PRIRODOSLOVNO-MATEMATIČKI FAKULTET U SPLITU

Erasmus catalogue
2026./2027.

	ID	Course name	Course name (EN)	Hours (Lectures+Seminars+ Practicals+Fieldwork)	ECTS	Semester	Level	Programme
1.	PMT201 251420	3D printanje	3D printing	30+0+30+0	6	1 5 3	Graduate Undergraduate	Physics and Computer Science, specialization in Education; Computer Science; Physics (specialization in Education); Physics (specialization in Computational Physics); Computer Science and Technics, specialization in Education; Mathematics and Computer Science, specialization in Education
2.	PMM602 245248	Algebra I	Algebra I	45+0+0+0	6	1	Graduate	Mathematics (specialization in Pure Mathematics)
3.	PMM606 245252	Algebra II	Algebra II	45+0+0+0	6	2	Graduate	Mathematics (specialization in Pure Mathematics)
4.	PMIK25 230831	Analitika učenja	Learning Analytics in Computer Based Education	30+0+30+0	5	2	Graduate	Data science and engineering
5.	PMP272 186528	Analiza podataka u fizici visokih energija	Data Analysis in High Energy Physics	30+0+30+0	6	3	Graduate	Physics (specialization in Astrophysics and Elementary Particle Physics); Physics (specialization in Computational Physics)
6.	PMII15 211924	Arhitekture neuronskih mreža	Neural Network Architectures	30+0+30+0	5	3	Graduate	Data science and engineering; Mathematics (specialization in Computer Science); Mathematics (specialization in Statistics and Computer Science); Mathematics and Computer Science, specialization in Education; Computer Science, specialization in Education
7.	PMP133 267599	Astročestična fizika	Astroparticle Physics	30+0+15+0	6	3	Graduate	Physics (specialization in Astrophysics and Elementary Particle Physics); Physics (specialization in Computational Physics)
8.	PMP16D 173831	Atmosfersko onečišćenje	Atmospheric pollution	30+0+15+0	4	2	Graduate	Physics (specialization in Biophysics); Physics (specialization in Environmental Physics)

9.	PMIH10 79286	Baze podataka	Databases	30+0+30+0	5	3 5 1	Graduate Undergraduate	Engineering Physics (specialization in Thermodynamic Systems); Engineering Physics (specialization in Mechanical Systems); Mathematics (staro); Mathematics and Computer Science (staro); Computer Science; Physics (specialization in Computational Physics); Mathematics and Computer Science, specialization in Education; Mathematics (specialization in Mathematics); Mathematics (specialization in Computer Science); Computer Science and Technics; Physics; Mathematics (specialization in Statistics and Computer Science)
10.	PMP141 267582	Biofizika	Biophysics	45+15+30+0	6	1 3	Graduate	Physics and Computer Science, specialization in Education; Physics (specialization in Education); Physics (specialization in Biophysics); Physics (specialization in Computational Physics)
11.	PMP140 267579	Bioinformatika	Bioinformatics	30+0+30+0	5	1 3	Graduate	Physics and Computer Science, specialization in Education; Physics (specialization in Biophysics); Mathematics and Physics, specialization in Education
12.	PMM950 159820	Diferencijalne jednadžbe	Differential equations	30+0+30+0	6	3	Undergraduate	Mathematics and Physics; Mathematics and Physics (specialization in Education); Mathematics and Physics (Inženjerski); Mathematics and Physics (Matematika i fizika (staro)); Physics
13.	PMM810 173195	Diofantske jednadžbe	Diophantine equation	30+15+0+0	5	3 1	Graduate	Mathematics and Physics, specialization in Education; Mathematics (specialization in Pure

								Mathematics); Mathematics (specialization in Education); Mathematics and Computer Science, specialization in Education
14.	PMP264 216062	Ekstremne pojave u okolišu	Extreme Environmental Phenomena	30+0+15+0	4	3	Graduate	Physics (specialization in Environmental Physics)
15.	PMM019 111939	Elementarna geometrija	Elementary geometry	30+0+30+0	6	2 4	Undergraduate	Mathematics (staro); Mathematics and Computer Science (staro); Mathematics and Physics; Mathematics and Physics (specialization in Education); Mathematics and Physics (Matematika i fizika (staro)); Mathematics and Computer Science, specialization in Education; Mathematics
16.	PMT168 300464	Energetika	Energetics	30+30+0+0	4	1	Graduate	Computer Science and Technics, specialization in Education
17.	PMP108 173241	Filozofija znanosti	Philosophy of Science	15+15+0+0	2	3 5	Undergraduate	Computer Science; Physics
18.	PMP163 216059	Fizika mora I	Ocean Physics I	30+0+15+0	5	3 1	Graduate	Physics (specialization in Education); Physics (specialization in Environmental Physics); Mathematics and Physics, specialization in Education
19.	PMP268 240173	Fizika mora II	Ocean Physics II	30+5+15+0	5	2 4	Graduate	Physics (specialization in Environmental Physics); Mathematics and Physics, specialization in Education
20.	PMIK80 173003	Informatička praksa	Informatics Practice	0+0+176+0	5	5 6 4	Undergraduate Graduate	Computer Science; Computer Science and Technics, specialization in Education
21.	267487	Informatički projekt iz baza podataka	IT Project - Database	0+30+0+0	2	4	Undergraduate	Computer Science
22.	PMIH30 172995	Interakcija čovjeka i računala: osnove i principi	Human Computer Interaction:: Fundamentals and Principles	30+0+30+0	5	2 4	Graduate Undergraduate	Physics and Computer Science, specialization in Education; Computer Science; Computer Science and Technics, specialization in Education;

								Mathematics (specialization in Computer Science); Mathematics and Computer Science, specialization in Education
23.	PMP407186484	Istraživački rad iz biofizike	Research in Biophysics	10+20+0+0	5	3	Graduate	Physics (specialization in Biophysics)
24.	PMP26C227855	Istraživački rad iz fizike okoliša	Research in Environmental Physics	10+20+30+0	6	3	Graduate	Physics (specialization in Environmental Physics)
25.	PMIK65280038	Istraživački rad u informatičkom obrazovanju	Research in Computer Science Education	15+30+0+0	5	4	Graduate	Mathematics and Computer Science, specialization in Education; Computer Science, specialization in Education
26.	PMS13579108	Kineziološka aktivnost, fitness i zdravlje	Kinesiological activity, fitness and health	15+0+15+0	2	3 1	Graduate	Physics (specialization in Education); Physics (specialization in Astrophysics and Elementary Particle Physics); Physics (specialization in Biophysics); Physics (specialization in Environmental Physics); Physics (specialization in Computational Physics); Mathematics and Physics, specialization in Education; Mathematics (specialization in Education); Biology and Chemistry, specialization in Education; Mathematics and Computer Science, specialization in Education; Computer Science, specialization in Education
27.	PMP110251437	Klasična mehanika I	Classical Mechanics I	45+0+30+0	6	3	Undergraduate	Physics
28.	PMF5	Klimatske promjene, meteorologija i oceanografija u nastavi	Klimatske promjene, meteorologija i oceanografija u nastavi	15+0+0+0	5	2	Doctoral	Istraživanje u edukaciji u području prirodnih i tehničkih znanosti (Fizika)
29.	PMM11660987	Kompleksna analiza	Complex analysis	30+0+30+0	6	6 5	Undergraduate	Mathematics (staro); Mathematics and Computer Science (staro); Mathematics and Physics; Mathematics and Physics (specialization in Education);

								Mathematics and Physics (Inženjerski); Mathematics and Physics (Matematika i fizika (staro)); Mathematics and Computer Science, specialization in Education; Mathematics (specialization in Mathematics); Mathematics (specialization in Computer Science); Mathematics (specialization in Applied Mathematics)
30.	PMSN09 134030	Komunikacijske vještine	Communication Skills	15+15+0+0	2	6 2 4	Undergraduate Graduate	Computer Science; Physics (specialization in Education); Mathematics and Physics, specialization in Education; Computer Science and Technics, specialization in Education; Mathematics (specialization in Education); Biology and Chemistry, specialization in Education; Mathematics and Computer Science, specialization in Education
31.	PMP107 251439	Matematičke metode fizike I	Mathematical methods of physics I	45+15+30+0	6	3	Undergraduate	Physics
32.	PMP102 79383	Matematičke metode fizike III	Mathematical Methods of Physics III	30+0+30+0	5	5	Undergraduate	Physics
33.	PMM017 240162	Matematički programski alati I	Mathematical program tools I	0+0+30+0	2	5 3	Undergraduate	Mathematics and Computer Science, specialization in Education; Mathematics (specialization in Mathematics); Mathematics (specialization in Computer Science); Mathematics (specialization in Applied Mathematics)
34.	PMM018 147957	Matematički programski alati II	Mathematical program tools II	0+0+30+0	2	2 6	Undergraduate	Mathematics (staro); Mathematics and Computer Science (staro); Mathematics and Physics; Mathematics and Physics (Inženjerski);

								Mathematics and Physics (Matematika i fizika (staro)); Mathematics and Computer Science, specialization in Education; Mathematics (specialization in Mathematics); Mathematics (specialization in Computer Science); Mathematics (specialization in Applied Mathematics)
35.	PMT154 300095	Materijali	Materials	45+0+30+0	5	3	Undergraduate	Computer Science and Technics
36.	PMP161 240172	Meteorologija I	Meteorology I	30+5+15+0	5	3 1	Graduate	Physics (specialization in Education); Physics (specialization in Environmental Physics); Mathematics and Physics, specialization in Education
37.	PMP260 216065	Meteorologija II	Meteorology II	30+0+15+0	5	2	Graduate	Physics (specialization in Environmental Physics)
38.	PMIH40 279897	Metodologija dizajna interakcija	Interaction Design Methodology	30+15+0+0	5	5 1	Undergraduate Graduate	Computer Science; Computer Science, specialization in Education
39.	PMP249 227869	Modeliranje i simulacije biomakromolekula	Modelling and Simulations of Biomacromolecule	30+0+30+0	5	3	Graduate	Physics (specialization in Biophysics)
40.	PMP115 267519	Napredna statistička fizika	Advanced Statistical Physics	45+15+15+0	6	6	Undergraduate	Physics
41.	PMM605 245253	Normirani prostori	Normed spaces	45+0+0+0	6	2	Graduate	Mathematics (specialization in Pure Mathematics)
42.	PMP203 267577	Nuklearna fizika	Nuclear Physics	30+0+30+0	6	4 2	Graduate	Physics and Computer Science, specialization in Education; Physics (specialization in Education); Physics (specialization in Astrophysics and Elementary Particle Physics); Physics (specialization in Biophysics); Physics (specialization in Environmental Physics); Physics (specialization in Computational Physics); Mathematics and Physics, specialization in Education

43.	PMM118 79583	Numerička analiza	Numerical analysis	30+0+30+0	5	4 2	Graduate	Mathematics (specialization in Computer Science); Mathematics (specialization in Pure Mathematics); Mathematics (specialization in Statistics and Computer Science)
44.	PMM103 60972	Obične diferencijalne jednadžbe	Ordinary differential equations	30+0+30+0	6	5 3	Undergraduate	Mathematics (staro); Mathematics and Computer Science (staro); Mathematics (specialization in Mathematics); Mathematics (specialization in Computer Science); Mathematics (specialization in Applied Mathematics)
45.	PMT179 87409	Obnovljivi izvori energije	Renewable Energy Sources	15+15+0+0	2	2 4	Graduate	Engineering Physics (specialization in Thermodynamic Systems); Engineering Physics (specialization in Mechanical Systems); Physics (specialization in Education); Physics (specialization in Computational Physics); Computer Science and Technics, specialization in Education
46.	PMIC61 251416	Okviri i alati za razvoj web aplikacija	Full Stack Development	30+15+0+0	5	5 3	Undergraduate Graduate	Computer Science; Mathematics and Computer Science, specialization in Education
47.	PMM607 245254	Operatori na normiranim prostorima	Operators on Normed Spaces	45+0+0+0	6	3	Graduate	Mathematics (specialization in Pure Mathematics)
48.	PMM715 201629	Osnovne algebarske strukture	Basic algebraic structures	30+0+30+0	6	6 2 4	Undergraduate Graduate	Mathematics and Physics; Mathematics and Physics (specialization in Education); Mathematics and Physics (Matematika i fizika (staro)); Mathematics and Computer Science, specialization in Education; Mathematics (specialization in Mathematics); Mathematics (specialization in Education)

49.	PMP009 68195	Povijest klasične fizike	History of Classical Physics	30+0+0+0	3	1 3	Graduate	Physics and Computer Science, specialization in Education; Physics (specialization in Education); Physics (specialization in Astrophysics and Elementary Particle Physics); Physics (specialization in Biophysics); Physics (specialization in Environmental Physics); Physics (specialization in Computational Physics); Mathematics and Physics, specialization in Education; Mathematics (specialization in Pure Mathematics)
50.	PMP103 68220	Povijest moderne fizike	History of Modern Physics	30+0+0+0	3	2 4	Graduate	Engineering Physics (specialization in Thermodynamic Systems); Engineering Physics (specialization in Mechanical Systems); Physics and Computer Science, specialization in Education; Physics (specialization in Education); Physics (specialization in Astrophysics and Elementary Particle Physics); Physics (specialization in Biophysics); Physics (specialization in Environmental Physics); Physics (specialization in Computational Physics); Mathematics and Physics, specialization in Education
51.	PMP162 61264	Prirodne znanosti i okoliš	Natural Science and the Environment	30+0+10+0	4	3 5	Undergraduate	Mathematics (staro); Mathematics (specialization in Mathematics); Mathematics (specialization in Computer Science); Physics
52.	PMID35 173004	Programiranje mobilnih aplikacija	Mobile Applications Programming	30+0+30+0	5	3	Graduate	Computer Science and Technics, specialization in Education; Mathematics and Computer Science, specialization in Education; Computer Science, specialization in Education

53.	PMIC60 79327	Programiranje mrežnih aplikacija	Network Application Programming	30+0+30+0	5	6 4 2	Undergraduate Graduate	Mathematics and Computer Science (staro); Computer Science; Physics (specialization in Computational Physics); Mathematics and Computer Science, specialization in Education; Mathematics (specialization in Computer Science); Computer Science and Technics; Physics
54.	PMP073 279889	Računalne metode u fizici	Computational methods in physics	30+0+30+0	4	5 1	Undergraduate	Mathematics and Physics (specialization in Education); Mathematics and Physics (Inženjerski); Mathematics and Physics (Matematika i fizika (staro)); Physics
55.	PMII60 147925	Računalni vid	Computer vision	30+0+30+0	5	2 4 6	Graduate Undergraduate	Physics and Computer Science, specialization in Education; Computer Science; Computer Science and Technics, specialization in Education; Mathematics (specialization in Computer Science); Mathematics and Computer Science, specialization in Education; Computer Science, specialization in Education
56.	PMT112 279900	Računalom podržani dizajn proizvoda (CAD)	Computer aided product design (CAD)	30+0+30+0	5	6 2 4	Undergraduate Graduate	Computer Science; Computer Science and Technics, specialization in Education; Computer Science, specialization in Education
57.	PMIC50 148038	Raspodijeljeni sustavi	Distributed systems	30+0+30+0	5	2 4	Graduate	Physics and Computer Science, specialization in Education; Computer Science and Technics, specialization in Education; Mathematics (specialization in Computer Science); Mathematics and Computer Science, specialization in Education;

								Computer Science, specialization in Education
58.	PMM161 240186	Seminar iz osnova matematike	Elementary Mathematics in basic education	0+45+0+0	4	6 4 2	Undergraduate Graduate	Mathematics and Physics; Mathematics and Physics (specialization in Education); Mathematics and Physics (Matematika i fizika (staro)); Mathematics and Computer Science, specialization in Education; Mathematics (specialization in Mathematics); Mathematics (specialization in Education)
59.	PMIC40 280035	Sigurnost računalnih učionica	Sigurnost računalnih učionica	15+30+0+0	5	4 2	Graduate	Mathematics and Computer Science, specialization in Education; Computer Science, specialization in Education
60.	PMM920 160164	Složenost algoritama	Complexity of algorithms	30+0+30+0	6	3	Graduate	Mathematics (specialization in Computer Science); Mathematics (specialization in Statistics and Computer Science)
61.	PMP114 267518	Statistička fizika	Statistical Physics	45+0+30+0	6	1 5	Graduate Undergraduate	Physics and Computer Science, specialization in Education; Mathematics and Physics (specialization in Education); Mathematics and Physics (Inženjerski); Mathematics and Physics (Matematika i fizika (staro)); Physics
62.	PMP271 148176	Stohastičke simulacije u klasičnoj i kvantnoj fizici	Stochastic Simulations in Classical and Quantum Physics	30+0+30+0	6	2	Graduate	Physics (specialization in Education); Physics (specialization in Astrophysics and Elementary Particle Physics); Physics (specialization in Biophysics); Physics (specialization in Environmental Physics); Physics (specialization in Computational Physics)
63.	PMS252 173165	Strani jezik u struci I (Engleski)	English for Specific Purposes I	0+30+0+0	2	1	Undergraduate	MP; Biology and Chemistry; Biology

64.	PMS251 172991	Strani jezik u struci II (Engleski)	English for Specific Purposes II	0+30+0+0	2	2	Undergraduate	Mathematics (staro); Mathematics and Computer Science (staro); Computer Science; Computer Science and Technics; Physics
65.	PMS253 173171	Strani jezik u struci II (Engleski)	English for Specific Purposes (II)	0+30+0+0	2	2	Undergraduate	Biology and Chemistry; Biology
66.	PMT157 300139	Tehnologije obrade materijala	Processing of materials	30+0+30+0	5	5	Undergraduate	Computer Science and Technics
67.	PMP401 267581	Teorija relativnosti	Relativity	30+0+30+0	6	1 3	Graduate	Physics and Computer Science, specialization in Education; Physics (specialization in Education); Physics (specialization in Astrophysics and Elementary Particle Physics); Physics (specialization in Computational Physics); Mathematics and Physics, specialization in Education
68.	PMS160 79109	Upravljanje razredom	Classroom management	15+15+0+0	2	3 1	Graduate	Physics and Computer Science, specialization in Education; Physics (specialization in Education); Mathematics and Physics, specialization in Education; Computer Science and Technics, specialization in Education; Mathematics (specialization in Education); Biology and Chemistry, specialization in Education; Mathematics and Computer Science, specialization in Education; Computer Science, specialization in Education
69.	PMB711 251477	Uvod u biofiziku stanice	Uvod u biofiziku stanice	30+5+10+0	3	3	Graduate	Molecular Biology
70.	PMP096 79401	Uvod u fiziku	Introduction to Physics	45+0+15+0	4	2	Undergraduate	Computer Science and Technics
71.	PMP160 279896	Uvod u fiziku okoliša	Introduction to Environmental Physics	30+0+15+0	4	4 6	Graduate Undergraduate	Mathematics and Physics, specialization in Education; Physics

