbook of Technology and
6. Innovation Management, 115-142. (dostupno na: https://maryannfeldman.web.unc.edu/wpcontent/uploads/sites/1774/2011/11/Contribution-of-Public-Entities_2008.pdf#page=136)

1.9. Additional literature

1. Herrmann, A., Huber, F., & Braunstein, C. (2000). Market-driven product and service design:
2. Bridging the gap between customer needs, quality management, and customer
3. satisfaction. International Journal of production economics, 66(1), 77-96. (dostupno na:
4. https://www.researchgate.net/publication/222562067_Marketdriven_product_and_service_design_Bridging_the_gap_between_customer_needs_quality_manage
5. ment_and_customer_satisfaction)
6. 2. Bloch, P. H. (2011). Product design and marketing: Reflections after fifteen years. Journal of Product
7. Innovation Management, 28(3), 378-380. (dostupno na: http://text2fa.ir/wpcontent/uploads/Text2fa.ir-Product-Design-and-Marketing-Reflections-After-Fifteen-Years-1.pdf)
8. 3. Krishnan, V., & Ulrich, K. T. (2001). Product development decisions: A review of the literature.
9. Management science, 47(1), 1-21. (dostupno na:
10. http://www.ktulrich.com/uploads/6/1/7/1/6171812/pdreview.pdf)

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Production Engineering**	
Course status	Mandatory	
Year	2.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+30+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

After listening to and passing the "Production Engineering" course, students understand the role of engineering in the process of production of goods and services. Students are trained to work in teams, and to apply knowledge and skills to analyse production strategies. The aim of the course "Production Engineering" is to acquire competencies for managing knowledge and intellectual resources in the field of production engineering.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Determine the basic techniques and procedures of production engineering and engineering in the production process.
2. Integrate acquired knowledge about materials and production technologies in production engineering.
3. Classify different models of production strategy development and the main factors affecting the production process.
4. Determine the production process, the spatial arrangement of the means of work and the degree of automation of the production process.
5. Plan models for the development of production strategies and modern procedures for improving production processes.
6. Manage production processes by predicting difficulties and problems that may arise in specific production.
7. Classify types of management responsibilities and ways of making decisions in production engineering.

1.4. Course content

1. Introductory lecture, introducing students to the syllabus of the Production Engineering course, lecture content, introduction, literature, obligations, basic concepts.
2. Decision making and process management; Engineering, development and production - Planning and programming.
3. Engineering, development and production - Research and development, final tests and serial production.

4. Business function of engineering - Commercial, financial and other jobs - Introduction of new products.
5. Seminar papers, division of tasks, Tender and tender documentation Production planning, examples from practice
6. Production management – production system, production managers, procedures for improving production processes.
7. Production strategy, production strategy development process, types of production strategies
8. Design of physical processes for the production of goods and services, choice of production process, design of service production, choice of product manufacturing technology.
9. Seminar papers, discussion, exercises on lesson questions. Presentation of seminar papers.

1.5. Teaching methods	☒ lectures ☒ seminars and workshops ☒ exercises ☒ distance learning	☒ individual exercises ☐ multimedia and network ☐ laboratory ☒ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

-After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

- Successfully and timely solve homework in written form

- Students must prepare, submit and defend a seminar paper within the given deadline.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Homework	Seminar / presentation	Min	Max
LO1	4%	-	6%	5%	10%
LO2	-	5%	5%	5%	10%
LO3	5%	5%	-	5%	10%
LO4	5%	10%	5%	10%	20%
LO5	5%	10%	5%	10%	20%
LO6	5%	5%	-	5%	10%
LO7	5%	10%	5%	10%	20%
Share in ECTS	1.45	2.25	1.3	-	5
Total	29%	45%	26%	50%	100%

Final Exam:

Learning outcome	Written Exam	Oral Exam	Min	Max
LO1	5 %	5 %	5 %	10 %
LO2	5 %	5 %	5 %	10 %
LO3	5 %	5 %	5 %	10 %
LO4	10 %	10 %	10 %	20 %
LO5	10 %	10 %	10 %	20 %

LO6	5 %	5 %	5 %	10 %
LO7	10 %	10 %	10 %	20 %
Share in ECTS	2.5	2.5	-	5
Total	50 %	50 %	50 %	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Materials from Merlin e-learning system.
2. Matika, D., "Proizvodno inženjerstvo", Politehnika u Puli,2007 (digitalni oblik)
3. Badanjak, S.: "Osnove inženjeringa u izgradnji", Energetika marketing, Zagreb, 1996.
4. Schroeder, R.,G.: "Upravljanje proizvodnjom": odlučivanje u funkciji proizvodnje», MATE, Zagreb, 1999.