72.	PMM151 240185	Uvod u matematičku analizu	Introduction to mathematical analysis	45+0+60+0	8.5	1	Undergraduate	Mathematics and Physics; Mathematics and Physics (specialization in Education); Mathematics and Physics (Inženjerski); Mathematics and Physics (Matematika i fizika (staro)); Mathematics and Computer Science, specialization in Education; Mathematics
73.	PMP261 216053	Uvod u mehaniku fluida	Introduction to Fluid Mechanics	30+0+30+0	6	3 1	Graduate	Physics (specialization in Biophysics); Physics (specialization in Environmental Physics); Physics (specialization in Computational Physics)
74.	PMP165 216064	Uvod u obradu podataka	Introduction to Data Analysis	20+0+30+0	5	2	Graduate	Physics (specialization in Environmental Physics)
75.	PMII10 79324	Uvod u umjetnu inteligenciju	Introduction to Artificial Intelligence	30+0+30+0	5	5 1 3	Undergraduate Graduate	Mathematics (staro); Mathematics and Computer Science (staro); Physics and Computer Science, specialization in Education; Computer Science; Mathematics and Computer Science, specialization in Education; Mathematics (specialization in Mathematics); Mathematics (specialization in Computer Science); Computer Science and Technics, specialization in Education; Physics; Mathematics (specialization in Pure Mathematics); Mathematics (specialization in Education)
76.	PMP006 251436	Valovi i optika	Waves and Optics	60+15+30+0	9	3 5	Undergraduate	Mathematics and Physics; Mathematics and Physics (specialization in Education); Mathematics and Physics (Inženjerski); Mathematics and Physics

								(Matematika i fizika (staro)); Mathematics (specialization in Applied Mathematics); Physics
77.	PMM201 79128	Vektorski prostori I	Vector spaces I	30+0+30+0	6	5 6 4 2	Undergraduate Graduate	Mathematics (staro); Mathematics and Computer Science (staro); Mathematics and Physics (Inženjerski); Mathematics and Physics, specialization in Education; Mathematics (specialization in Mathematics); Mathematics (specialization in Computer Science); Mathematics (specialization in Applied Mathematics); Mathematics (specialization in Education); Mathematics and Computer Science, specialization in Education
78.	PMP105 173817	Znanstvena komunikacija	Scientific Communication	20+10+0+0	2	4 2	Graduate	Physics and Computer Science, specialization in Education; Physics (specialization in Education); Physics (specialization in Astrophysics and Elementary Particle Physics); Physics (specialization in Biophysics); Physics (specialization in Environmental Physics); Physics (specialization in Computational Physics); Mathematics and Physics, specialization in Education

Course name	3D printing		
ID	PMT201	Study year	2.
Lecturer	doc. dr. sc. Ivan Peko	ECTS workload	6.0
Associates		Number of hours	L: 30, S: 0, E: 30, P: 0
Course status	Elective	Online percentage	0%

Course description	
Course aims	- To be informed about different processes and technologies of 3D printing and the possibilities of their application in different branches of industry, medicine, dentistry, bioengineering, biotechnology, nanotechnology... - Develop skills for 3D design and creation of designed models on devices and machines for 3D printing - Acquire skills about all stages of the 3D printing process and producing a functional product - To be informed about the possibilities of connecting 3D printing and 3D scanning and other 3D technologies with the aim of applying them in different fields: in industry, medicine, dentistry, bioengineering, biotechnology...
Enrolment requirements	None.
Learning outcomes	Learning outcomes expected at the level of the course (4 to 10 learning outcomes) - Describe different 3D printing procedures and processes - Choose the appropriate 3D printing technology depending on specific requirements and applications - Choose a suitable material for making the desired product using the 3D printing process - Define suitable parameters on the machine/device for 3D printing with the aim of obtaining a quality printed product - Plan the 3D printing process from the initial design to the final product - Connect 3D scanning with 3D printing - Design own product in 3D design software and produce it on a 3D printer
Syllabus	Lectures: 1. Introduction to 3D printing, historical development of the technology 2. Application of 3D printing 3. Phases and flow of the 3D printing process 4. 3D printing processes: production from liquid materials 5. 3D printing processes: production from powder materials 6. 3D printing processes: production from solid materials 7. Machines and devices for 3D printing, 3D printing parameters settings 8. Materials for 3D printing 9. Design for 3D printing 10. 3D printing in industry 11. 3D / 4D printing in medicine, dentistry 12. 3D / 4D printing in bioengineering and biotechnology 13. 3D printing in nanotechnology 14. Future perspectives and trends in the development of 3D printing 15. 3D scanning, connecting 3D scanning and 3D printing, reversible engineering Exercises: Week 1 - Week 7: 3D design on the computer

Week 8 - Week 10: 3D design of own product on the computer
Week 11 - Week 13: 3D printing of designed products
Week 14: 3D scanning. Connection between 3D scanning and 3D printing.
Reversible engineering.

Teaching types						
	☑ Lectures		☐ Fieldwork		☑ Radionice	
	☑ Seminars		☐ Independent work		☐	
	☑ Practicals		☑ Multimedia		☐	
	☐ Remote learning		☑ Laboratory		☐	
	☐ Blended learning		☐ Supervision		☐	

Student obligations	Active participation in lectures and constructive/practical exercises.					
Monitoring student work	Class attendance	1	Research		Practical work	1
	Experimental work	1	Paper			
	Essay		Seminar paper			
	Midterm exam	1	Oral exam			
	Written exam	1	Project	1		

Assessment and evaluation of student work	2 tests (midterm exams)/final exam from the theoretical part Grade = (K1 + K2)/2 (K1: result of the 1st test, K2: result of the 2nd test) Rating by percentages: 50 - 62%: sufficient (2), 63 - 75%: good (3), 76 - 87%: very good (4), 88 - 100%: excellent (5)

Required literature	Title	Number of copies available	Availability via other media
	Andreas Gebhardt, Jan-Steffen Hötter: Additive Manufacturing - 3D Printing for Prototyping and Manufacturing, Hanser Publications, Cincinnati, 2016.		
	Ben Redwood, Filemon Schöffer, Brian Garret: The 3D Printing Handbook -Technologies, design and applications, 3D Hubs, Amsterdam, 2017.		
	Ian Gibson, David Rosen, Brent Stucker, Mahyar Khorasani: Additive ManufacturingTechnologies, Springer, 2021.		
	Mohammed Maniruzzaman: 3D and 4D Printing in Biomedical Applications, Wiley-VCH, 2019.		
	Georgios Tsoulfas, Petros I. Bangeas, Jasjit S. Suri: 3D Printing: Applications in Medicine and Surgery, Elsevier, 2020.		
	Deepak M. Kalaskar: 3D Printing in Medicine, Elsevier, 2017.		
	Sanjay ¬Kumar: Additive Manufacturing Processes, Springer, 2020.		
	John O. Milewski: Additive Manufacturing of Metals - From Fundamental Technology to Rocket Nozzles, Medical Implants, and Custom Jewelry, Springer, 2017.		
	Ehsan Toyserkani, Dyuti Sarker, Osezua Obehi Ibhadode, Farzad Liravi, Paola Russo, Katayoon Taherkhani: Metal Additive Manufacturing, Wiley, 2022.		

Supplementary literature	Richard Leach, Simone Carmignato: Precision Metal Additive Manufacturing, CRC Press, 2021.

Quality assurance	Conversation with students, student evaluation using an anonymous survey, student success in the exam, self-assessment.
Other (in the opinion of the proponent)	

Course name	Algebra I					
ID	PMM602	Study year	1.			
Lecturer	doc. dr. sc. Gordan Radobolja	ECTS workload	6.0			
Associates		Number of hours	L	S	E	P
			45	0	0	0
Course status	Compulsory	Online percentage	30%			

Course description	
Course aims	This course is the first part of a standard graduate algebra course which considers group and ring theory. In particular, the emphasis is on free groups, finitely generated abelian groups, their subgroups, certain classes of commutative rings with identity and certain classes of ideals. The gained knowledge should serve as a basis for the second part of the course and for continuation of studies on the postgraduate level. Main constructions are introduced by the use of category language.
Enrolment requirements	Successful completion of undergraduate courses which consider algebraic structures; in internal case: Vector spaces I and Algebraic structures.
Learning outcomes	Upon successful completion of the course student should - Analyze the structure of finite groups by applying Sylow's theorems and use them to classify groups of small order. - Classify finitely generated abelian groups. - Formulate and interpret the basic concepts of category theory (category, functor, universal property, free object) and recognize universal constructions in algebraic contexts. - Apply categorical language to describe products, coproducts, quotients, and other universal constructions in the categories of groups and rings. - Analyze the structure of integral domains; distinguish between Euclidean domains, unique factorization domains (UFDs), and principal ideal domains (PIDs), and prove the implications between them. - Construct the ring of fractions and prove its universal property. - Construct examples and counterexamples that clarify the relationships between the classes of algebraic structures under consideration. - Apply advanced algebraic methods precisely and effectively.
Syllabus	Groups, categories, direct products and direct sums, internal products and sum. Product of a family of homomorphisms. (6 hours) Free groups, free products, free abelian groups and their subgroups. Structure theory of finitely generated abelian groups. (6 hours) The action of a group on a set. (2 hours) The Sylow theorems. (2 hours) Nilpotent and solvable groups. (2 hours) Rings and homomorphisms of rings, ideals (prime and maximal ideals), direct product of rings. Chinese remainder theorem. (6 hours) Factorization in rings, prime and irreducible elements. (2 hours) Principal ideal domains, Euclidean and unique factorization domains. (2 hours)

	Rings of fractions. Local rings (2 hours)

Teaching types	☑ Lectures ☑ Seminars ☐ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☑ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☐ ☐ ☐ ☐

Student obligations	Attending classes, giving report(s) on the research done in order to solve the appointed project problem and taking oral exam.

Monitoring student work						
	Class attendance	1.5	Research		Practical work	
	Experimental work		Paper			
	Essay		Seminar paper	3.5		
	Midterm exam		Oral exam	1		
	Written exam		Project			

Assessment and evaluation of student work	Attending classes, giving report(s) on the research done in order to solve the appointed project problem and taking oral exam.

Required literature	Title	Number of copies available	Availability via other media
	T. W. Hungerford, Algebra, Springer, New York, 1996.		Pdf file on the Moodle platform

Supplementary literature	D. S. Dummit, R.M. Foote, Abstract Algebra, J. Wiley and Sons, Inc., 2004. S. Lang, Algebra, Addison-Wesley Publishing Company, Redwood City, California, 1984.
Quality assurance	Exam results statistics. Students' quality assessment at the end of the semester carried out by the University authorized committee through anonymous polls.
Other (in the opinion of the proponent)	

Course name	Algebra II					
ID	PMM606	Study year	1.			
Lecturer	doc. dr. sc. Gordan Radobolja	ECTS workload	6.0			
Associates		Number of hours	L	S	E	P
			45	0	0	0
Course status	Compulsory	Online percentage	0%			

Course description	
Course aims	State the most important results on polynomials and polynomial rings with the emphasis on polynomials over a field. Set the theory of algebraic field extensions and prove the fundamental theorem of algebra. Prove the fundamental theorem of Galois theory and as a consequence, unsolvability of the quintic. Set the fundations of theory of modules over arbitrary ring. Prepare the students for more advanced algebraic courses on graduate and postgraduate level.
Enrolment requirements	Courses passed: Algebraic structures and Vector spaces I, Courses taken: Algebra I.
Learning outcomes	- Analyze the structure of polynomial rings over a commutative ring and over a field, including properties of divisibility, irreducibility, and factorization criteria. - Distinguish and characterize modules over a commutative ring, including free and finitely generated modules, and analyze their structural invariants. - Construct the tensor product of modules via its universal property and analyze its basic properties and functoriality. - Analyze algebraic field extensions, including algebraic and transcendental extensions, the degree of an extension, and the construction of splitting fields. - Prove the Fundamental Theorem of Galois Theory and apply it to the analysis of solvability of polynomials by radicals.
Syllabus	Algebras (2) Polynomial rings (4) Roots of polynomials and factorization in polynomial rings (4) Modules and homomorphisms (2) Sums, products and exact sequences of modules (3) Hom functor (3) Free modules (3) Tensor product of modules (4) Algebraic field extensions (3) Classical Greek problems (1) Splitting fields and algebraic closures (4) Galois theory (4) Applications of Galois theory (3) Abel's theorem (3)

Teaching types	☑ Lectures ☐ Seminars ☐ Practicals ☐ Remote learning ☐ Blended learning		☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision		☐ ☐ ☐ ☐			
Student obligations	Lectures and exercises attendances are obligatory. Students should write and present seminars.							
Monitoring student work	Class attendance	2	Research		Practical work			
	Experimental work		Paper					
	Essay		Seminar paper	1				
	Midterm exam	1	Oral exam	2				
	Written exam		Project					
Assessment and evaluation of student work	Students present one seminar and write two tests. These are prerequisites for oral exam. Final grade is based on seminar (20%), tests (30%) and oral exam (50%).							
Required literature	Title					Number of copies available	Availability via other media	
	T. W. Hungerford, Algebra, Springer, 2003							
	D. S. Dummit, R. M. Foote, Abstract algebra, Wiley, 2003							
Supplementary literature	S. Lang, Algebra, Springer 3rd edition, 2005							
Quality assurance	Discussion in classes and official student survey.							
Other (in the opinion of the proponent)								

Course name	Learning Analytics in Computer Based Education					
ID	PMIK25	Study year	1.			
Lecturer	izv. prof. dr. sc. Ani Grubišić	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Elective	Online percentage	30%			

Course description	
Course aims	The aim is to acquire knowledge about the application of learning analytics in a Computer Based Education.
Enrolment requirements	Course enrolment requirements: None Entry competences: basic usage of computer
Learning outcomes	Describe learning analytics and how it differs from related concepts such as educational data mining. Analyze, plan, and deploy a small learning analytics pilot, including the intent of LA and tools needed to address analytics goals. Develop a matrix of prominent learning analytics tools and the particular analytics strategies each tool addresses. Evaluate current state of learning analytics technologies and describe the benefits and drawbacks to open source and proprietary tool sets. Evaluate and describe the role of learning analytics in intelligent tutoring systems. Conduct basic analytics activities (such as importing and visualizing data) through in open source tools (R). Interpret data collected in e-learning systems. Examine data sets to gain insight into how students are involved in e-learning systems.
Syllabus	Learning analytics: definition, dimensions, framework (2h L) Predictive Modeling in Learning Analytics: Big Data and Education, Regressors, Classifiers (4h L, 4h E) Model Validation: Confidence, Diagnostic, Over-Fitting (4h L, 4h E) Behavior Detection, Data Synchronization, Knowledge Engineering (2h L, 2hE) Knowledge Inference: Bayesian Knowledge Tracing, Performance Factor Analysis (4h L, 4h E) Relationship Mining: Correlation Mining, Causal Mining, Sequential Pattern Mining, Network Analysis (4h L, 4h E) Structure Discovery: Clustering, Validation and Selection, Factor Analysis (4hL, 4h E) Learning analytics dashboard: Learning Curves, Moment by Moment Learning Graphs, Scatter Plots, State Space Diagrams (4h L, 4h E) Using Data to Provide Personalized Student Support (4h L, 4h E)

Teaching types			
☑ Lectures	☐ Fieldwork	☐	
☐ Seminars	☑ Independent work	☐	
☑ Practicals	☐ Multimedia	☐	
☐ Remote learning	☐ Laboratory	☐	
☐ Blended learning	☐ Supervision		

Student obligations						
Monitoring student work	Class attendance	2	Research	0.5	Practical work	1
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam	0.5	Oral exam	0.5		

	Written exam	0.5	Project			

Assessment and evaluation of student work	Homeworks (25%) Project report (25%) Written exam (50%)

Required literature	Title	Number of copies available	Availability via other media
	The Handbook of Learning Analytics, Editors: Charles Lang, George Siemens, Alyssa Wise, Dragan Gašević, ISBN: 978-0-9952408-0-3, DOI: 10.18608/hla17		Online
	Baker, R.S. (2018) Big Data and Education. 4th Edition. Philadelphia, PA: University of Pennsylvania.		Online

Supplementary literature	Nisbet, R., Elder, J., Miner, G. (2009). Handbook of Statistical Analysis & Data Mining Applications. Elsevier, Inc: London UK. ISBN-13: 978-0123747655 Sclater, N. (2017). Learning Analytics Explained. New York, USA: Taylor & Francis.
Quality assurance	Conversations with students, anonymous student survey, exam performance, self-analysis.
Other (in the opinion of the proponent)	

Course name	Data Analysis in High Energy Physics					
ID	PMP272	Study year	2.			
Lecturer	izv. prof. dr. sc. Toni Šćulac	ECTS workload	6.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Elective	Online percentage	30%			

Course description	
Course aims	Teaching students basics of data analysis in high energy physics.
Enrolment requirements	Introduction to elementary particles.
Learning outcomes	Students are expected to: - Understand and describe how LHC works - Understand basics of the Standard Model - Explain the workflow of data analysis - Know how to work with the ROOT programming package - Understand probability theory: frequentist and Bayesian - Understand Monte Carlo simulation - Explain particle interactions with matter - Explain estimators, likelihood, maximum likelihood, and extended maximum likelihood method - Explain confidence intervals and know how to determine them for different estimators - Explain Neymann and Bayesian confidence intervals - Explain hypothesis testing and p-value
Syllabus	1. LHC physics and the Standard Model 2. Data analysis in HEP 3. ROOT programming package 4. Probability and statistics 5. Monte Carlo simulations in HEP 6. Distributions and estimators 7. Likelihood, maximum likelihood and extended maximum likelihood methods 8. Confidence intervals 9 9. Hypothesis testing and p-value

Teaching types						
	☑ Lectures		☐ Fieldwork		☐	
	☐ Seminars		☑ Independent work		☐	
	☑ Practicals		☑ Multimedia		☐	
	☐ Remote learning		☐ Laboratory		☐	
	☐ Blended learning		☐ Supervision		☐	

Student obligations	Attend at least 70% of lectures and 70% of exercises.					
Monitoring student work	Class attendance	2	Research		Practical work	2
	Experimental work		Paper			
	Essay		Seminar paper			

	Midterm exam		Oral exam	1		
	Written exam	1	Project			

Assessment and evaluation of student work	The final grade is formed after the student passes both test parts: - written exam (problem solving on computer, 50% rating) and - oral exam (theory, 50% rating).		
Required literature	Title	Number of copies available	Availability via other media
	Statistical Data Analysis, Oxford Science Publications, 1st edition, Glen Cowan		
Supplementary literature	Slides from lectures.		
Quality assurance	Anonymous student questionnaire and course evaluation performed by the University of Split.		
Other (in the opinion of the proponent)			

Course name	Neural Network Architectures		
ID	PMII15	Study year	2.
Lecturer	izv. prof. dr. sc. Goran Zaharija	ECTS workload	5.0
Associates		Number of hours	L: 30, S: 0, E: 30, P: 0
Course status	Elective	Online percentage	0%

Course description	
Course aims	Recent advances in Artificial neural networks and deep learning have fundamentally changed the field of machine learning, especially with regarding the range of applications in which they offer superior performance. This course offers a practical overview of modern machine learning methods with special emphasis on deep learning approaches. Through the course, students will become familiar with the most commonly used neural network architectures and will create their own models of these architectures through practical examples.
Enrolment requirements	
Learning outcomes	After passing the course, students will be able to: 1. recognize the basic models of deep machine learning: convolutional neural networks (CNN), feedback and recursive neural networks (RNN, LSTM, GRU), and generative neural networks (GAN) 2. describe the basic algorithms for learning in deep neural networks, based on gradient descent (BP, BPTT) 3. explain the principles of robust deep learning using regularization in neural networks (L1, L2, dropout, blackout) 4. analyze and evaluate neural networks intrinsically and extrinsically 5. implement solutions based on deep learning using modern software libraries (Keras, TensorFlow) 6. form solutions based on deep neural networks, using various data sources like images, text, and similar unstructured data
Syllabus	1. Introduction and course overview (2+2) 2. Multilayer perceptron (MLP) and backpropagation (BP) (2+2) 3. Approaches to the regularization of neural networks (2+2) 4. Learning Optimizations in neural networks (2+2) 5. Convolutional neural networks (CNN) (2+2) 6. Recurrent neural networks (RNN) and learning by backpropagation through time (BPTT) (2+2) 7. Recursive neural networks (2+2) 8. Vanishing gradients problem and advanced variants of neural networks (long short-term memory, LSTM, en. gated recurrent unit, GRU) (2+2) 9. Generative neural models of deep learning (generative adversarial networks, GAN) (2+2) 10. Simultaneous learning with neural networks (en. multi-task learning, MTL) (2+2) 11. Learning vector descriptions of data (2+2) 12. Practical deep learning, parameters, and evaluation (2+2) 13. In-depth learning in image, text, and speech processing (2+2) 14. Limitations of deep learning and active areas of research (2+2) 15. Exam preparation (2+2)

Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning		☐ Fieldwork ☑ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision		☐ ☐ ☐ ☐		
Student obligations	Regular class attendance, practical assignment						
Monitoring student work	Class attendance	1.5	Research		Practical work		
	Experimental work		Paper				
	Essay		Seminar paper				
	Midterm exam	0.5	Oral exam				
	Written exam	2	Project	1			

Assessment and evaluation of student work
Tasks (25%) Project (25%) Written exam (50%) Students must pass each of the components

Required literature	Title	Number of copies available	Availability via other media
	Goodfellow, Bengio, Courville: Deep learning. 2016.		https://www.deeplearningbook.org/
	Bishop. Pattern Recognition and Machine Learning. Springer, 2010		
	Murphy. Machine Learning: A Probabilistic Perspective. MIT Press, 2012.		
	Daume III: A Course in Machine Learning. 2015.		http://ciml.info/

Supplementary literature	Scientific and popular papers in the field of deep machine learning.
Quality assurance	Conversation with students, student evaluation using an anonymous survey, self-assessment.
Other (in the opinion of the proponent)	

Course name	Astroparticle Physics					
ID	PMP133	Study year	2.			
Lecturer	doc. dr. sc. Ivana Weber	ECTS workload	6.0			
Associates		Number of hours	L	S	E	P
			30	0	15	0
Course status	Elective	Online percentage	0%			

Course description			
Course aims			
Enrolment requirements			
Learning outcomes			
Teaching types	☐ Lectures ☐ Seminars ☐ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☐ ☐ ☐ ☐
Student obligations			
Assessment and evaluation of student work			

Required literature	Title	Number of copies available	Availability via other media
	-		
Supplementary literature			
Quality assurance			
Other (in the opinion of the proponent)			

Course name	Atmospheric pollution					
ID	PMP16D	Study year	1.			
Lecturer	doc. dr. sc. Marin Vojković	ECTS workload	4.0			
Associates		Number of hours	L	S	E	P
			30	0	15	0
Course status	Elective	Online percentage	30%			
Course description						
Course aims	Provide knowledge on - Characteristics of the atmosphere and air quality - Main atmospheric pollutants - Effects of pollutants on health effects - Ozone in the atmosphere - Main chemical reactions of pollutants in the atmosphere - Modeling transport and dispersion of atmospheric pollutants Provide knowledge on					
Enrolment requirements	Prerequisites - Basic physics - Basic meteorology - Basic chemistry Prerequisites - Basic physics - Basic meteorology - Basic chemistry					
Learning outcomes	1. Understanding main characteristics of air pollution. 2. Awareness on human health degradation caused by atmospheric pollutants. 3. Knowledge on chemical reactions and processes relevant to air quality. 4. Ability to analyze modeling results and to construct a simple dispersion model.					
Syllabus	1. Chemical elements and compounds in the atmosphere (1h) 2. Structure of the atmosphere (1h) 3. Ideal gas laws (3h) 4. Chemical elements and compounds relevant to air pollution and health impacts (5h) 5. Aerosols in the atmosphere (5h) 6. Ozone in the atmosphere (5h) 7. Modeling air pollution (3h) 7.1 Gaussian models of dispersion (3h) 7.2 Numerical models based on higher-order closures (1h) 7.3 Lagrangian stochastic models of dispersion (2h) 7.4 Forecasting air pollution using photochemical models (1h)					

Teaching types	☑ Lectures ☑ Seminars ☑ Practicals ☐ Remote learning ☑ Blended learning		☐ Fieldwork ☑ Independent work ☐ Multimedia ☐ Laboratory ☑ Supervision		☐ ☐ ☐ ☐		
Student obligations	Attending all forms of teaching.						
Monitoring student work	Class attendance	1	Research		Practical work		
	Experimental work		Paper				
	Essay	1	Seminar paper				
	Midterm exam		Oral exam	2			
	Written exam		Project				

Assessment and evaluation of student work	The grade is determined on the basis of grades: - oral presentations, - homework.		
Required literature	Title	Number of copies available	Availability via other media
	Jacobson, M. Z., 2012: Air Pollution and Global Warming. Cambridge University Press. 375 pp.		
	Turner, B. D., 1970: Workbook of Atmospheric Dispersion Estimates. U.S. Department of Health, Education and Wealthfare. 95 pp.		
Supplementary literature			
Quality assurance	1. Analysis of the acquired learning outcomes at the end of the class, compared with the work of students. 2. Monitoring the development of students in the subjects who followed the links with the success of the case 3. Exam results statistics and student evaluation through an anonymous survey at the end of the course. The survey is conducted according to the regulations of the University of Split.		
Other (in the opinion of the proponent)			

Course name	Databases		
ID	PMIH10	Study year	1.
Lecturer	prof. dr. sc. Marko Rosić	ECTS workload	5.0
Associates		Number of hours	L: 30, S: 0, E: 30, P: 0
Course status	Elective	Online percentage	0%

Course description	
Course aims	Understanding the basic concepts of relational data model. The acquisition of knowledge and skills needed in the design of relatively simple databases based on the relational model. Acquiring knowledge of syntax and semantics of SQL language and understanding the SQL queries execution plan. Object oriented representation of the relational database.
Enrolment requirements	Admission requirements: none. Entry competences: user level using the operating system, knowledge of object-oriented programming concepts, basic knowledge of C #.
Learning outcomes	Students will be able to: 1. define the basic concepts of relational database model 2. Establish relational model of relatively simple problems from the real world which are described in natural language 3. Introduce a relational database object 4th use SQL query language for searching and updating relational database 5th understand the plan of execution of SQL queries and indexes role in it 6th understand the basic concepts related to the administration and the security database
Syllabus	Week 1: Introduction to the subject. The information and data. The role of the database in the information system. Historical Development of databases: file, hierarchical, network, relational and object databases. Exercises: connect the client - the user interface editor SQL queries - with a system for relational database management MS SQL Server. Create a database using a graphical user interface. Data types. Tjedan2: The terms of the relational data model. Relational Algebra (Part 1): Operation Union, intersection, difference, projections and restrictions. Incomplete information and the NULL value. The properties of the relational query language SQL. Exercises: The syntax and semantics of SQL (Part 1): select-from-where. Frequently used functions in queries. Operations with NULL values. Week3: Relational Algebra (Part 2): theta and natural joining, aggregation functions. Exercises: The syntax and semantics of SQL (Part 2): inner join, left and right outer join, and full join. Workout queries over the prepared database. Week4: Views. DDL part of SQL. Codd's rules. The structure of a typical system for relational database management. Exercises: The syntax and semantics of SQL (Part 3): insert into, update from, delete from, create, alter and drop. Tjedan5: The creation of the relational data model. The integrity and consistency of the database. Restrictions in order to preserve integrity. Exercises: nested SQL queries. SQL queries aggregation: group by - having. Workout queries. Tjedan6: Functional dependencies data. Normalization. Normal forms: 1NF, 2NF and 3NF.

Exercises: Introduction to SQL execution plan instruction. Workout queries.
Tjedan7:
Normal forms: Boyce-Codd, 4NF4 and 5NF.
Exercise: Preparing for the first midterm.
Tjedan8:
ER model (part 1): identification of entities and their attributes. The types of connections between the entities.
Exercise: The first colloquium.
Tjedan9:
ER model (Part 2): decomposition connection M: N recursive relationship.
Exercises: Design ER model (Part 1) Based on the analysis of the problem described in natural language.
Tjedan10:
Study example of creating an ER model.
Exercises: Design ER model (part 2). Implementation of relational schemas.
Tjedan11:
Indices. Optimizing SQL queries. Materialized views.
Exercises: practicing design ER model.
Tjedan12:
Transactions. Types of locking elements of a relational database. Triggers, stored procedures and functions.
Exercise: Optimizing SQL queries.
Tjedan13:
Properties LINQ query language. Presentation of object-relational database.
Exercises: tool LINQ to SQL Classes. Linking to the relational database management from the application program. LINQ queries in a simple console application.
Tjedan14:
The basic database administration. The management of user rights. Backing up and restoring.
Exercise: Preparing for the second midterm.
Tjedan15:
The role of the log (Eng. Log) database. Database recovery after collapsing. The term replication. Distributed Databases.
Exercise: The second colloquium

Teaching types			
	☑ Lectures	☐ Fieldwork	☐
	☐ Seminars	☐ Independent work	☐
	☑ Practicals	☐ Multimedia	☐
	☐ Remote learning	☐ Laboratory	☐
	☐ Blended learning	☐ Supervision	☐

Student obligations
Lecture attendance 70%, exercise attendance 70%, 3 homework, 2 tests, written and oral exam. Students who are successful at colloquia go to the oral exam.

Monitoring student work						
	Class attendance	1	Research		Practical work	0.5
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam		Oral exam	2		
	Written exam	2	Project			

<table>
<tr><td>Assessment and evaluation of student work</td><td colspan="3">Grading and evaluating student work in class and at the final exam Activity of students in lectures and exercises (presence at lectures and exercises, addressing the challenges of homework) (20%).
Written exam (40%): The semester are held two tests with the tasks of the SQL language, ie, design relational database. Each of them is scored on a scale of 0-50 points. Students who achieve at least 25 points in each colloquium released a written exam. Other students take a written examination, which substantially corresponds to the colloquia.
Oral exam (40%) is compulsory for all students, while answering three questions randomly selected from a list of 50 questions divided into three categories.
The final grade is derived on the basis of all these ratings with weighting factors as indicated in parentheses for each form of assessment.</td></tr>
<tr><td rowspan="2">Required literature</td><td>Title</td><td>Number of copies available</td><td>Availability via other media</td></tr>
<tr><td>Mladen Varga: Baze podataka - Konceptualno, logičko i fizičko modeliranje podataka, Društvo za razvoj informacijske pismenosti (DRIP), Zagreb, 1994.</td><td>20</td><td></td></tr>
<tr><td>Supplementary literature</td><td colspan="3">Tonći Dadić: Baze podataka – skripta: http://www.pmfst.unist.hr/~tdadic/Dadic_BazePodataka.pdf</td></tr>
<tr><td>Quality assurance</td><td colspan="3">Talk with students, student evaluation using the anonymous survey, the success of students in the exam, self-assessment.</td></tr>
<tr><td>Other (in the opinion of the proponent)</td><td colspan="3"></td></tr>
</table>

Course name	Biophysics					
ID	PMP141	Study year	2.			
Lecturer	prof. dr. sc. Larisa Zoranić	ECTS workload	6.0			
Associates		Number of hours	L	S	E	P
			45	15	30	0
Course status	Elective	Online percentage	10%			

Course description	
Course aims	Understanding the structure and function of macromolecules and biological complexes, and their role in cellular processes using physical models.
Enrolment requirements	Basic knowledge of molecular biology, biochemistry, classical mechanics, electrodynamics, quantum and statistical mechanics.
Learning outcomes	After successfully completing the course, the student will be able to: 1. recognize and define some of the models in biophysics that describe the structure and function of biological molecules and systems 2. explain and evaluate basic physical models that describe biological processes 3. independently solve some of the simple problems in biophysics 4. understand, evaluate and present scientific research in biophysics
Syllabus	Lesson plan by week: 1. Introductory lessons, basic biological molecules, the basis of the cell, spatial and temporal scales in biology, models in biology 2. Energies in biology, basics of metabolism, mechanical and chemical equilibrium, local equilibrium, application of thermodynamics and statistical mechanics in biology, examples of ligand binding, two-state model and membrane channels. 3. Global states, global transitions, chemical potential and free energy, van't Hoff relations 4. Binding models, cooperative and sequential binding, Hill coefficients. Allosteric reactions. 5. Models of myoglobin and hemoglobin. Law of mass action. Osmosis. 6. Random walk model, effective length, Kuhn length, persistence length, radius of gyration, Gaussian distribution, Brownian motion and connection with diffusion. 7. Protein structure, HP and hc models. Forces in proteins. Hydrophobicity, hydrophobic effect, hydrophobic force. 8. Electrostatic contributions in biological systems. pH and pK values, free and electrostatic energy. Poisson-Boltzmann equation. 9. Bioelectricity, Nernst equation, voltage gated channels. 10. Action potential, circuit model, membrane potential model, bistable behavior of Na+ and K+ ion currents. The cable equation 11. Diffusion models, Einstein's model, Smoluchowski's model. 12. Chemical kinetics, reaction rates, reaction rate, reaction coordinate, Arrhenius behavior, example of retinal isomerization in photosynthesis, macroscopic and microscopic dynamic model. 13. Dynamic models. Michelis-Menten enzyme kinetics. 14. Biological membranes, models of the structure and function of membranes and vesicles. 15. Selection of a topic of choice: photosynthesis, molecular motors, biological networks, biological samples and others according to the students' interest.

Teaching types			
	☑ Lectures ☑ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☐ ☐ ☐ ☐

Student obligations	Attendance and commitment of students in class, preparation and presentation of seminars, discussion of scientific articles.					
Monitoring student work	Class attendance	2	Research		Practical work	
	Experimental work		Paper			
	Essay		Seminar paper	1		
	Midterm exam	1	Oral exam	2		
	Written exam		Project			

Assessment and evaluation of student work	The conditions for passing the exam are: passing the colloquium or written exam, written and presented assignments and seminars, and passing the oral exam.		
Required literature	Title	Number of copies available	Availability via other media
	Physical Biology of the Cell, Rob Phillips, Jane Kondev, Julie Theriot and Hernan G. Garcia, Garland Science, Taylor & Francis Group, 2013.	3	
Supplementary literature	1. Molecular and Cellular Biophysics Meyer B. Jackson University of Wisconsin Medical School, Cambridge University Press 2006 . 2. Bioenergetika, rad membranskih proteina Juretić Davor, Informator, Zagreb, 1997. 3. Glaser, R. “Biophysics”. Springer-Verlag, Berlin, 2001. 4. Fersht, A. “Structure and mechanism in protein science”, Freeman and Company, New York, 1998. 5. Volkenshtein, M.V. “Biophysics”, Mir Publishers, Moscow 1983. 6. Hill, T.L. Free “Energy Transduction in Biology”, Academic Press, New York 1977. 7. Molekularna biofizika , Antonio Šiber , script, 2012.. 8. Scientific articles, lectures		
Quality assurance	The success of the program is monitored by the quality of knowledge demonstrated in the exams, as well as by the assessment of the demonstrated enthusiasm for the subject, through conversations with students, and by monitoring the student's progress during classes. External evaluation includes student surveys.		
Other (in the opinion of the proponent)			

Course name	Bioinformatics					
ID	PMP140	Study year	2.			
Lecturer	izv. prof. dr. sc. Željka Sanader Maršić	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Elective	Online percentage	0%			

Course description	
Course aims	The main goal of the course is to acquaint students with the available tools that bioinformatics offers for analyzing the sequence and structure of proteins and nucleic acids so that by the end of the course they will be independent in performing analyses. The course will present the tools of structural bioinformatics, phylogenetics, and genomics and proteomics.
Enrolment requirements	To successfully follow bioinformatics courses, prior knowledge of biochemistry and biophysics is required. More specifically, knowledge of the structure and physico-chemical properties of nucleotides and amino acids is required, which is covered in the previously attended courses of the students.
Learning outcomes	After completing the course, students should: 1) Know biological databases 2) Know the tools for comparing nucleic acid sequences 3) Know the tools for comparing protein sequences 4) Predict the structure of proteins 5) Understand phylogenetic trees and their construction 6) Understand genome sequencing and mapping 7) Be independent in choosing tools according to analysis needs 8) Be independent in the interpretation of results obtained using bioinformatics tools 9) Be able to criticaly analyse publicly available bioinformatics tools, i.e. be able to recognize false-negative and false-positive results
Syllabus	Weekly lesson plan: 1) Introduction to bioinformatics, familiarization with the history and development and definition of the field 2) and 3) Getting to know databases: literature databases, databases of gene and protein sequences, protein structures, functional domains and complete genomes 4) and 5) Simple and multiple alignment of nucleic acid and protein sequences, various algorithms and tools for sequence alignment 6) and 7) Prediction of secondary and tertiary structure of proteins: modeling by homology and tools used for said predictions 8) and 9) Programs for visualization of protein structure 10) and 11) Basics of molecular phylogenetics and algorithms for the construction of phylogenetic trees 12) and 13) Genome mapping, sequencing and annotation and functional genomics 14) and 15) Analysis of protein expression at the proteome level, post-translational modifications