1.9. Additional literature

1. Russell, R.S., Taylor, B.W., Bayley, T., Castillo, I. - Operations Management_Creating Value Along the Supply Chain, 2nd. ed. (2020)
2. James B. Dilworth: "OPERATIONS MANAGEMENT", Mc Grow Hill, inc., New York 1995.
3. Schonberger R. J., Knod M. E.: "OPERATIONS MANAGEMENT", Irwin, 1994.
4. Sanders, R: "Operations Management", John Wiley, fourth edition, USA, 2011

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Simulations of Dynamic Systems**	
Course status	Mandatory	
Year	2.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+15+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

Theoretical and practical training of students for modelling dynamic systems and conducting simulations of dynamic systems using Matlab/Simulink simulation software.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Create a multidisciplinary model based on physical laws.
2. Determine continuous and discrete linear models with distributed and concentrated parameters.
3. Classify the signal in the time and frequency domain.
4. Form a mathematical model in the form of differential equations and state space and in the form of transfer functions.
5. Evaluate the parameters of the dynamic system.
6. Create a simpler dynamic system model (eg pendulum model) and a more complicated dynamic system model (eg robot mechanism motion and magnetic levitation system).
7. Simulate system dynamics and interpret simulation results from the Matlab/Simulink software package.

1.4. Course content

1. Basic model definitions.
2. Objectives of modelling and simulation.
3. Multidisciplinary models.
4. Physical laws. Mathematical notation of mechanical (translational and rotational), electrical, hydraulic, pneumatic, thermal and combined systems by ordinary differential equations.
5. System modelling with concentrated and distributed parameters.
6. Analytical and numerical solution of differential equations. Laplace transforms. Portable functions. Methods of direct integration.
7. Identification of dynamic system parameters.
8. Simulation programs and programming on the Matlab/Simulink software platform.

1.5. Teaching methods	☒ lectures ☐ seminars and workshops	☒ individual exercises ☐ multimedia and network

	☒ exercises ☐ distance learning	☐ laboratory ☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Seminar Paper	Written verification	Individual exercises	Min	Max
LO1	-	-	5%	-	2,5%	5%
LO2	-	-	5%	-	2,5%	5%
LO3	2%	-	10%	-	6%	12%
LO4	2%	-	10%	-	6%	12%
LO5	2%	10%	-	-	6%	12%
LO6	2%	10%	-	10%	11%	22%
LO7	2%	10%	10%	10%	16%	32%
Share in ECTS	0.5	1.5	2	1	-	5
Total	10%	30%	40%	20%	50%	100%

Final Exam:

Learning outcome	Written Exam	Min	Max
LO1	10%	5%	10%
LO2	10%	5%	10%
LO3	20%	10%	20%
LO4	10%	5%	10%
LO5	20%	10%	20%
LO6	20%	10%	20%
LO7	10%	5%	10%
Share in ECTS	5	-	5
Total	100%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E

60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Palm, W.J.: System Dynamics, 2nd edition, Mc-Graw Hill, New York, 2010.
2. Kulakowski B. T., et al: Dynamic Modeling and Control of Engineering Systems, 3rd edition, Cambridge University Press, Cambridge, 2007.
3. …, Using Simulink, The Mathworks, Inc., Natick, MA, USA, 2004.

1.9. Additional literature

1. Chaturvedi, D.K.: Modeling and Simulations of Systems Using Matlab and Simulink, CRC Press, Boca Raton, 2010.
2. Doebelin, E.O.: System Dynamics: Modeling, Analysis, Simulation, Design, Marcel Dekker Inc., New York, 1998.