Teaching types			
	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☑ Independent work ☐ Multimedia ☑ Laboratory ☐ Supervision	☐ ☐ ☐ ☐

Student obligations	Attendance and commitment of the student in class, making assignments in class, making assignments at home, making a seminar that includes independent research of a physical problem, writing a report and presenting it.		
Assessment and evaluation of student work	The conditions for taking the exam are: the ability to use existing bioinformatics tools. Assessment through exercises on the computer, homework and final seminar. The grade is concluded according to the grade of the student's effort in class and the grade of the seminar.		
Required literature	Title	Number of copies available	Availability via other media
	Arthur Lesk: Introduction to Bioinformatics; Oxford University Press; Great Clarendon Street, Oxford, OX2 6DP, United Kingdom	5	
	Charles Cantor: Biophysical Chemistry Part I, The Conformation of Biological Macromolecules; W.H.Freeman, 1980	5	
	Charles Cantor: Biophysical Chemistry Part I, The Conformation of Biological Macromolecules; W.H.Freeman, 1980	5	
Supplementary literature	[1] Supratim Choudhuri: Bioinformatics for Beginners; Academic Press; 2014, Elsevier Inc. [2] Scientific papers, lectures		
Quality assurance	Student evaluation through anonymous questionnaires at the end of the course.		
Other (in the opinion of the proponent)			

Course name	Differential equations		
ID	PMM950	Study year	2.
Lecturer	doc. dr. sc. Andrijana Ćurković	ECTS workload	6.0
Associates		Number of hours	L: 30, S: 0, E: 30, P: 0
Course status	Compulsory	Online percentage	40%

Course description	
Course aims	To insure that chosen chapters of the subject comprise the most important ideas, results and methods from both viewpoints: theoretical and practical. Highlighting the analysis of second order equations, a balanced exposition should insure transition from memorized formulas to the critical understanding of the fundamental Existence and uniqueness theorem and its proof.
Enrolment requirements	Working knowledge of calculus, gained from a normal two- or three-semester course sequence or its equivalent. An acquaintance with functions of several variables, elementary complex functions and operations with matrices. In internal case: taken courses Mathematics 1 and Mathematics 2 (or DIR I).
Learning outcomes	Student should 1. be able to distinguish different types of first order DE and to apply methods for their solving; 2. understand what an initial value problem is, and how to show a given function is a solution to one; 3. recognize a homogeneous LDE with constant coefficients and be able to write down the fundamental solution set; 4. be able to find particular solutions of LDE through the method of undetermined coefficients and variation of parameters; 5. explain what happens to solutions as time tends to infinity; 6. make use of a known solution to reduce the order of HLDE; 7. find power series solutions of second order LDE; 8. use the Wronskian to show whether solutions are linearly independent; 9. be able to write down the solution to the problem x'=Ax, x(t0)=x0 by means of matrix exponential function; 10. explain in their own words conditions that ensure existence and uniqueness of a solution to the Cauchy problem.
Syllabus	1. The notion of DE. Basic mathematical models; direction fields. Classification of DE. (2 hours) 2. First order DE: linear, separable, homogeneous, Bernoulli, Riccati. (2 hours) 3. Differences between linear and nonlinear equations. Exact equations. Introduction to the second order LDE. (2 hours) 4. Algebraic structure of the solution set to homogeneous LDE. Abel's theorem. Linear independence and the Wronskian. (2 hours) 5. Second order homogeneous LDE with constant coefficients. Nonhomogeneous equations: method of undetermined coefficients. (2 hours) 6. Method of variation of parameters for second order LDE. General theory of nth order LDE. (2 hours) 7. LDE of nth o rder with constant coefficients. Nonhomogeneous LDE of nth order. (2 hours) 8. Series solutions of second order LDE near ordinary point. (2 hours) 9. Regular singular points. Euler equations. (2 hours) 10. Series solutions of second order LDE near regular singular point. (2 hours) 11. Bessel's equation. Systems of first order DEs. Systems of first order LDEs. (2 hours) 12. Homogeneous linear systems with constant coefficients. (2 hours) 13. The matrix exponential function. Nonhomogeneous linear systems. (2 hours) 14. Proof of the Existence and uniqueness theorem for one-dimensional problem. (2 hours) 15. Existence and uniqueness theorem for a n-dimensional problem; a glance on linear case. (1 hour)

Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning		☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision		☐ ☐ ☐ ☐		
Student obligations	Attending lectures and exercises and taking exams.						
Monitoring student work	Class attendance	2	Research		Practical work		
	Experimental work		Paper				
	Essay		Seminar paper				
	Midterm exam		Oral exam	2			
	Written exam	2	Project				

Assessment and evaluation of student work	During the semester students write two partial tests. Final exam consists of a written and an oral part due for completion within one exam term. Both parts are equally valued in the final grade. Passing written test (score ≥50%) is a necessary condition for taking up an oral exam. At the end of the semester, students who passed both partial tests are admitted directly to the oral exam in an exam term (January/February) of their choice.		
Required literature	Title	Number of copies available	Availability via other media
	W.E. Boyce and R.C. DiPrima, Elementary Differential Equations and Boundary Value Problems, John Wiley & Sons, Inc., New York, 2012		Elektronski dokument na Moodle podršci
Supplementary literature	1. M. Alić, Obične diferencijalne jednadžbe, skripta, PMF-Zagreb, Matematički odjel, 1994. 2. D.G. Zill and M.R. Cullen, Differential Equations with Boundary-Value Problems, Brooks/Cole, Cengage 2009.		
Quality assurance	Exam results statistics. Students' quality assessment at the end of the semester carried out by the University authorized committee through anonymous polls.		
Other (in the opinion of the proponent)			

Course name	Diophantine equation					
ID	PMM810	Study year	2.			
Lecturer	izv. prof. dr. sc. Marija Bliznac Trebješanin	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	15	0	0
Course status	Elective	Online percentage	0%			

Course description	
Course aims	The aim of the course is to acquaint students with the fundamental knowledge of the theory of Diophantine equations, and train them for the application of that knowledge in solving various tasks. Students should adopt a variety of techniques for solving Diophantine equations.
Enrolment requirements	Requirements: Course passed: Introduction to Number Theory. Required competences: knowledge of different mathematical structures.
Learning outcomes	The student is able to: - define Diophantine equations - explain various problems which are reduced to Diophantine equations - apply different ways of solving Diophantine equations - analyze various types of Diophantine equations
Syllabus	-Diophantine equation (2) - Examples of Diophantine equation (2) -Fermats equation (2) -Linear Diophantine equation 2) -Pells equation (2)-Group of units of quadratic integers (2) -Binary quadratic form (2) -Pythagorean triples. (2) - Equation x4+y4=z2. (2) -Sums of two squares (2) - Sums of four squares (2) -Ternary quadratic form (2) -Lagrange theorem. (2) -Thue equation (2) - Equation y2=x3+k (2)

Teaching types						
	☑ Lectures		☐ Fieldwork		☐	
	☑ Seminars		☐ Independent work		☐	
	☐ Practicals		☐ Multimedia		☐	
	☐ Remote learning		☐ Laboratory		☐	
	☐ Blended learning		☐ Supervision		☐	

Student obligations	Attending classesandwriting seminar paper					
Monitoring student work	Class attendance	1	Research		Practical work	
	Experimental work		Paper			
	Essay		Seminar paper	1		

	Midterm exam		Oral exam	3			
	Written exam		Project				
Assessment and evaluation of student work	Seminar paper and final oral exam						
Required literature	Title					Number of copies available	Availability via other media
	Andrej Dujella, Diofantske jednadžbe, Zagreb 2006, skript						
Supplementary literature	1.I. Niven, H.S. Zuckerman, H.L. Montgomery, An Introduction to the Theory Numbers, Wiley, New York, 1991. 2.K. Ireland, M. Rosen, A classical introduction to modern number theory, Springer, New York 1982. 3.W. Sierpinski, Elementary Theory of Numbers, Panstwowe wydawnictvo naukowe, Warszawa 1964.						
Quality assurance	Statistics of test results and student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split.						
Other (in the opinion of the proponent)							

Course name	Extreme Environmental Phenomena					
ID	PMP264	Study year	2.			
Lecturer	izv. prof. dr. sc. Jadranka Šepić	ECTS workload	4.0			
Associates		Number of hours	L	S	E	P
			30	0	15	0
Course status	Elective	Online percentage	0%			

Course description	
Course aims	Provide basic knowledge on extreme processes and conditions in the environment Enable students to extract and analyze extreme processes and conditions Provide techniques and methods for estimating frequency and strength of extremes in a changing climate
Enrolment requirements	Basics of physics Basics of mathematics
Learning outcomes	Gain knowledge on extreme events in the atmosphere, lithosphere and oceans Gain knowledge on statistics of extremes Learn how to extract and analyze extreme events
Syllabus	1. Definition of extremes (2 hours of lectures) 2. Ranking extreme events (2 hours of lectures) 3. Sources of extremes; preconditioning vs. Local effect (2 hours of lectures) 4. Extremes in the atmosphere: El Nino, La Nina, Hurricanes, tropical cyclones, hurricane strength winds, tornados, heat and cold waves (6 hours of lectures) 5. Extreme events in seas and oceans: storm surge, tsunami, meteotsunami, rogue waves, solitons (6 hours of lectures) 6. Extreme events in seismology: destructive earthquakes, landslides, volcanic eruptions (4 hours of lectures) 7. Statistic of extremes (6 hours of lectures) 8. Climate change and environmental extremes (2 hours of lectures)

Teaching types			
	☑ Lectures	☐ Fieldwork	☐
	☐ Seminars	☑ Independent work	☐
	☑ Practicals	☐ Multimedia	☐
	☐ Remote learning	☐ Laboratory	☐
	☐ Blended learning	☐ Supervision	☐

Student obligations	Attend at least 70% of lectures and 70% of exercises.

Monitoring student work						
	Class attendance	1.5	Research		Practical work	1.5
	Experimental work		Paper			
	Essay		Seminar paper	0.5		
	Midterm exam		Oral exam	0.5		
	Written exam		Project			

Assessment and evaluation of student work	During the semester, students will analyze a selected extreme event. This analysis will include data analysis, statistical analysis, and estimation of frequency and strength of extremes in future climate. Students will present the results of this analysis in a seminar essay. The final grade is formed based

	on the practical training (50%), seminar essay (25%), and oral exam (25%).

Required literature	Title	Number of copies available	Availability via other media
	James R. Holton & Gregory J. Hakim An Introduction to Dynamic Meteorology Academic Press, 2013.	0	da
	Mirko Orlić, Uvod u fizičku oceanografiju	5	ne

Supplementary literature	Roland B. Stull An Introduction to Boundary Layer Meteorology Kluwer, 1988. Emil Julius Gumbel Statistics of extremes Dover Publications, 2004
Quality assurance	Statistics of exam results and student evaluation through an anonymous survey at the end of the course. The survey is conducted according to the rules of the University of Split.
Other (in the opinion of the proponent)	

Course name	Elementary geometry						
ID	PMM019	Study year	1.				
Lecturer	prof. dr. sc. Jurica Perić	ECTS workload	6.0				
Associates		Number of hours	L	S	E	P	
			30	0	30	0	
Course status	Compulsory	Online percentage	30%				

Course description	
Course aims	The aim of the course is to systematise, consolidate and deepen the knowledge of elementary (Euclidean) geometry setting the foundation strictly axiomatic. Within this axiomatisation classic model of Euclidean geometry will be processed and introduction for other models and geometry will be made.
Enrolment requirements	/
Learning outcomes	The student is able to: - list the axioms of planimetry and stereometry - describe the history of the study of Euclid's fifth postulate - list isometries of the plane, express and reproduce their basic properties - describe triangle, circle and square and reproduce basic theorems, define a polygon and polygon area, show the areas of the basic polygons - define the volume of polyhedrons and show volumes of the basic polyhedrons - express and prove the claims of stereometry using previously proven claims from planimetry - solve the task corresponding to the theoretical concepts worked during the course - explain the significence of Euclidean geometry in mathematics, its historical and intuitive importance, and the reasons for the occurance of other geometries, primarily hyperbolic geometry
Syllabus	Planimetry: - five groups of axioms – 2 hours - some properties of isometry, symmetries – 4 hours - angles and some theorems about them – 2 hours - 5. Euclidean postulate – 2 hours - congruence of triangles, similarity of triangles – 4 hours - circles, tendon and tangential rectangle – 4 hours Polygons, polygon area - 6 hours Stereometry - the geometry of space - prisms, pyramids, cylinders, cones – 3 hours - polyhedrons and volume – 3 hours

Teaching types								
	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning		☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision		☐ ☐ ☐ ☐			
Student obligations	Attendance at 70% of lectures and 70% of exercises.							
Monitoring student work	Class attendance	1	Research		Practical work			

	Experimental work		Paper				
	Essay		Seminar paper				
	Midterm exam	1	Oral exam	3			
	Written exam	1	Project				

Assessment and evaluation of student work	The exam is taken in written and oral form. Written exam is preliminary part of the exam and requirement for the oral exam is to pass a written exam. The written form of the exam can be taken partially, during class, where curriculum provided. Activity in class, solving homework, colloquium, written and oral examination are the elements from which form the final grade is formed.		
Required literature	Title	Number of copies available	Availability via other media
	B. Pavković, D. Veljan, Elementarna matematika 1, Tehnička knjiga, Zagreb, 1991.		
	B. Pavković, D. Veljan, Elementarna matematika 2, Školska knjiga, Zagreb, 1995.		
Supplementary literature	D. Palman, Planimetrija, Element, Zagreb,1998. D. Palman, Stereometrija, Element, Zagreb, 2005.		
Quality assurance	Statistics of test results and student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split.		
Other (in the opinion of the proponent)			

Course name	Energetics		
ID	PMT168	Study year	1.
Lecturer	doc. dr. sc. Ivan Peko	ECTS workload	4.0
Associates		Number of hours	L: 30, S: 30, E: 0, P: 0
Course status	Compulsory	Online percentage	30%

Course description	
Course aims	Adopt basic knowledge of energetics and energy conversion and form a critical opinion about the efficient use of energy sources.
Enrolment requirements	none.
Learning outcomes	After this course, students will be able to: - Distinguish between renewable and non-renewable energy sources. - Describe the formation of fossil fuels - Distinguish energy facilities. - Describe the working principle of energy facilities. - Compare energy conversion plants. - Represent and defend the argument attitude about the use of certain energy sources - Represent and provide arguments to defend position on the construction of the power plant in Croatia.
Syllabus	Week 1 An introductory lecture, introducing students to the rules and literature. Introduction to content of the course. Introduction to energetics, energetic concept, the concept of energy. The law of conservation of energy. Energetics, energy and power. Energy conversion. The primary and transformed energy forms. Week 2 Entropy and the world. Energetics yesterday, today, tomorrow. History of energy use. World and energetic. Sustainable development of energetics and sustainability of energy system. Assessment methods of sustainable development of energy systems: External cost, multicriteria analysis, exergy, emergy. Week 3 Nonrenewable energy sources. Reserves of nonrenewable energy sources. The formation of fossil fuels. Carbon. Fossil fuels: coal, oil, natural gas, nuclear energy. Estimation of non-renewable energy sources. Week 4 Renewable energy sources, the Kyoto Protocol. European objectives. The potential of renewable energy sources. Energy water (hydropower). The energy of the sun. Wind energy. Wave energy. Tidal power and energy from the sea. Biomass and biomass potential in Croatia. Biodiesel. Geothermal energy. Week 5 Plants for converting energy. Centralized energy facilities. Centralized heating systems. Thermal power plants - power plants and diesel power plants, the thermal power station with a steam turbine, the thermal power station with gas turbine. Parts of the thermal power plant. Thermal power plants in Croatia. Week 6

Nuclear power plants: The historical development. Principle of operation and basic division of nuclear power plants. Types of nuclear power plants. Nuclear energy compared to other energy sources. Safety of nuclear power plants. The development and goal of nuclear energy.

Week 7
1st colloquium

Week 8
Hydropower plants: Description of the plant. Division of hydropower plants. Storage hydropower plant. River hydropower plants. The pumped storage plants. Low-pressure, medium-pressure and high-pressure hydro power. Parts of hydropower plants. Types of water turbines (Pelton, Francis and Kaplan turbines). Hydroelectric power plants in Croatia.

Week 9
Solar energy. Insolation. Solar collectors. Photovoltaic cells - development, implementation and cost-effectiveness. Photo-voltage solar potential in Europe. The impact on the environment. Solar power plants.

Week 10
Wind energy. The kinetic energy of the wind. The statistics of wind, wind atlas, wind rose. Influence of terrain on the wind farm choice of location. Wind power plants. The basic division of wind power plants, main parts wind power plants. Principle of operation wind power plants. Selection of generators and mechanical systems of wind power plants. Connecting wind power plants to the electricity grid. Market of wind energy.

Week 11
The oceans as energy collectors. Methods of ocean energy conversion into electric energy: Tidal power, energy of sea waves, OTEC, other theoretical and practical technology. Tidal power: division, potential for and against. Plants for converting energy of sea waves. Ocean Thermal Energy Conversion (OTEC). Types of OTEC plants. Other technologies.

Week 12
Geothermal energy. Geothermal power plants. Types of geothermal power plants: dry steam principle (Dry steam) The principle of steam separation (flash steam), binary principle (binary cycle). Geothermal potential in Croatia.

Week 13
Biomass. Energy from biomass. Heat pumps. The development of heat pump technology. The theoretical principle of the heat pump. Parts of heat pumps.

Week 14
Croatia and world from the aspect of energetics. Energy Development Strategy in Croatian. The national program of energy development. Energetic present and future.

Week 15
2nd colloquium and student paper presentations.