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Modeling and Simulation of Hydraulic and Pneumatic Systems**	
Course status	Mandatory	
Year	2.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	45+30+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

Acquiring knowledge about hydraulic and pneumatic systems as components of mechatronic systems, as well as the methodologies and instruments for their design

1.2. Course enrolment requirements

Attended: Pneumatic and hydraulics

1.3. Learning outcomes

1. To present servo-hydraulic systems.
2. To present servo-pneumatic systems.
3. Evaluate complex hydraulic and pneumatic systems in mobile plants.
4. Evaluate complex hydraulic and pneumatic systems in industrial plants.
5. Create simulation models of hydraulic and pneumatic systems in order to solve the seminar paper.

1.4. Course content

1. Mathematical and numerical modelling of hydraulic and pneumatic components and systems.
2. Hydraulic and pneumatic servo systems.
3. Hydrostatic hybrid technology.
4. Power plants with hydrostatic power transmission.
5. Air logic control systems.
6. Modelling of complex hydraulic and pneumatic systems with appropriate software tools.
7. Laboratory exercises on FESTO pneumatic-hydraulic systems and FANUC robotic arm.

1.5. Teaching methods	☐ lectures ☐ seminars and workshops ☒ exercises ☒ distance learning	☒ individual exercises ☐ multimedia and network ☒ laboratory ☐ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Seminar paper	Research presentation	Written verification	Min	Max
LO1	-	-	-	10%	5%	10%
LO2	5%	-	-	10%	7.5%	15%
LO3	-	-	30%	10%	20%	40%
LO4	-	5%	5%	-	5%	10%
LO5	5%	20%	-	-	12.5	25%
Share in ECTS	0.5	1.25	1.75	1.5	-	5
Total	10%	25%	35%	30%	50%	100%

Final Exam:

Learning outcome	Written Exam	Min	Max
LO1	10%	5%	10%
LO2	10%	5%	10%
LO3	30%	15%	30%
LO4	10%	5%	10%
LO5	40%	20%	40%
Share in ECTS	1	0,5	1
Total	100%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Siminati, D: Uljna hidraulika, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2012.
2. Petrić, J.: ''Automatska regulacija: uvod u analizu i sintezu'', Fakultet strojarstva i brodogradnje, Sveučilište u Zagrebu, 2012.
3. Gregov, G.: Pneumatsko upravljanje, skripa za vježbe, Rijeka, 2019.

1.9. Additional literature

1. H. E. Merritt: ''Hydrauilc Control Systems'', John Wilez&Sons, 1967 2. Bishop, R. H., The Mechatronics Handbook, CRC Press, Boca Raton, 2002.
1.10. Quality monitoring method
Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Electrical filters**	
Course status	Elective	
Year	2.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+15+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

Ability of solving given problem in manner to determine electrical filter which fulfill given specifications. Developing ability of working in small groups and presentation obtained results.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Apply basic mathematical operations on time domain signals.
2. Estimate and compare given filter transfer function approximations.
3. Describe filter realizations designed with operational and transconductance amplifiers.
4. Analise high-order filter structures.
5. Make the first and the second order filter design using operational and transconductance. amplifiers based on given specifications.
6. Make high-order filter cascade realization using operational and transconductance amplifiers based on given specifications.
7. Estimate sensitivity measures of electrical filters.

1.4. Course content

1. Operation over signals.
2. Operational amplifier, ideal and real.
3. Frequency analysis and responses.
4. Signal filtering and filter classification. Filter characteristics: amplitude and phase. Group time delay. Filter transfer function.
5. Approximation of filter responses with rational functions. Approximation types: Butterworth, Chebyshev, Bessel, Cauer. Passive realizations. Active realizations.
6. The first and the second order filter blocks.
7. High-order filter realizations. Active filter structures.
8. Sensitivity. Influence of real parameters.

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☒ distance learning	☒ individual exercises ☐ multimedia and network ☒ laboratory ☐ mentoring work

		☐ other _____

1.6. Students' obligations to take the exam

Course attendance, homework, laboratory work, continuous knowledge testing, written exam.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Homework	Laboratory exercises	Written exams	Min	Max
I1	2%	-	-	5%	3,5%	7%
I2	4%	-	-	5%	4,5%	9%
I3	4%	-	-	10%	7%	14%
I4	-	10%	-	-	5%	10%
I5	-	-	20%	-	10%	20%
I6	-	10%	20%	-	15%	30%
I7	-	10%	-	-	5%	10%
Share in ECTS	0.5	1.5	2	1	-	5
Total	10%	30%	40%	20%	50%	100%

Final Exam:

Learning outcome	Written Exam	Min	Max
LO1	7%	3,5%	7%
LO2	9%	4,5%	9%
LO3	14%	7%	14%
LO4	10%	5%	10%
LO5	20%	10%	20%
LO6	30%	15%	30%
LO7	10%	5%	10%
Share in ECTS	5	-	5
Total	100%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C

75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Stojković, N., Mijat, N.: Analogna obrada signala, Tehnički fakultet, Rijeka, 2005.

1.9. Additional literature

1. N. Stojković, V. Naglić, N. Mijat: Teorija mreža i linija, Tehnički fakultet, Rijeka, 2005.

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Finance Control**	
Course status	Elective	
Year	2.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	15+45+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

The aim of the course is to understand and adopt the basic elements of the analysis of the creditworthiness of companies, and to teach students to calculate basic financial indicators, as well as for a simple assessment of the creditworthiness of companies using the obtained financial indicators of operations.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Determine the basic features of financial statements of companies;
2. Determine the basic financial indicators used in creditworthiness assessment;
3. Analyze and differentiate the basic steps in calculating financial indicators and monitor their trends;
4. Determine and compare the instruments of financial analysis in assessing creditworthiness;
5. Evaluate and assert financial indicators when calculating creditworthiness.

1.4. Course content

1. Financial analysis and the basics of lending;
2. Basic terms;
3. Financial reports of companies, balance sheet and profit and loss account;
4. Classification of companies by size;
5. Horizontal and vertical analysis;
6. Basic financial indicators in determining creditworthiness;
7. Liquidity indicators and working capital;
8. Indebtedness indicators;
9. Debt repayment indicators;
10. Profitability indicators;
11. Calculation and analysis of financial performance indicators.

1.5. Teaching methods	☒ lectures ☒ seminars and workshops ☒ exercises ☒ distance learning	☒ individual exercises ☐ multimedia and network ☐ laboratory ☒ mentoring work

		☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

- Active participation in exercises;

- Independently calculate and analyze financial indicators using an example from practice;

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Exercise 1	Exercise 2	Calculation and analysis of indicators – case study	Min	Max
LO1	3%	7%	-	-	5%	10%
LO2	3%	7%	-	-	5%	10%
LO3	3%	-	7%	-	5%	10%
LO4	5%	-	9%	-	7%	14%
LO5	-	-		56%	23%	56%
Share in ECTS	0,7	0,7	0,8	2,8	-	5
Total	14%	14%	16%	56%	50%	100%

Final Exam:

Learning outcome	Calculation and analysis of indicators – case study	Oral Exam	Min	Max
LO1	-	10%	5%	10%
LO2	-	10%	5%	10%
LO3	-	10%	5%	10%
LO4	-	14%	7%	14%
LO5	56%	-	23%	56%
Share in ECTS	2,8	2,2	-	5
Total	56%	44%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E

60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Materials on Merlin e-learning system
2. Leko V. (1996): Procjena boniteta trgovačkog društva, Masmedia, Zagreb

1.9. Additional literature

1. Žager K., Žager L. (1999)- Analiza financijskih izvještaja, Masmedia, Zagreb

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Management and Organization**	
Course status	Elective	
Year	2.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	45+15+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

The general goal of the course is to train students to successfully understand the concepts, roles and tasks of management in modern organizations and to understand and interpret the organizational forms of modern organizations.

The specific goals are to train students to independently manage the managerial functions of the function, to acquire knowledge about methods and ways of working, and to successfully apply the acquired knowledge in solving business problems of the company in regular and complex situations; development of one's own potential and competencies for management analysis and performing managerial tasks at different organizational levels in different organizations; to acquaint students with basic organizational theories and key organizational models and to apply the acquired theoretical knowledge in practice.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Design the role and concept of management,
2. Create planning models,
3. Create organizational models,
4. Create management models,
5. Create control models,
6. Create a business strategy,
7. Form a type of organizational structure
8. Present an adequate organizational structure.