Teaching types			
	☑ Lectures	☐ Fieldwork	☐
	☑ Seminars	☑ Independent work	☐
	☐ Practicals	☐ Multimedia	☐

	☐ Remote learning ☐ Blended learning	☐ Laboratory ☐ Supervision	☐

Student obligations	Class attendance Independent planning and presentation of student paper Active participation in the teaching process Exam.

Monitoring student work						
	Class attendance	1.5	Research		Practical work	
	Experimental work		Paper		Self-study for exam	1.5
	Essay		Seminar paper	1		
	Midterm exam		Oral exam			
	Written exam		Project			

Assessment and evaluation of student work	Total scoring (100%): Exam or 2 colloquiums - 90%, student paper 10% 1. Colloquium 1: 45% (or exam) 2. Colloquium 2: 45% (or exam) 3. Student paper: 10% (obligatory) Rating by percentage: 50% to 62% - sufficient (2) 63% to 75% - good (3) 76% to 88% - very good (4) 89% to 100% - excellent (5)

Required literature	Title	Number of copies available	Availability via other media
	B. Udovičić, Energetika, Školska Knjiga, Zagreb, 1993.		
	Energetika - predavanja – interna skripta i online materijali.		

Supplementary literature	1. V. Paar, Energetska kriza:gdje (ni)je izlaz?, Školska knjiga, Zagreb, 1984. 2. H. Požar, Osnove energetike I, II i III, Školska knjiga, Zagreb,1992. 3. P. Kulušić, Novi izvori energije, Školska knjiga, Zagreb, 1991. 4. W.E. Westman, Ecology, Impact, Assessment and Environmental Planning, J. Wiley, 1985. 5. Časopis Energija 6. Renewable Energy, edit.by Godfrey Boyle, Oxford University Press, 2004. 7. Internet
Quality assurance	Conversation with the students. Students opinions about the quality of teaching through anonymous polls. The success of students at exam. Self-evaluation.

Other (in the opinion of the proponent)	

Course name	Philosophy of Science					
ID	PMP108	Study year	3.			
Lecturer	prof. dr. sc. Mile Dželalija	ECTS workload	2.0			
Associates		Number of hours	L	S	E	P
			15	15	0	0
Course status	Elective	Online percentage	0%			

Course description

Course aims	Produbiti pojmovno razumijevanje strukture i razvoja znanstvenih teorija u povijesnom, logičkom i epistemološkom smislu, pružiti povijesnoznanstvene i filozofskologičke pretpostavke za refleksiju i kritičko preispitivanje metoda i pretpostavaka znanstvene spoznaje, poticati dijalog između prirodnih, humanističkih i društvenih znanosti.
Enrolment requirements	None
Learning outcomes	Na kraju kolegija studenti će moći: - opisati osnovne elemente logičke strukture znanstvene teorije, - izložiti glavna obilježja povijesnog razvoja znanstvene metode i znanstvenih pojmovnih okvira, - iskazati osnovne probleme i odrediti alternativna stajališta u filozofiji znanosti, - prepoznati vrijednost znanstvene spoznaje i argumentacije kao oblika kritičke racionalnosti u sporazumijevanju.
Syllabus	Sadržaj kolegija ima fleksibilnu organizaciju koja se osloncem na ključne teme prilagođava teorijskim interesima studenata. - Odnos filozofije u znanosti u povijesnoj perspektivi. Pitanje znanstvene metode. [2 P; 2 S] - Znanstveni jezik i spoznaja: sintaksa i semantika znanstvenog jezika i pitanje intersubjektivne provjerljivosti u logičkom empirizmu: prikaz i kritika. [1P; 1S] - Metoda prirodne znanosti i matematika. Filozofija matematike i ontološko pitanje. Gödel i ograničenja aksiomatske metode. [2P; 2S] - Logička teorija mjerenja. Problem mjerenja u kvantnoj fizici. [2P; 2S] - Vrijeme, prostor, prostor-vrijeme. Položaj i razvoj teorija o prostoru i vremenu unutar empirijskih znanosti i filozofije. [2P; 2S] Ključne teorije o prostoru i vremenu (Aristotel, Newton, Leibniz, Kant, Einstein,...). [1P; 1S] - Znanstvena spoznaja kao dinamični fenomen. Kuhnova teorija razvoja znanosti. Teorija logike promjene znanstvenih teorije. [3P; 3S] - Realizam i antirealizam u filozofiji znanosti [1P; 1S] - Recentni trendovi u razumijevanju odnosa znanosti i filozofije [1P; 1S]
Teaching types	☑ Lectures ☑ Seminars ☐ Practicals ☐ Remote learning ☑ Blended learning	☐ Fieldwork ☑ Independent work ☐ Multimedia ☐ Laboratory ☑ Supervision	☐ ☐ ☐ ☐	
Student obligations	Aktivno sudjelovanje u radu kolegija. Proučavanje literature. Priprema i izlaganje seminarskog rada.			

Monitoring student work						
	Class attendance	1	Research		Practical work	
	Experimental work		Paper			
	Essay		Seminar paper	0.5		

	Midterm exam		Oral exam	0.5		
	Written exam		Project			

Assessment and evaluation of student work	Bilježi se redovitost pohađanje nastave. Boduje se aktivnost tijekom nastave kao te izrada i prezentacija seminarskog rada. Završni ispit obuhvaća vrednovanje završne verzije seminarskog rada i usmeni ispit.

Required literature	Title	Number of copies available	Availability via other media
	S. Lelas i T. Vukelja (1996) Filozofija znanosti. Zagreb: Školska knjiga.		
	Z. Šikić (1995) Filozofija matematike. Zagreb: Školska knjiga.		
	T. Kuhn (2013) Struktura znanstvenih revolucija. Zagreb: Jesenski i Turk.		

Supplementary literature	L. Wittgenstein (1987) Tractatus logico-philosophicus. Sarajevo: Veselin Masleša. B. Žarnić (2006) Filozofija znanosti: priručnik (tumačenja odabranih tekstova) http://marul.ffst.hr/~logika/2006filozofijaznanosti/skriptaFZ.pdf
Quality assurance	Statistics of test results and student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split
Other (in the opinion of the proponent)	

Course name	Ocean Physics I					
ID	PMP163	Study year	2.			
Lecturer	izv. prof. dr. sc. Žarko Kovač	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	0	15	0
Course status	Elective	Online percentage	0%			

Course description	
Course aims	- gaining knowledge on basic dynamical and physical processes in the ocean - provide knowledge of equations describing the physical dynamics of the oceans - acquiring basic knowledge about the impact of physical on biological and chemical processes in the oceans
Enrolment requirements	- basics of physics - basics of mathematics - basics of fluid mechanics - basic programming
Learning outcomes	- knowledge of physical processes in the sea - knowledge of basic equations of physical oceanography - knowledge of boundary conditions - formulation of simple mathematical models in physical oceanography - introductory knowledge about the effect of physical on biological processes in the ocean - introductory knowledge of the transport of tracers by ocean currents
Syllabus	1. Non-inertial reference frame (2 hours of lectures) 2. Coriolis force (2 hours of lectures) 3. Inertial oscillations (4 hours of lectures) 4. Equations of motion (4 hours of lectures) 5. Geostrophic balance (4 hours of lectures) 6. Continuity equation (2 hours of lectures) 7. Energy conservation equation and equation of state (4 hours of lectures) 8. Boundary conditions (2 hours of lectures) 9. Interaction of light and sea water (4 hours of lectures)

Teaching types			
	☑ Lectures	☑ Fieldwork	☑ domaće zadaće
	☐ Seminars	☑ Independent work	☐
	☑ Practicals	☐ Multimedia	☐
	☐ Remote learning	☐ Laboratory	☐
	☐ Blended learning	☐ Supervision	☐

Student obligations	Attend at least 70% of lectures and 70% of exercises.					
Monitoring student work	Class attendance	1	Research		Practical work	
	Experimental work		Paper		Domaće zadaće	1
	Essay		Seminar paper			

	Midterm exam		Oral exam	2		
	Written exam	1	Project			

Assessment and evaluation of student work	During the first 7 weeks of classes, students receive 5 homework assignments from the first 5 teaching units. These assignments are handed over at the end of the 8th week of classes. During the next 7 weeks of classes, students receive 5 new homework assignments from the last 4 teaching units. These assignments are handed over at the end of the 15th week of class. Students who submit assignments on time and achieve more than 50% of the possible points are exempted from taking the written part of the exam. Students who do not pass assignments or achieve less than 50% of the possible points must take a written exam. The final grade is formed on the basis of homework / exam (1/2 grade) and the answer to the oral exam (1/2 grade).

Required literature	Title	Number of copies available	Availability via other media
	Benoit Cushman-Roisin & Jean-Marie Beckers Introduction to Geophysical Fluid Dynamics: Physical and Numerical Aspects Academic Press, 2007		
	Robert H. Stewart Introduction To Physical Oceanography Texas A & M University, 2000		

Supplementary literature	Steven Pond & George L. Pickard Introductory Dynamical Oceanography Butterworth-Heinemann, 1983 George L. Pickard & William J. Emery Descriptive Physical Oceanography: An Introduction Pergamon Press, 1982 Lynne D. Talley, George L. Pickard, William J. Emery, James H. Swift Descriptive Physical Oceanography: An Introduction Academic Press, 2011
Quality assurance	Exam results statistics and student evaluation through an anonymous survey at the end of the course. The survey is conducted according to the regulations of the University of Split.
Other (in the opinion of the proponent)	

Course name	Ocean Physics II					
ID	PMP268	Study year	2.			
Lecturer	izv. prof. dr. sc. Žarko Kovač	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	5	15	0
Course status	Elective	Online percentage	0%			

Course description	
Course aims	- gaining knowledge on basic dynamical and physical processes in the ocean - acquiring knowledge of physical models describing ocean currents and wave motion - to introduce students to basic numerical methods for solving differential equations describing the physical dynamics of the ocean - gaining knowledge about more complex forms of motion in the ocean - to introduce students with to the concept of vorticity
Enrolment requirements	- Ocean Physics I - Introduction to Fluid Mechanics - programming
Learning outcomes	- basic knowledge about turbulence in the ocean - knowledge of basic forms of currents in the ocean and their physical causes - understanding different forms of wave motion in the ocean - introductory knowledge of numerical methods of discretization of equations of equations of motion - basic knowledge of ocean tides
Syllabus	1. Reynolds averaging (2 hours of lectures) 2. Turbulent cascade (2 hours of lectures) 3. Surface Ekman layer (4 hours of lectures) 4. Bottom Ekman layer (2 hours of lectures) 5. Wind currents in the oceans (6 hours of lectures) 6. Vorticity (2 hours of lectures) 7. Free waves (4 hours of lectures) 8. Shallow water equations and dynamics (4 hours of lectures) 9. Tides (2 hours of lectures) 10. Storm surge (2 hours of lectures)

Teaching types			
	☑ Lectures	☑ Fieldwork	☑ domaće zadaće
	☐ Seminars	☑ Independent work	☐
	☑ Practicals	☐ Multimedia	☐
	☐ Remote learning	☐ Laboratory	☐
	☐ Blended learning	☐ Supervision	☐

Student obligations	Attend at least 70% of lectures and 70% of exercises.					
Monitoring student work	Class attendance	1	Research		Practical work	
	Experimental work		Paper		Domaće zadaće	1

	Essay		Seminar paper			
	Midterm exam		Oral exam	2		
	Written exam	1	Project			

Assessment and evaluation of student work	During the first 7 weeks of classes, students receive 5 homework assignments from the first 5 teaching units. These assignments are handed over at the end of the 8th work in class and at the final exam week of classes. During the next 7 weeks of classes, students receive 5 new homework assignments from the last 4 teaching units. These assignments are handed over at the end of the 15th week of class. Students who submit assignments on time and achieve more than 50% of the possible points are exempted from taking the written part of the exam. Students who do not pass assignments or achieve less than 50% of the possible points must take a written exam. The final grade is formed on the basis of homework / exam (1/2 grade) and the answer to the oral exam (1/2 grade).

Required literature	Title	Number of copies available	Availability via other media
	Benoit Cushman-Roisin & Jean-Marie Beckers Introduction to Geophysical Fluid Dynamics: Physical and Numerical Aspects Academic Press, 2007		da

Supplementary literature	Jochen Kampf Ocean Modelling for Beginners Springer, 2009. Jochen Kampf Advanced Ocean Modelling Springer, 2009. Reza Malek-Madani Physical Oceanography: A Mathematical Introduction with MATLAB CRC Press, Taylor & Francis, 2012. Rick Salmon Introduction to Ocean Waves Scripps Institution of Oceanography, 2018.
Quality assurance	Statistics of test results and student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split.
Other (in the opinion of the proponent)	

Course name	Informatics Practice						
ID	PMIK80	Study year	2.				
Lecturer	prof. dr. sc. Saša Mladenović	ECTS workload	5.0				
Associates		Number of hours	L	S	E	P	
			0	0	176	0	
Course status	Elective	Online percentage	0%				

Course description	
Course aims	The course goal is to prepare students for the work market. Students development are guided in accordance with the work market demand. The goal is to develop independent and creative problem-solving skills.
Enrolment requirements	In accordance to paragraph 4. subdivision 6. of the University of Split internship rulebook, if the number of available internship places is less than the number of applicants than the selection procedure will be organized in accordance with the paragraph 5. of the internship rulebook.
Learning outcomes	Use the gained knowledge to solve concrete tasks. To estimate resources needed to successfully accomplish the task. To estimate the time needed for the task completion. To solve the problem independently by using internet resources. To cooperate with other employees in the receiving firm.
Syllabus	Informatics practice (internship) is realized in the receiving firm, training base during 22 working days, 8h per day according to the time table agreed upon with the internship mentor. It can start as early as 1st October and can end as late as the end of the academic year. It is assumed that the student will be informed about the firm's nature of the business and marketplace. The task or tasks, as well as a detailed plan of activity, will be prepared in cooperation with the internship mentor.
Teaching types	☐ Lectures ☐ Seminars ☐ Practicals ☐ Remote learning ☐ Blended learning ☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☑ Supervision
Student obligations	The realization of tasks in accordance with the activity plan prepared. Creating an internship report and presentation in front of the mentor appointed by the Faculty.

Monitoring student work						
	Class attendance		Research		Practical work	5
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam		Oral exam			
	Written exam		Project			

Assessment and evaluation of student work	Internship mentor grade the student by using descriptive marks: - the student has successfully accomplished the internship - the student has not accomplished the internship The last mark has to be justified in written form.

	When the internship mentor positively evaluated the student's internship, mentor appointed by the Faculty is analyzing the internship report, discusses with the student about working tasks and grade the student by using descriptive marks: - the student has successfully created and defended the internship report - the student has not successfully created and defended the internship report The last mark has to be justified in written form. When both mentors grade the internship as successful the overall grade is "passed successfully". In the student failed to pass it is not allowed to enroll the course again next year.

Required literature	Title	Number of copies available	Availability via other media
	-		
Supplementary literature			
Quality assurance	The questionnaires are filled by the student in accordance with the Split University internship rulebook. The student uses the 5 levels Likert scale to evaluate the internship. Moreover, the student can make remarks and suggest changes with the goal to improve the internship for the future.		
Other (in the opinion of the proponent)			

Course name	IT Project - Database						
ID		Study year	2.				
Lecturer	doc. dr. sc. Monika Mladenović	ECTS workload	2.0				
Associates		Number of hours	L	S	E	P	
			0	30	0	0	
Course status	Compulsory	Online percentage	0%				

Course description	
Course aims	The course combines theoretical and practical components in the field of relational database design, focusing on real-world application through a student project.
Enrolment requirements	Admission requirements: Enrollment in the course Databases. Entry competences: Basic user-level proficiency in operating systems; familiarity with key concepts of the relational data model.
Learning outcomes	Upon successful completion of the course, the student will be able to: 1. Evaluate the feasibility of a relational database project. 2. Design a relational model for simpler real-world problems described in natural language. 3. Construct an Entity-Relationship (ER) model. 4. Develop a database based on the ER model. 5. Formulate and execute queries on the database. 6. Develop an application layer for interacting with the database. 7. Assess and evaluate the data model.
Syllabus	Basic concepts of relational databases. (2) System analysis. (2) System design. (2) Design of the ER model. (2) Mapping the ER model to the relational data model. (2) Implementation of the relational database. (2) Project tasks and analysis of representative examples. (2) Work on the project. (12) Presentation of completed projects. (4)

Teaching types			
	☐ Lectures ☑ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☐ ☐ ☐ ☐

Student obligations	Lessons attendance, homeworks, activity on lessons

Monitoring student work						
	Class attendance	0.5	Research		Practical work	
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam		Oral exam			

	Written exam		Project	1.5		
Assessment and evaluation of student work	Activity of students in lectures and exercises (presence at the exercises and work on project) (25%) Final project (75%) The final grade is derived on the basis of all these ratings with weighting factors as indicated in parentheses for each form of assessment					
Required literature	Title	Number of copies available	Availability via other media			
	-					
Supplementary literature						
Quality assurance	Talk with students, student evaluation using the anonymous survey, the success of students in the exam, self-assessment.					
Other (in the opinion of the proponent)						

Course name	Human Computer Interaction:: Fundamentals and Principles					
ID	PMIH30	Study year	2.			
Lecturer	prof. dr. sc. Andrina Granić	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Elective	Online percentage	25%			

Course description	
Course aims	Acquisition of fundamental knowledge related to the interaction between human and computer, the importance of good user interface design, along with its role in effective communication between humans and interactive computer systems. Introduction to basic aspects and principles of usable and accessible design as well as design for good user experience. Acquisition of knowledge related to techniques and methods of usability and user experience evaluation.
Enrolment requirements	No formal prerequisites, but is assumed that students have already acquired basic knowledge about interactive computer systems
Learning outcomes	1. Name and explain fundamental terminology and concepts from the Human-Computer (HCI) field. 2. Critically evaluate selection of the principles for the design of usable and accessible user interface. 3. Explain the design for good user experience. 4. Compare and value different approaches to usability evaluation. 5. Decide on adequate methodology for user interface evaluation. 6. Use case: critically evaluate reasons for the development of interactive computer system (product, service); decide on the key functionality according to the set goals; apply principles of usable interface design; decide on and employ adequate evaluation approach.
Syllabus	Lectures: 1. Human-Computer Interaction (HCI): definitions and fundamental principles (2h) 2. Design of everyday things (2h) 3. Usability, accessibility and user experience (2h) 4. Short chronology on interface and interaction design (2h) 5. Human aspects of interaction (4h) 6. Modelling of human-computer interaction (2h) 7. Computer aspects of interaction (2h) 8. Invited lecture (2h) 9. Development of interactive computer systems (2h) 10. User interface design (2h) 11. Prototyping (2h) 12. User interface evaluation (4h) 13. Future interfaces and interactions (2h) Exercises: 1. Introduction to course exercises – generally about structure of exercises; gained knowledge and skills; topics which will be covered; work flow; individual and group tasks; grading. 2. Psychology of everyday things – examples of usable and unusable design of everyday things; analysis of unnecessary design, design with potential and design with new purpose; emotional design; design of future things; 1. Individual task for students (analysis of everyday things, usable and unusable design). 3. Presentations of the 1. Individual student tasks – analysis and discussion.