1.4. Course content

1. Introduction and theory of management,
2. Planning,
3. Organizing,
4. Guidance,
5. Controlling,
6. Business strategy,
7. Organizational structure,
8. Contemporary organizational forms.

1.5. Teaching methods	☒ lectures ☒ seminars and workshops ☐ exercises ☐ distance learning	☒ individual exercises ☐ multimedia and network ☐ laboratory ☒ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity	Solving tasks in class	Discussion	Min	Max
LO1	2%	4%	5%	6,25%	12,5%
LO2	2%	4%	5%	6,25%	12,5%
LO3	2%	5%	6%	6,25%	12,5%
LO4	2%	5%	6%	6,25%	12,5%
LO5	2%	5%	6%	6,25%	12,5%
LO6	2%	5%	6%	6,25%	12,5%
LO7	2%	5%	6%	6,25%	12,5%
LO8	2%	5%	6%	6,25%	12,5%
Share in ECTS	0.8	1.9	2.3	-	5
Total	16%	38%	46%	50%	100%

Final Exam:

Learning outcome	Oral Exam	Min	Max
LO1	12,5%	6,25%	12,5%
LO2	12,5%	6,25%	12,5%
LO3	12,5%	6,25%	12,5%
LO4	12,5%	6,25%	12,5%
LO5	12,5%	6,25%	12,5%
LO6	12,5%	6,25%	12,5%
LO7	12,5%	6,25%	12,5%
LO8	12,5%	6,25%	12,5%
Share in ECTS	5	-	5
Total	100%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Buble, M.: Management, Ekonomski fakultet, Split, 2000.
2. Bahtijarević-Šiber, F. i dr.: Organizacijska teorija, Informator, Zagreb, 1991.
3. Sikavica, P., Bahtijarević-Šiber, F., Pološki Vokić, N.: Temelji menadžmenta, Školska knjiga, Zagreb, 2008.

1.9. Additional literature

1. Certo, S. M.: Modern Management, Prentice Hall, New Jersey, 2005
2. Dessler, G.: Framework for Management, Prentice Hall, New Jersey, 2002.
3. Robbins, S. P., Coulter, M.: Management, Prentice Hall, New Yersey, 2005.

1.10. Quality monitoring method

Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Professional Practice**	
Course status	Mandatory	
Year	2.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	8
	Number of hours in the semester (L+E+S)	0+240+0

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

The aim of the Professional practice course is for the student to acquire practical knowledge and skills that enable him to complement the theoretical knowledge he has acquired or that he acquires in the teaching process, and which through professional practice he learns to apply in his work and qualify him for the labor market.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Compare theoretical knowledge with profession.
2. Combine techniques, skills and modern tools necessary for engineering practice.
3. Assess the possibility of applying theoretical knowledge.
4. To present responsibility, consistency, accuracy, timeliness.

1.4. Course content

1. Getting to know the company/institution, work organization.
2. Overview of the production, service and/or processing activities of the company/institution.
3. Comprehensive overview of the technological and work process.
4. Acquaintance, mastery and application of the basic rules of safety at work, but also the rules of possible certificates and norms of the company/institution (quality rules).
5. Technical and other documentation of the company/institution related to business operations
6. Description of the instruments, tools and equipment used during professional practice and the anticipated protection measures during their use.
7. Description of methods, techniques and skills used during practical work with reference to previously acquired theoretical knowledge.
8. Depending on the activities of the company or institution where the internship is carried out, the student will adjust his professional internship program so that he devotes most of his stay in the company or appropriate institution to practical knowledge of the issues he studies during his professional studies.

1.5. Teaching methods	☐ lectures ☐ seminars and workshops	☐ individual exercises ☐ multimedia and network

	☒ exercises ☐ distance learning ☒ fieldwork	☐ laboratory ☒ mentoring work ☐ other _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

Regular attendance at practice and fulfillment of other obligations prescribed by the implementation program, as well as preparation of a professional practice work diary.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

The student is continuously monitored and evaluated during the professional practice, and upon completion, the work diary is evaluated and the student is evaluated.