4. Role of the cognitive psychology – area of interest, influence on the Human Computer Interaction field; information processing; Model of Human Processor; user interface perception.
5. Cognitive "lab" – practical exercises in solving problems from the field of cognitive abilities (attention, perception, memory, learning, problem solving).
6. User interface usability – examples of web interfaces; usability testing methodology; 2. Individual task for students (interface usability analysis of the 3 web sites).
7. Presentations of the 2. Individual student tasks – analysis and discussion.
8. Introduction to group project – iteration procedure of designing web site interfaces; usability testing introduction; goal and methods; task description for preparing and conducting the testing; instructions for writing an usability report.
9. Allocation of tasks and web site interface for usability testing – group work.
10. Developing measurement instruments, questionnaires and questions for user interviews – group work.
11. Implementation of interface usability testing through 6 steps – group work.
12. Group presentations of conducted testing – analysis and discussion.
13. Defining necessary changes on web site interfaces – group work.
14. Implementation of necessary changes on web site interfaces – group work.
15. Group projects – final presentations of student projects.

Teaching types

☑ Lectures	☐ Fieldwork	☐
☑ Seminars	☑ Independent work	☐
☑ Practicals	☐ Multimedia	☐
☐ Remote learning	☑ Laboratory	☐
☐ Blended learning	☑ Supervision	

Student obligations

Active participation in all activities: lectures, consultations, searching the literature, individual work in the assigned project and given use case; final oral exam

Monitoring student work

Class attendance	1	Research		Practical work	2
Experimental work		Paper			
Essay		Seminar paper			
Midterm exam		Oral exam	1		
Written exam	1	Project			

Assessment and evaluation of student work

Individual /group projects (50%).
Final/Oral Exam (50%).

Required literature

Title	Number of copies available	Availability via other media
J. Preece, et al.: Human-Computer Interaction, Addison-Wesley, Harlow, England, 1994.	1	
B. Schneiderman and C. Plaisant: Designing the User Interface. Strategies for Effective Human-Computer Interaction, 5th Edition, Addison-Wesley, Reading, MA, 2010.	1	on-line

Supplementary literature

1. S. Krug: Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability. 3rd Edition, New Riders, 2014.

2. J. Nielsen: Usability Engineering, Boston: AP Professional, 1993.

3. D. Norman: The Psychology of Everyday Things, Basic Books, 1988.

	Svi nastavni materijali dostupni on-line, uključujući i dodatnu znanstvenu literaturu.
Quality assurance	student discussion, anonymous student evaluation questionnaire, student success rate, self-assessment
Other (in the opinion of the proponent)	

Course name	Research in Biophysics					
ID	PMP407	Study year	2.			
Lecturer	doc. dr. sc. Lucija Krce	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			10	20	0	0
Course status	Compulsory	Online percentage	20%			

Course description	
Course aims	To train students towards independent research, with the participating in development, measurement, analysis and presentation of scientific projects in biophysics and bio-science.
Enrolment requirements	The learning outcomes of Bachelor programmes in physics, basic knowledge in molecular biology and biochemistry.
Learning outcomes	On completion of this course a student should be able to: 1. Explore, develop and present a physical model for the selected problem in biophysics or interdisciplinary. 2. Depending on the research subject, get familiar with the techniques and methods applied in the biophysical or interdisciplinary research. 3. Prepare and present a seminar work. 4. Develop a critical understanding of scientific investigation in biophysics and interdisciplinary and ability to describe and present such research.
Syllabus	The course depends on the research subject, with the general content: 1. Definition of a research problem 2. Literature search 3. Definition of a physical model 3. Measurements, simulations, bioinformatical analysis, programming ... 4. Analysis and calculation 5. Writing seminar 6. Presentation

Teaching types			
☑ Lectures	☐ Fieldwork	☑ Aktivni rad studenata, uz stručno vođenje.	
☑ Seminars	☐ Independent work	☐	
☐ Practicals	☐ Multimedia	☐	
☐ Remote learning	☐ Laboratory	☐	
☐ Blended learning	☑ Supervision		

Student obligations	Independently, with the professional guidance, to complete and present small scientific project.					
Monitoring student work	Class attendance	1	Research		Practical work	
	Experimental work		Paper		Samostalna mjerenja, analiza i prezentiranje rada	4
	Essay		Seminar paper			
	Midterm exam		Oral exam			
	Written exam		Project			

Assessment and evaluation of student work	Preparation and presentation of the research (100%).		
Required literature	Title	Number of copies available	Availability via other media
	Depending on the choice of the research subject		
Supplementary literature			
Quality assurance	1. Analysis of the acquired learning outcomes at the end of the class, compared with the introductory work of students. 2. Monitoring the development of students in the subjects who followed the links with the success of the case. 3. Exam results statistics and student evaluation through an anonymous survey at the end of the course. The survey is conducted according to the regulations of the University of Split.		
Other (in the opinion of the proponent)			

Course name	Research in Environmental Physics		
ID	PMP26C	Study year	2.
Lecturer	izv. prof. dr. sc. Žarko Kovač doc. dr. sc. Marin Vojković izv. prof. dr. sc. Jadranka Šepić	ECTS workload	6.0
Associates		Number of hours	L: 10, S: 20, E: 30, P: 0
Course status	Compulsory	Online percentage	0%

Course description	
Course aims	- train students for independent research - acquire skills of presentation of scientific results according to the standards of the profession - encouraging independent research
Enrolment requirements	- Introduction to Fluid Mechanics - Meteorology I - Ocean Physics I - Introduction to Data Analysis - Meteorology II - Ocean Physics II
Learning outcomes	- knowledge of making a physical model for a selected problem in environmental physics - knowledge of research planning - depending on the choice of research topic, knowing specific techniques and Methods of measurement and data processing - depending on the choice of research topic, knowing specific techniques and modelling methods - preparing a written seminar - oral presentation
Syllabus	1. Review of current research in environmental physics (10 hours of lectures) 2. Definition of the research problem (*) 3. Literature search (*) 4. Analysis of the theoretical model (*) 5. Presentation of the theoretical foundations of the research topic (10 hours of seminars) 6. Measurements, simulations, development of computer programs (*) 7. Analysis and data processing (*) 8. Presentation of quantitative research results (10 hours of seminars) 9. Writing a seminar (*) * The exact number of hours of practice of each teaching unit depends on the research topic.

Teaching types	☑ Lectures ☑ Seminars ☑ Practicals ☐ Remote learning ☑ Blended learning	☑ Fieldwork ☑ Independent work ☑ Multimedia ☑ Laboratory ☑ Supervision	☑ Homework ☐ ☐ ☐

Student obligations	Attend at least 70% of lectures and 70% of exercises.					
Monitoring student work	Class attendance	2	Research		Practical work	0.5
	Experimental work	0.5	Paper			
	Essay		Seminar paper	1		
	Midterm exam		Oral exam			
	Written exam		Project	2		

Assessment and evaluation of student work	For the first 5 weeks, the teacher gives lectures on current research topics in environmental physics (models, measurements, instrumentation). By the end of the 5th week of classes, the student chooses a topic and a mentor. Depending on the topic, the student also receives a co-mentor who can be from an external institution. In weeks 6 - 15, the student conducts research by attending individualized exercises adapted to the research topic. At the end of week 10, he presents the theoretical foundations of the research topic. At the end of week 15, the student presents the quantitative results of the research. He then submits a written seminar containing theory and results. Students who do not present theoretical or quantitative results, or do not submit a seminar, lose the right to take the exam.		
Required literature	Title	Number of copies available	Availability via other media
	- books depending on the research topic		
Supplementary literature	- papers depending on the research topic		
Quality assurance	Exam results statistics and student evaluation through an anonymous survey at the end of the course. The survey is conducted according to the regulations of the University of Split.		
Other (in the opinion of the proponent)			

Course name	Research in Computer Science Education					
ID	PMIK65	Study year	2.			
Lecturer	doc. dr. sc. Monika Mladenović	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			15	30	0	0
Course status	Elective	Online percentage	0%			

Course description	
Course aims	Explore literature for selected areas of IT education research (eg teaching methods, visualization systems, educational technology, etc.), write a literature review for the selected area, and create a research plan.
Enrolment requirements	Completed Method of teaching computer science II
Learning outcomes	After passing the course, students will be able to: - Discuss areas of information education and open research issues - Describe the steps in carrying out the literature review - Recognize scientific papers that are relevant to the implementation of their own research work - Identify research questions, applied methodology and research findings - Create an overview of the area - Develop a plan for carrying out its own research - Discuss the decisions made in the design of the research plan
Syllabus	1. Getting acquainted with the areas of research in informatics education (2 + 0) 2. Research Planning Phases (2 + 0) 3. Examples and analysis of existing research in education from selected IT fields (7 + 0) 4. How to write literature review (2 + 0) 5. Analysis of Existing Literary Examinations (2 + 0) 6. Presentations of student seminars and research plans (0 + 15)

Teaching types						
	☑ Lectures		☐ Fieldwork		☐	
	☑ Seminars		☐ Independent work		☐	
	☐ Practicals		☐ Multimedia		☐	
	☐ Remote learning		☐ Laboratory		☐	
	☐ Blended learning		☐ Supervision		☐	

Student obligations
Attending lectures. Creating seminar work. Design (and conduct) research

Monitoring student work						
	Class attendance	0.5	Research	1.5	Practical work	
	Experimental work		Paper			
	Essay		Seminar paper	3		
	Midterm exam		Oral exam			
	Written exam		Project			

Assessment and evaluation of student work	Research plan (30%), seminar work and presentation (70%).		
Required literature	Title	Number of copies available	Availability via other media
	Sally Fincher, Marian Petre: Computer Science Education Research, 2004.	1	
	Orit Hazzan, Tami Lapidot, Noa Ragonis: Guide to Teaching Computer Science: An Activity-Based Approach	1	
Supplementary literature	Journals. Computers & Education, ACM Transactions on Computing Education The Computer Science Education Copnferences: SIGCSE (Special Interest Group on Computer Science Education) ITiCSE (Innovation and Technology in Computer Science) ISSEP (Informatics in Secondary Schools: Evolution and Perspective)		
Quality assurance	Conversation with students, student evaluation using anonymous poll, student success on exams, self-assessment,		
Other (in the opinion of the proponent)			

Course name	Kinesiological activity, fitness and health					
ID	PMS135	Study year	1.			
Lecturer	prof. dr. sc. Mladen Hraste	ECTS workload	2.0			
Associates		Number of hours	L	S	E	P
			15	0	15	0
Course status	Elective	Online percentage	0%			

Course description	
Course aims	The first objective of the course is to help students in understanding and implementation of a healthy way of life. Another goal of the course to over kinesiology operators maintain and improve their health and raise their quality of life and study
Enrolment requirements	There are no requirements for subject enrolling. There are no entry competences required.
Learning outcomes	After completing the course students will be capable: o to implement independent participation in fitness programs o to implement physically active lifestyle o to apply learned knowledge and skills needed for further independent learning and the acquisition of new motor competence o to promote the value of an active and healthy lifestyle o better mental and physical health
Syllabus	1st teaching topic (2 hours of lectures): concept and definition of kinesiology; development and structure of kinesiology 2ndt teaching topic (2 hours of lectures): equation specifications in sports 3rd teaching topic (2 hours of lectures): kinesiological activity and health 4th teaching topic (2 hours of lectures): review of scientific research on the effects of kinesiology to human health 5th teaching topic (2 hours of lectures): program of contemporary aerobics 6th teaching topic (2 hours of lectures): cardio fitness program 7th teaching topic (3 hours of lectures: weight fitness program 8th teaching topic (2 hours of exercises): program of contemporary aerobics (pilates) 9th teaching topic (2 hours of exercises): program of contemporary aerobics (aerobic) 10th teaching topic (2 hours of exercises): cardio fitness program (manual i fat burn program) 11th teaching topic (2 hours of exercises): cardio fitness program (high intensity interval training) 12th teaching topic (2 hours of exercises): weight fitness program for low extremities 13th teaching topic (2 hours of exercises): weight fitness program for hands

	and shoulders 14th teaching topic (3 hours of exercises): weight fitness program for trunk

Teaching types			
	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☐ ☐ ☐ ☐

Student obligations	
	Students are required to attend a minimum of 24 out of 30 planned hours (80%).

Monitoring student work						
	Class attendance	0.75	Research		Practical work	0.75
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam		Oral exam			
	Written exam	0.5	Project			

Assessment and evaluation of student work	
	The course is rated as the arithmetic mean score of the practical exam and the theoretical exam. The student will get a grade excellent (5) of the practical part of the exam if motor movement performed flawlessly, easily and harmoniously. The student will get a grade very good (4) of the practical part of the exam if motor movement performed flawlessly, easily and harmoniously, but a little "harder". Students will get a good grade (3) of the practical part of the exam if motor movement performed with minor errors and with less difficulty. The student will get a grade sufficient (2) of the practical part of the exam if motor movement performed with major mistakes and with great difficulty. Students will receive an unsatisfactory grade (1) of the practical part of the exam if you can not perform a motor task is not in the elemental form. The theoretical part is taken by written test

Required literature	Title	Number of copies available	Availability via other media
	http://www.pmfst.hr/~mhraste/ Priručnik iz kolegija Kineziološka aktivnost, fitness i zdravlje		dostupno

Supplementary literature	
	Delavier F. (2009). Anatomski vodič za vježbe snage. Medicinska naklada, Zagreb. Milanović i sur. (1996). Fitness. Fakultet za fizičku kulturu Sveučilišta u Zagrebu, Zagrebački velesajam, Zagrebački športski savez, Fakultet za fizičku kulturu. Mišigoj-Duraković M. i sur. (1999). Tjelesno vježbanje i zdravlje. Fakultet za fizičku kulturu Sveučilišta u Zagrebu. Mraković M. (1993). Osnove sistematske kineziologije. Priručnik za sportske trenere (ur. Milanović D., Kolman M.). Fakultet za fizičku kulturu, Hrvatski olimpijski odbor, Zagrebački sportski savez. Sharkey, B. J. ; Gaskill, S. E. (2008). Fitness and health. Vežbanje i zdravlje. Beograd: Subcom.

Quality assurance	Internal and external expert evaluation. Student evaluation.
Other (in the opinion of the proponent)	

Course name	Classical Mechanics I						
ID	PMP110	Study year	2.				
Lecturer	izv. prof. dr. sc. Željka Sanader Maršić	ECTS workload	6.0				
Associates		Number of hours	L	S	E	P	
			45	0	30	0	
Course status	Compulsory	Online percentage	30%				

Course description	
Course aims	Formulation of the laws of classical mechanics with the development of mathematical methods for solving problems and critical assessment of their applicability to classical systems.
Enrolment requirements	Mechanics (passed) Mathematics I (passed) Mathematics II (attended)
Learning outcomes	1. Interpret and apply the fundamental principles of classical mechanics, which includes Newton's determinism, Galilean invariance, and laws of conservation of momentum, angular momentum, and energy. Use vector calculus to solve basic problems in classical mechanics. 2. Apply Newton's postulates by solving differential equations. Explain what are inertial and non-inertial reference frames. 3. Derive the equation of motion of a particle in a non-inertial frame, describe the influence of each term on the particle's motion, and analyze the impact of Coriolis force on the motion of objects close to the Earth's surface. 4. Sketch possible trajectories of a particle in the field of any central force and derive the analytical expression for the particle's trajectory in the field of several well-known central forces, including Kepler's problem. Describe the scattering experiment on a fixed target with emphasis on Rutherford's experiment. 5. Qualitatively and quantitatively analyze the motion of particle systems, different types of harmonic oscillators (explain the phenomenon of resonance), and rigid bodies (derive Euler's equations, define Euler angles, solve the problem of symmetric and asymmetric oscillations, derive the expression for the inertia tensor, and calculate it for several regular geometric bodies).
Syllabus	1. (3+2) Scalars, Vectors, and Tensors 2. (3+2) Kinematics 3. (3+2) Newtonian Mechanics 4. (3+2) Mechanics of Particle Systems 5. (3+2) Motion in One Dimension 6. (3+2) Non-inertial Frames 7. (3+2) Central Forces 8. (3+2) Particle Scattering in a Central Force Field, 1/2 9. (3+2) Particle Scattering in a Central Force Field, 2/2 10. (3+2) Multipole Expansion of the Gravitational Potential 11. (3+2) Two-Body Problem 12. (3+2) Three-Body Problem and Lagrange Points 13. (3+2) Orthogonal Transformations

	14. (3+2) Kinematics of Rigid Bodies 15. (3+2) Euler's Equations and Angles

Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☑ Independent work ☑ Multimedia ☐ Laboratory ☐ Supervision	☐ ☐ ☐ ☐

Student obligations						
Monitoring student work	Class attendance	2.5	Research		Practical work	
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam		Oral exam	1.75		
	Written exam	1.75	Project			

Assessment and evaluation of student work	Twice during the semester, students take a written exam covering two halves of the material. Students who score more than 50% on each exam are exempt from taking the written exam and can proceed to the oral exam. Students who score 50% or more on the first written quiz can take the oral exam in two parts, immediately after the written exam is graded. The final grade is based on the written exam (worth 1/2 of the grade) and the performance on the oral exam (worth 1/2 of the grade).

Required literature	Title	Number of copies available	Availability via other media
	Herbert Goldstein, John Safko, Charles Poole: Classical Mechanics, Pearson New International Edition, Pearson; 3rd edition (July 25, 2013)	3	no
	David Morin: Introduction to Classical Mechanics: With Problems and Solutions, Cambridge University Press; 1st edition (February 4, 2008)	4	no

Supplementary literature	Slides and lecture notes.
Quality assurance	1. Teachers who have correlated learning outcomes collaborate and jointly ensure the quality of teaching. 2. Statistical analysis of exam results and evaluation of success in accordance with the stated learning outcomes. 3. Student evaluation through an anonymous survey conducted in accordance with the regulations of the University of Split.
Other (in the opinion of the proponent)	

Course name	Klimatske promjene, meteorologija i oceanografija u nastavi					
ID	PMF5	Study year	1.			
Lecturer	izv. prof. dr. sc. Jadranka Šepić	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			15	0	0	0
Course status	Elective	Online percentage	0%			

Course description	
Course aims	Upoznati se s teorijskim osnovama odabranih poglavlja iz područja klimatskih promjena, meteorologije i oceanografije. Osmisliti nastavni sadržaj, s uključenom teorijskom, eksperimentalnom i istraživačkom komponentom, vezan uz odabranu temu
Enrolment requirements	
Learning outcomes	Po završetku kolegija studenti će moći: ➢ Samostalno obrađivati teme iz klimatskih promjena, meteorologije i oceanografije ➢ Osmisliti i razviti teorijsku komponentu nastavnog sadržaja ➢ Osmisliti i razviti eksperimentalnu komponentu nastavnog sadržaja ➢ Osmisliti i razviti istraživačku komponentu nastavnog sadržaja
Syllabus	1. Upoznavanje s odabranom temom iz područja klimatskih promjena, meteorologije i oceanografije (4 h) 2. Demonstracijski eksperimenti vezani uz odabranu temu; te njihovo osmišljavanje i provođenje (4 h) 3. Osmišljavanje istraživačkog rada prikladnog za rad s učenicima (4 h) 4. Osmišljavanje i razvoj cjelokupnog nastavnog sadržaja vezanog uz odabranu temu (4 h)

Teaching types						
	☑ Lectures		☐ Fieldwork		☐	
	☐ Seminars		☑ Independent work		☐	
	☐ Practicals		☐ Multimedia		☐	
	☐ Remote learning		☐ Laboratory		☐	
	☐ Blended learning		☐ Supervision		☐	

Student obligations	Pohađanje nastave, seminarski i istraživački rad					
Monitoring student work	Class attendance	1	Research		Practical work	1
	Experimental work	1	Paper			
	Essay		Seminar paper	1		
	Midterm exam		Oral exam	1		
	Written exam		Project			

Assessment and evaluation of student work			
Required literature	Title	Number of copies available	Availability via other media
	John Marshall & R. Alan Plumb Atmosphere, Ocean and Climate Dynamics Elsevier Academic Press, 2008.	1	
	J. David Neelin Climate Change and Climate Modelling	1	
	Practical Meteorology: An algebra-based survey of Atmospheric Science Kluwer, 1988.	1	
	Egbert Boeker & Rienk Van Grondelle Environmental Physics: Sustainable Energy and Climate Change Wiley	1	
Supplementary literature			
Quality assurance	Razgovori sa studentima, anonimna studentska anketa, uspješnost na ispitu, samoanaliza.		
Other (in the opinion of the proponent)			

Course name	Complex analysis		
ID	PMM116	Study year	3.
Lecturer	prof. dr. sc. Jurica Perić	ECTS workload	6.0
Associates		Number of hours	L: 30, S: 0, E: 30, P: 0
Course status	Compulsory	Online percentage	30%

Course description	
Course aims	Aim of the course aims is to introduce basic concepts and results from the theory of complex functions of a complex variable, with an emphasis on the theory of analytical functions. Students must develop the ability of understanding the results presented in the lectures as well as setting up and solving tasks and problems that may be found in connection with these results. Techniques to solve tasks students acquire on the exercises.
Enrolment requirements	Taken course „Foundation of mathematical analysis“.
Learning outcomes	The student is able to: - analyze the topological properties of a set of complex numbers - analyze the importance of the Cauchy-Riemann conditions - distinguish differentiable complex functions and functions of real variables - connect differentiability with integral along closed curve (general Cauchy theorem) - relate analyticity and development in order (Taylor and Laurent Development) - classify singularities (pole, removable and essential singularity) - apply the acquired knowledge on residuums in the calculation of special improper integrals
Syllabus	Complex numbers C - 2 hours Convergence of the series, closer of the set - 2 hours Complex functions of complex variables, continuity, limit - 2 hours Completeness - 2 hours Compactness - 2 hours Analytic functions, Cauchy-Riemann theorem - 2 hours Integral of the complex function - 2 hours General Cauchy theorem - 2 hours Cauchy's integral formula - 2 hours Series of functions - 2 hours Uniformly convergent series of functions - 2 hours Taylor and Laurent theorem - 2 hours Isolated singularities - 3 hours Residuum theorem and applications - 3 hours
Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning ☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision
Student obligations	Attendance at 70% of lectures.

Monitoring student work	Class attendance	1	Research		Practical work	
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam	1	Oral exam	3		
	Written exam	1	Project			

Assessment and evaluation of student work	The exam is taken in written and oral form. Written exam is preliminary part of the exam and requirement for the oral exam is to pass a written exam. The written form of the exam can be taken partially, during class, where curriculum provided. Activity in class, solving homework, colloquium, written and oral examination are the elements from which form the final grade is formed.		
Required literature	Title	Number of copies available	Availability via other media
	B. Červar, Kompleksna analiza, skripta		
	Š. Ungar, Matematička analiza 4, (skripta), Zagreb, 2001.		
	H. Kraljević, S. Kurepa, Matematička analiza 4/I: Funkcije kompleksne varijable, Tehnička knjiga, Zagreb, 1986.		
Supplementary literature	S. Kurepa, Matematička analiza III, Tehnička knjiga, Zagreb, 1975. W. Rudin, Real and complex analysis, McGraw-Hill, New York, 1970.		
Quality assurance	Statistics of test results and student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split.		
Other (in the opinion of the proponent)			

Course name	Communication Skills					
ID	PMSN09	Study year	2.			
Lecturer	Ana Mršić Zdilar, v. pred.	ECTS workload	2.0			
Associates		Number of hours	L	S	E	P
			15	15	0	0
Course status	Elective	Online percentage	0%			

Course description	
Course aims	• to understand the basic concepts related to verbal and nonverbal communication, as well as the factors that influence these concepts; • to develop the skills of presentation planning, presentation structure, and presentation performance in the Croatian language; • to develop pragmatic language competence; • to adopt the basic principles of written communication.
Enrolment requirements	None.
Learning outcomes	tudents will be able to: 1. describe the theories and models of communication; 2. employ active listening techniques; 3. demonstrate questioning skills; 4. give a technical presentation; 5. critically evaluate their own communication skills; 6. recognize disfluent speech; 7. negotiate and demonstrate the skills of assertive communication
Syllabus	Definitions of communication; Overview of the theory of communication; Cross-cultural communication Verbal and nonverbal communication Questioning as a communication skill Active listening and Barriers to active listening Written communication; Project reports Presentation skills (systematic guide) Technical presentation Technical presentation and peer evaluation Assertive communication and Critical thinking Public speaking skills Types of speech disfluencies Group and Team communication

Teaching types	☑ Lectures ☑ Seminars ☐ Practicals ☐ Remote learning ☐ Blended learning		☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision		☐ ☐ ☐ ☐		
Student obligations	Active participation in all activities: lectures, consultations, searching the literature, individual work.						
Monitoring student work	Class attendance	0.5	Research		Practical work		
	Experimental work		Paper	1			
	Essay		Seminar paper				
	Midterm exam		Oral exam				
	Written exam	0.5	Project				
Assessment and evaluation of student work	The final grade is determined as the average of: • assessment of oral presentation and peer assessment of oral presentation; • assessment of written communication skills, • written and oral assessment.						
Required literature	Title	Number of copies available	Availability via other media				
	-						
Supplementary literature	1.Davies, J. W.: Communication skills: A Guide for Engineering and Applied Science Students. Pearson: Prentice Hall, 2001. 2.Harris, T. E., Sherblom, J.C.: Small Group and Team Communication. Pearson Education/Allyn & Bacon, 2010.						
Quality assurance	• Vođenje evidencije o prisutnosti na nastavi • Godišnja analiza uspješnosti polaganja ispita • Studentska anketa s ciljem evaluacije nastavnika • Samoevaluacija nastavnika • Povratna informacija od strane studenata koji su već diplomirali o relevantnosti sadržaja predmeta						
Other (in the opinion of the proponent)							

Course name	Mathematical methods of physics I					
ID	PMP107	Study year	2.			
Lecturer	izv. prof. dr. sc. Bernarda Lovrinčević	ECTS workload	6.0			
Associates		Number of hours	L	S	E	P
			45	15	30	0
Course status	Compulsory	Online percentage	10%			

Course description	
Course aims	To teach students to use methods of vector and tensor analysis as well as probability and statistics in analysis and solving of physics problems.
Enrolment requirements	Calculus in one variable
Learning outcomes	1. Formulate the action of differential vector operator nabla on scalar and vector fields in any orthogonal coordinate system and discuss the interpretation of obtained quantities in physical systems. 2. Choose optimal procedure when calculating physical quantities (using Gauss's, Stokes' and Green's theorem, directional derivative and mathematical identities) 3. Formulate basic operators and theorems of tensor analysis and apply them in different areas, such as mechanics or electrodynamics 4. Apply basic concepts of probability theory and use permutations, combinations and variations in calculations. 5. Calculate basic statistical parameters of a series of data (mean value, standard deviation, estimation of errors), recognise when it is possible to fit data using least squares method and use the calculation of correlations in statistical analysis. 6. Describe properties of discrete and continuous random variables. 7. Enumerate basic methods for parameter estimation, define likelihood function and apply hypothesis testing (e.g. chi-square test).
Syllabus	1. Curved coordinates. Gradient. Directional derivative. (5h) 2. Divergence. Curl. (6h) 3. Vector integration. Gauss's Theorem. Stokes Theorem. (6h) 4. Gauss's law and Poisson's Equation. Multiple applications of nabla (6h) 5. Dirac Delta Function. (6h) 6. Differential Vector Operators in orthogonal coordinates. Examples in spherical and cilindrical coordinates. (6h) 7. Introduction to Tensor Analysis. Contraction and direct product. Quotient Rule. (8h) 8. Tensors in general coordinates. Covariant derivatives. (8h) 9. Basics in combinatorics. (6h) 10. Elements of the probability theory: random events, dependence and independence. (6h) 11. Random variables and probability distributions (10h) 12. Basic statistical parameters of data series. Propagation of errors. Least squares method. (7h) 13. Statistical estimation of parameters. Testing statistical hypothesis. (10h)
Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning ☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision
Student obligations	Active participation during class attendance.

Monitoring student work	Class attendance	3	Research		Practical work	
	Experimental work		Paper		Independent work and exam	3
	Essay		Seminar paper			
	Midterm exam		Oral exam			
	Written exam		Project			

Assessment and evaluation of student work	Colloquia and final exam.		
Required literature	Title	Number of copies available	Availability via other media
	1. L. Vranješ Makrić, Skripta iz matematičkih metoda fizike I, lecture notes, 2009. Moodle Web page		yes
	2. PP Presentations in probability and statistics		yes
Supplementary literature	1. K. F. Riley, M. P.Hobson, S. J. Bence, Mathematical methods for physics and engeneering. 2. H. J. Weber , G. B. Arfken, G. Arfken, Essential Mathematical Methods for Physicists, Academic Press, 2003.		
Quality assurance	- following the success of students in colloquia and exam - following the student success in the following exams and the connection to the success of this course - student surveys		
Other (in the opinion of the proponent)			

Course name	Mathematical Methods of Physics III					
ID	PMP102	Study year	3.			
Lecturer	izv. prof. dr. sc. Petar Stipanović prof. dr. sc. Larisa Zoranić	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Compulsory	Online percentage	10%			

Course description	
Course aims	Knowledge and skills in the numerical methods and their implementation, including the methods of linear algebra and numerical analysis, applied in solving problems in physics.
Enrolment requirements	Basic knowledge of programming (C or C++), mathematical analysis, linear algebra and general physics.
Learning outcomes	1. Apply numerical methods to obtain approximate solutions to mathematical problems such as interpolation, differentiation and integration. 2. Develop a critical understanding of the capabilities and limits of the various numerical methods and correctly estimate numerical errors. 3. Solve ordinary and partial differential equations frequently encountered in physics in some simple cases. 4. Formulate, computationally solve and present results for simple problems in physics.
Syllabus	Practical exercises on the computer follow lectures with the same schedule according to the following content with applications in physics. INTRODUCTION TO NUMERICAL METHODS (2h) Introduction to the course. Reminder of programming basics: recursive relations, numerical errors. (2h) Solving a system of homogeneous linear equations by the method of Gauss-Jordan elimination with pivoting. Three-diagonal system of linear equations. (2h) Numerical derivation. (2h) Root-finding algorithms: bisection method and Newton-Raphson method. APPROXIMATION AND INTERPOLATION (2h) Approximations and polynomial interpolation. Lagrange interpolating polynomial. (2h) Neville's algorithm. (2h) Cubic spline interpolation. NUMERICAL INTEGRATION (2h) Newton-Cotes quadrature. Equally spaced points. Trapezoidal rule. Simpson's rule. (2h) Gauss-Legend quadrature. Legendre polynomials. Laguerre polynomials. Hermite polynomials. ORDINARY DIFFERENTIAL EQUATIONS (1h) Introduction to differential equations. Numerical solution of motion equations. (1h) Euler's method. Predictor-corrector method. Visualization. (2h) Runge-Kutta method. Harmonic oscillations. PARTIAL DIFFERENTIAL EQUATIONS (4h) Explicit and implicit scheme. 1D diffusion equation. (2h) Crank-Nicolson method. Wave equation. (2h) Elective topic. Project tasks.

Teaching types			
	☑ Lectures ☑ Seminars ☑ Practicals	☐ Fieldwork ☑ Independent work ☐ Multimedia	☐ ☐ ☐

	☐ Remote learning ☐ Blended learning	☐ Laboratory ☐ Supervision	☐

Student obligations	Active participation in classes and assignments. Solving given physics problems and project and its presentation.						
Monitoring student work	Class attendance	2	Research		Practical work		1
	Experimental work		Paper				
	Essay		Seminar paper				
	Midterm exam	1	Oral exam				
	Written exam		Project	1			

Assessment and evaluation of student work	The conditions for passing the exam are: - completed mandatory assignments given during lectures and exercises, - passed colloquia or written exam; while a project is elective for a higher grade. The grade is formed according to the evaluation of the student's activity, the grade of the practical exams and the grade of the project.

Required literature	Title	Number of copies available	Availability via other media
	[1] Morten Hjorth-Jensen: "Computational Physics", Lecture Notes, University of Oslo, 2007, 2015.		yes
	[2] W. H. Press, S. A. Teukolsky, W. T. Vetterling & B. P. Flannery: Numerical Recipes in C / C++, The Art of Scientific Computing, Cambridge, 2002, 2007. University Press		yes
	[3] K. Ćosić, P. Marendić: "Naučite programirati uz C++", Element, 2009, 2014.	9	no
	[4] Leandra Vranješ Markić: "Matematičke metode fizike I", skripta, PMFST, Split, 2009.		yes
	[5] Digitalni materijali s predavanja (P. Stipanović, L. Zoranić).		yes

Supplementary literature	[6] H. J. Weber , G. B. Arfken, G. Arfken, Essential Mathematical Methods for Physicists, Academic Press, 2003. [7] B. W. Kernighan & D. M. Ritchie "The C programing langauge", Prentice Hall, USA, 1998. [8] Z. Drmač, V. Hari, M. Marušić, M. Rogina, S. Singer & S. Singer: Numerička analiza, skripta, PMF, Zagreb, 2003. [9] Cplusplus.com: "C++ Language", Tutorial, http://www.cplusplus.com/doc/tutorial/ [10] Scientific papers.
Quality assurance	Lecturers who teach subjects, which have correlated learning outcomes, collaborate and take care of teaching quality. Discussion with students and analyzing their progress in solving problem and project tasks. Statistics of exam results and evaluation of efficacy in accordance with the learning outcomes. Student evaluation by anonymous survey conducted according to the rules of the University of Split.
Other (in the opinion of the proponent)	

Course name	Mathematical program tools I					
ID	PMM017	Study year	3.			
Lecturer	doc. dr. sc. Gordan Radobolja	ECTS workload	2.0			
Associates		Number of hours	L	S	E	P
			0	0	30	0
Course status	Compulsory	Online percentage	0%			

Course description	
Course aims	Competence in the use of LaTeX. Competence in the use of Maxima.
Enrolment requirements	
Learning outcomes	The student is able to: - prepare the text for reading and printing using LateX - connect smaller units of the document written in LaTex (main page, a list of figures and tables, contents, chapters) in the final document - show standard mathematical expressions (matrices, integrals, sums, products, piecewise defined function) using Latex - prepare a seminar and presentation using Latex - define basic objects using Maxima (functions, lists, matrices) - solve mathematics problems using Maxima - create graphics for functions of two and three variables with the change of features of the graphics using Maxima - modify algorithms for implementation in Maxima
Syllabus	Introduction to Maxima. - 2 hours Notation and arithmetic. - 2 hours Defining functions. - 2 hours Lists, matrices. - 2 hours Differential calculus, solving equations. - 2 hours Graphics. - 6 hours Introduction to Latex. - 1 hour Composing plain text. - 1 hour Environments in LaTeX. Tables. - 2 hours The colors in the text. - 1 hour Graphics. - 1 hour Composing mathematical text. - 1 hour Writing mathematical formulas. Parts of mathematical formulas. - 2 hours Array environment. - 1 hour The environment for the theorem. - 2 hours Beamer. - 2 hours

Teaching types					
	☐ Lectures ☐ Seminars ☐ Practicals ☐ Remote learning ☐ Blended learning		☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision		☐ ☐ ☐ ☐
Student obligations	Attendance at 70% of exercises.				
Monitoring student work	Class attendance	1	Research		Practical work

	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam		Oral exam			
	Written exam	1	Project			

Assessment and evaluation of student work	During the course students work on the computer is monitored. The exam is taken using a computer and consists of two parts, part for the Latex and part for the Maxima.		
Required literature	Title	Number of copies available	Availability via other media
	Š. Ungar, Ne baš tako kratak uvod u TeX s naglaskom na LaTeX2ε, Sveučilište u Osijeku, Odjel za matematiku, Osijek 2002.		
Supplementary literature			
Quality assurance	Statistics of test results and student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split		
Other (in the opinion of the proponent)			

Course name	Mathematical program tools II		
ID	PMM018	Study year	3.
Lecturer	prof. dr. sc. Jurica Perić dr. sc. Ivana Vukorepa	ECTS workload	2.0
Associates		Number of hours	L: 0 / S: 0 / E: 30 / P: 0
Course status	Compulsory	Online percentage	30%