Continuous checking:

Learning outcome	Regular practice attendance	Work diary / Report	Min	Max
LO1	20%	10%	15%	30%
LO2	15%	10%	12,5%	25%
LO3	15%	10%	12,5%	25%
LO4	10%	10%	10%	20%
Share in ECTS	4,8	3,2	-	8
Total	60%	40%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

NOTE: The professional practice course is not graded.
Evaluation of achievements is carried out through continuous verification, and the student must fulfill the expected learning outcomes as part of regular attendance at practice and filling in the work diary.
The student has passed the course if he receives a Certificate of Professional Internship from the company where he did the professional internship and a certified Professional Internship Work Diary from the subject holder.

1.8. Obligatory literature

1. Rulebook on professional practice, Procedures on professional practice
2. Documents related to professional practice (Referral for professional practice, Work diary, Certificates of completed professional practice)

3. Evaluation forms for professional practice.
1.9. Additional literature
1. Documentation related to the company/institution where professional practice is carried out.
1.10. Quality monitoring method
Teaching evaluations; student survey.

Istarsko veleučilište
Università Istriana
di scienze applicate

Study program	**Professional Graduate Study Programme in Mechatronics**	
Course title	**Research Methodology**	
Course status	Mandatory	
Year	2.	
Teaching load (Lectures, Exercises, Seminars)	ECTS	5
	Number of hours in the semester (L+E+S)	30+0+15

1. DESCRIPTION OF THE COURSE

1.1. Course objectives

The aim of the course is to familiarize students with research methods and techniques and train them for independent implementation of professional and scientific research.

1.2. Course enrolment requirements

There are no requirements for enrolling in the course.

1.3. Learning outcomes

1. Choose and use different research methods in accordance with the research questions;
2. Apply the rules of citation and paraphrasing and the default standard of citing literature;
3. Present and interpret the conducted research;
4. Adopt and apply ethical principles in research;
5. Create and shape the concept of the final thesis.

1.4. Course content

1. Introduction to research methodology and phases of research work.
2. Data collection methods - procedures and instruments.
3. Data processing and analysis.
4. Paraphrasing, quoting and writing literature.
5. Structuring and guidelines for creating the thesis concept.

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☐ exercises ☒ distance learning ☒ individual exercises	☐ multimedia and network ☒ group assignments and teamwork ☒ topic research _____

1.6. Students' obligations to take the exam

After arriving on mobility, the student is obliged to contact the teacher by e-mail and agree on teaching activities and obligations.

1.7. Evaluating and grading of the student work during classes and at the final exam with linking learning outcomes, teaching methods and assessment.

Two forms of achievement evaluation are possible:

- Continuous checking during classes
- Taking the final exam

Continuous checking:

Learning outcome	Class activity group assignments and teamwork	Independent task	Presentation research	Min	Max
LO1	10%	-	-	5%	10%
LO2	10%	-	-	5%	10%
LO3	-	-	30%	15%	30%
LO4	-	5%	5%	5%	10%
LO5	20%	20%	-	20%	40%
Share in ECTS	2	1.25	1.75	-	5
Total	40%	25%	35%	50%	100%

Final Exam:

Learning outcome	Oral Exam	Min	Max
LO1	10%	5%	10%
LO2	10%	5%	10%
LO3	30%	15%	30%
LO4	10%	5%	10%
LO5	40%	20%	40%
Share in ECTS	5	-	5
Total	100%	50%	100%

The student passed the course if he achieved a percentage of points that is greater than or equal to the defined minimum for each learning outcome.
The results that the student does not pass during the continuous assessment, will be taken during the examination period.
The passed learning outcome through continuous verification or through the exam period is "valid" until the course is repeated, after which it is retaken.

The final grade of the course:

Range of points %	Numerical grade	ECTS grade
0,00-49,99	insufficient (1)	FX, F
50,00-59,99	sufficient (2)	D, E
60,00-74,99	good (3)	C
75,00-89,99	very good (4)	B
90,00-100,00	excellent (5)	A

1.8. Obligatory literature

1. Materials from e-learning

1.9. Additional literature

In agreement with the student.

1.10. Quality monitoring method

Teaching evaluations; student survey.