Course description	
Course aims	Competence in the use of Scilab. Competence in the use of Octave.
Enrolment requirements	
Learning outcomes	The student is able to: define basic objects using Scilab and Octave (functions, lists, matrices) solve mathematical problems using Scilab and Octave create graphics for functions of two and three variables with the change of features of the graphics using Scilab and Octave solve ordinary and partial differential equations using Scilab demonstrate the behavior of mathematical models using simulation in Scilab design animation in Scilab modify algorithms for implementation in Scilab and Octave
Syllabus	Introduction to Scilab and its possibilities - 2 hours Matrices - 2 hours Graphics - 4 hours First partial exam - 1 hour Functions. Branching instructions. Loops - 2 hours Data types - 2 hours. Second partial exam - 1 hour Differential calculus - 2 hours Differential equations - 2 hours Third partial exam - 2 hours Introduction to Octave and its possibilities - 2 hours Basic data types - 2 hours Functions. Branching instructions. Loops. - 2 hours Fourth partial exam - 1 hour Graphics - 2 hours Fifth partial exam - 1 hour

<table>
<tr><td>Teaching types</td><td colspan="3">☐ Lectures
☐ Seminars
☑ Practicals
☐ Remote learning
☐ Blended learning</td><td colspan="2">☐ Fieldwork
☐ Independent work
☐ Multimedia
☐ Laboratory
☐ Supervision</td><td>☐
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☐
☐</td></tr>
<tr><td>Student obligations</td><td colspan="6"></td></tr>
<tr><td rowspan="5">Monitoring student work</td><td>Class attendance</td><td>0.5</td><td>Research</td><td></td><td>Practical work</td><td>1.5</td></tr>
<tr><td>Experimental work</td><td></td><td>Paper</td><td></td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar paper</td><td></td><td></td><td></td></tr>
<tr><td>Midterm exam</td><td></td><td>Oral exam</td><td></td><td></td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td></td><td></td></tr>
<tr><td>Assessment and evaluation of student work</td><td colspan="6">During the course students work on the computer is monitored. The exam is taken using a computer and consists of five partial exams during the semester (3 partial exams in Scilab, 2 partial exams in Octave).</td></tr>
<tr><td rowspan="2">Required literature</td><td>Title</td><td colspan="2">Number of copies available</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="5">-</td></tr>
<tr><td>Supplementary literature</td><td colspan="6"></td></tr>
<tr><td>Quality assurance</td><td colspan="6">Statistics of test results and student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split</td></tr>
<tr><td>Other (in the opinion of the proponent)</td><td colspan="6"></td></tr>
</table>

Course name	Materials					
ID	PMT154	Study year	2.			
Lecturer	doc. dr. sc. Ivan Peko	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			45	0	30	0
Course status	Compulsory	Online percentage	0%			

Course description	
Course aims	Adopting basic knowledge of materials for the purpose of education in primary and secondary schools
Enrolment requirements	None
Learning outcomes	1. Define the types of chemical bonds and crystal systems 2. Explain the process of crystallization and characteristics of individual crystal structures 3. Analyze the basic phase diagrams 4. Define conditions occurrence of certain structural phase Fe-C alloy 5. Characterize polymer, composite and ceramic materials 6. Define the basic procedures of heat treatment of metal materials 7. List the basic properties and areas of application of certain technical materials 8. Explain methods of testing materials 9. Create awareness about the importance of recycling materials, their care, and environmental protection
Syllabus	1. Introduction to the course and basic concepts 2. The structure of matter - the amorphous and crystalline structures 3. Crystallization of metals 4. Phase Diagrams 5. Phase diagram Fe-C 6. Iron, steel 7. Non-ferrous metals and alloys 8. Colloquium 9. Non-ferrous metals 10. Polymers 11. Ceramic materials 12. Composite materials, wood and stone 13. Heat treatment of materials 14. Material recycling, disposal of materials 15. Colloquium

Teaching types			
	☑ Lectures	☐ Fieldwork	☐
	☐ Seminars	☑ Independent work	☐
	☑ Practicals	☑ Multimedia	☐
	☐ Remote learning	☐ Laboratory	☐
	☐ Blended learning	☐ Supervision	
Student obligations	Class attendance, homework (programs), independent study and literature reading, accessing colloquium and/or written and oral examination.		

Monitoring student work	Class attendance	2.5	Research		Practical work	
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam	0.5	Oral exam	1		
	Written exam	1	Project			

Assessment and evaluation of student work	Class attendance is registered, but not included in the evaluation. Exam and partial exam consists of a theoretical part and assignments. - Theoretical exam (50%) - Assignments (50%) Passing threshold is 50%.		
Required literature	Title	Number of copies available	Availability via other media
	Materijali – predavanja (interna skripta) Mr.sc. Goran Fučko		
	Deželić R, osnove konstrukcijskih materijala, Fesb, Split		
Supplementary literature	Anzulović B., Materijali, FESB, Split		
Quality assurance	Conducting an anonymous student surveys, talk with students, analyses the success of students on tests and exams, self-assessment.		
Other (in the opinion of the proponent)			

Course name	Meteorology I					
ID	PMP161	Study year	2.			
Lecturer	izv. prof. dr. sc. Jadranka Šepić	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	5	15	0
Course status	Elective	Online percentage	0%			

Course description			
Course aims	Provide knowledge of basic variables and processes in the atmosphere Provide knowledge on atmospheric thermodynamic processes Provide knowledge on equations describing dynamics and states of the atmosphere		
Enrolment requirements	Basics of physics Basics of mathematics Basics of fluid mechanics Basic programming		
Learning outcomes	Basic knowledge on atmospheric composition and structure Basic knowledge on relevant variables and processes in the atmosphere Basic knowledge on thermodynamic of dry and moist air Basic knowledge on atmospheric stability Basic knowledge on cloud formation and precipitation Basic knowledge on fundamental forces acting in the atmosphere Basic knowledge on basic equations		
Syllabus	1. Atmospheric composition and atmospheric basics (2 hours of lectures) 2. Ais pressure; hydrostatic equilibrium (2 hours of lectures) 3. Thermodynamics of unsaturated air (3 hours of lectures) 4. Moisture variables (3 hours of lectures) 5. Thermodynamics of saturated air (4 hours of lectures) 6. Atmospheric stability (3 hours of lectures) 7. Clouds and precipitation (5 hours of lectures) 8. Fundamental forces (4 hours of lectures) 9. Equation of movement, equation of continuity, heat conservation law (4 hours of lectures) 11. Scaling analysis. Geostrophic balance and geostrophic wind (2 hours of lectures) 12. Component equations in other coordinates (2 hours of lectures)		
Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☑ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☑ Homework assignments ☐ ☐ ☐
Student obligations	Attend at least 70% of lectures and 70% of exercises.		

Monitoring student work	Class attendance	1.5	Research		Practical work	
	Experimental work		Paper		Homework assignments	1
	Essay		Seminar paper			
	Midterm exam		Oral exam	1.5		
	Written exam	1	Project			

Assessment and evaluation of student work	Twice during the semester students take preliminary exams (the first preliminary exam consists of the first eight lessons; and the second one of the last four lessons). Students who acquire more than 50% at preliminary exams are exempt from the written exam. Students receive and submit homework during the course. The final grade is formed based on the written exam (or preliminary exams) (40%), homework (20%) and oral exam (40%).		
Required literature	Title	Number of copies available	Availability via other media
	Roland B. Stull Practical Meteorology – An Algebra-based Survey of Atmospheric Sciencecs	0	da
Supplementary literature	James R. Holton & Gregory J. Hakim An Introduction to Dynamic Meteorology Academic Press, 2013.		
Quality assurance	Exam results statistics and student evaluation through an anonymous survey at the end of the course. The survey is conducted according to the regulations of the University of Split.		
Other (in the opinion of the proponent)			

Course name	Meteorology II					
ID	PMP260	Study year	1.			
Lecturer	izv. prof. dr. sc. Jadranka Šepić	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	0	15	0
Course status	Compulsory	Online percentage	0%			

Course description	
Course aims	provide knowledge on dynamical and physical processes in the atmosphere provide knowledge on general circulation of the atmosphere provide knowledge on synoptic processes provide knowledge on fronts and air masses
Enrolment requirements	Meteorology 1 Introduction to Fluid Mechanics Programming
Learning outcomes	gaining knowledge on dynamical processes in the atmosphere gaining knowledge on general circulation of the atmosphere gaining knowledge on synoptic-scale dynamics gaining knowledge on fronts and air masses gaining knowledge on atmospheric waves
Syllabus	1. Winds in the atmosphere: geostrophic wind (2 hours of lectures) 2. Gradient wind (2 hours of lectures) 3. Winds in atmospheric boundary layer (2 hours of lectures) 4. Cyclostrophic and gradient wind (2 hours of lectures) 5. General circulation of the atmosphere: surface circulation, upper troposphere circulation, vertical circulation (2 hours of lectures) 6. General circulation of the atmosphere – drivers: differential heating, vertical pressure profiles, hydrostatic thermal circulation (3 hours of lectures) 7. General circulation of the atmosphere: conceptual model (4 hours) 8. Barotropic and baroclinic atmosphere (2 hours of lectures) 9. Rossby waves (2 hours of lectures) 10. Fronts and air masses: genesis and movement (5 hours)

Teaching types			
☑ Lectures	☑ Fieldwork	☑ Homework assignments	
☐ Seminars	☐ Independent work	☐	
☑ Practicals	☐ Multimedia	☐	
☐ Remote learning	☐ Laboratory	☐	
☐ Blended learning	☐ Supervision		

Student obligations	Attend at least 70% of lectures and 70% of exercises.					
Monitoring student work	Class attendance	1.5	Research		Practical work	
	Experimental work		Paper			1

	Essay		Seminar paper			
	Midterm exam		Oral exam	1.5		
	Written exam	1	Project			

Assessment and evaluation of student work	Twice during the semester, students take preliminary exams (the first preliminary exam consists of the first six lessons, and the second one of the last seven lessons). Students who acquire more than 50% at preliminary exams are exempt from the written exam. Students receive and submit homework during the course. The final grade is formed based on the written exam (or preliminary exams) (40%), homework (20%), and oral exam (40%).

Required literature	Title	Number of copies available	Availability via other media
	James R. Holton & Gregory J. Hakim An Introduction to Dynamic Meteorology Academic Press, 2013.	2	no
	Roland B. Stull Practical Meteorology – An Algebra-based Survey of Atmospheric Sciencecs	0	yes

Supplementary literature	Roland B. Stull An Introduction to Boundary Layer Meteorology Kluwer, 1988.
Quality assurance	Exam results statistics and student evaluation through an anonymous survey at the end of the course. The survey is conducted according to the regulations of the University of Split.
Other (in the opinion of the proponent)	

Course name	Interaction Design Methodology					
ID	PMIH40	Study year	1.			
Lecturer	prof. dr. sc. Andrina Granić	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	15	0	0
Course status	Elective	Online percentage	25%			

Course description	
Course aims	Acquisition of fundamental knowledge related to the interdisciplinary field of Interaction Design (ID) defined as the design of interactive products to support people in their everyday and working lives, including psychological and social aspects of users, interaction styles, user requirements, up-to-date design approaches, usability and evaluation, traditional and future interface paradigms.
Enrolment requirements	No formal prerequisites, but it would be preferable if students have already acquired basic knowledge from the course Human-Computer Interaction I: Fundamental Principles.
Learning outcomes	1. Name and explain fundamental terminology and concepts from the Interaction Design (ID) field. 2. Decide on and critically evaluate selection of adequate methods for the design of user-centred interactive products (different phases of information collection, planning, prototyping and evaluation). 3. Critically evaluate positive and negative aspects of different design methods from the HCI field to be used in interactive product development. 4. Compare and decide on adequate methodology for interactive product evaluation. 5. Argue on the role of available HCI methods in system development. 6. Use case: critically evaluate reasons for the development of interactive system /product; identify context of use and collect all relevant information in relation to the goal; produce personas, scenarios of use and low fidelity prototypes; apply adequate user-centred design methods; produce high fidelity prototypes; decide on and employ adequate evaluation approach.
Syllabus	Lectures: 1. Interaction Design (ID): definitions and fundamental principles (2h) 2. Short chronology on interaction design (2h) 3. Usability, user experience, quality in use (2h) 4. Designing for user experience (2h) 5. Research methods: visualization of information, interfaces and interactions (2h) 6. Invited lecture (2h) 7. Interaction Design model: user-centred design, prototyping, evaluation, implementation4h) 8. Personas and scenarios (2h) 9. Sketching, low and high fidelity prototypes (2h) 10. Participatory design (2h) 11. Methods and approaches to interaction evaluation (4h) 12. The future of Interaction Design (4h) Exercises: 1. Introduction to course exercises – generally about structure of exercises; gained knowledge and skills; topics which will be covered; work flow; individual and group tasks; grading. 2. Introduction to interaction design – digital artefacts design; new technologies; new interfaces; 1. individual task for students (analysis of 3 interaction design examples). 3. Presentations of the 1. individual student tasks – analysis and discussion.

4. Accessibility – design for all and universal accessibility; accessibility and usability; disability categories and examples of accessible interaction design; 2. individual task for students (analysis of interactive interfaces designed for disabilities categories).
5. Presentations of the 2. individual student tasks – analysis and discussion.
6. Understanding users – emotional aspects; emotional interfaces; persuasive technologies; anthropomorphism; virtual agents and characters; virtual learning assistants.
7. User experience design – 5 design levels; user needs; creation of the "personas".
8. Introduction to group project – design, evaluation and implementation of interactive object interface; analysis of current examples.
9. Selection of the concept for interactive object – group work.
10. Making a prototype of the interactive object interface – group work.
11. Evaluation of the interactive object interface – group work.
12. Group presentations of conducted evaluation – analysis and discussion.
13. Defining necessary changes on interactive object interfaces – group work.
14. Implementation of necessary changes on interactive object interfaces – group work.
15. Group projects – final presentations of student projects

Teaching types

☑ Lectures	☐ Fieldwork	☐
☑ Seminars	☑ Independent work	☐
☑ Practicals	☐ Multimedia	☐
☐ Remote learning	☑ Laboratory	☐
☐ Blended learning	☑ Supervision	

Student obligations

Active participation in all activities: lectures, consultations, searching the literature, individual work in the assigned project and given use case; final oral exam

Monitoring student work

Class attendance	1	Research		Practical work	2
Experimental work		Paper			
Essay		Seminar paper			
Midterm exam		Oral exam	1		
Written exam	1	Project			

Assessment and evaluation of student work

Quality of performance of assigned tasks (50%).

Oral exam (50%).

Required literature

Title	Number of copies available	Availability via other media
J. Preece, Y. Rogers, H. Sharp: Interaction Design: Beyond Human-Computer Interaction, John Wiley & Sons, 4th Edition, 2015.		
D. Saffer: Designing for Interaction, Second Edition: Creating Innovative Applications and Devices, New Riders, 2010.		

Supplementary literature

1. D. Norman: Emotional Design: Why We Love (or Hate) Everyday Things, Basic Books, 2005.
2. B. Shneiderman: Human Needs and the New Computing Technologies, MIT Press, 2003.
Svi nastavni materijali dostupni on-line, uključujući i dodatnu znanstvenu literaturu

Quality assurance

student discussion, anonymous student evaluation questionnaire, student success rate, self-assessment

Other (in the opinion of the proponent)	

Course name	Modelling and Simulations of Biomacromolecule					
ID	PMP249	Study year	2.			
Lecturer	izv. prof. dr. sc. Željka Sanader Maršić	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Compulsory	Online percentage	10%			

Course description	
Course aims	Understanding of the basics of the molecular dynamics and quantum chemical simulations and their application to biologically important systems.
Enrolment requirements	Basic knowledge of physics, biology, statistical mechanics, thermodynamics, classical and quantum mechanics, basics of programming
Learning outcomes	On completion of this course a student should be able to: 1. Recognize and discuss scientific ideas in modeling of reality and the importance of modeling in biology and medicine. 2. Understand the theoretical foundations of molecular dynamics methods and quantum-mechanical modeling methods. 3. Know the algorithms and techniques used in modeling biological molecular systems. 4. Independently model, simulate and analyze simple and some of the more complex systems of biomacromolecules by the method of molecular dynamics. 5. Understand the difference between molecular mechanical and quantum mechanical methods 6. Use the density functional theory to determine the most energetically favorable structure and its vibrational and absorption spectra. 7. Model the enzyme using a hybrid quantum mechanical / molecular mechanical method 8. Use visualization programs and show different ways of visualizing proteins
Syllabus	Weekly curriculum: INTRODUCTION 1. Course presentation; Methods of modeling biomolecules - basic characteristics and essential differences between empirical and quantum mechanical methods; Using the Linux operating system on computer clusters, basic commands, running / monitoring calculations on a computer cluster; 2. Database of three-dimensional structures of macromolecules "Protein Data Bank" (PDB); 3D structure prediction programs; Selected software tools for biomolecule visualization; Gromacs and Gaussian software packages; BASICS OF MD SIMULATIONS 3. Fundamentals of molecular dynamics (MD) method, equations of motion, numerical integrators, thermodynamic and statistical-mechanical basis of MD method, initial conditions in simulations of biological systems; 4. Force fields (classical atomic force fields, coarse-grained models ...), Solvent models; Simulation; Calculation of statical and dynamical quantities in MD; MD SIMULATIONS 5. MD simulation of proteins in water; Structural quantity analysis; Visualization of biological systems; 6. MD simulations of complex systems (e.g.: protein and ligand, membrane proteins, protein clustering); 7. Advanced sampling methods: "Umbrella sampling"; BASICS OF QM SIMULATIONS 8. Fundamentals of quantum mechanical (QM) method; Introduction to the theory of density functionals (approximations, Hohenberg – Kohn theorems, self-consistent field ...); 9. Functionals, basis sets; Limitations of the method; QM SIMULATIONS 10. QM simulations of peptides (geometry optimization, vibrational spectra, absorption spectra); 11. QM cluster method; QM/MM SIMULATIONS 12. Hybrid quantum-mechanical / molecular-mechanical methods (QM/MM): "additive and subtractive" approach; Mechanical and electrical embedding; Treating the boundary of the QM and MM parts of the system 13. Modelling of the enzymes using QM/MM method; ELECTIVE TOPICS

	14. and 15. Elective topics of interest to students: nonequilibrium MD, simulations in confined spaces, optical properties of organic dyes, making simulation films

Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☑ Independent work ☐ Multimedia ☑ Laboratory ☐ Supervision	☑ homework assignment ☐ ☐ ☐

Student obligations	Active participation in classes and assignments in class, solving of assignments at home, preparation of seminars that include independent solving of a physical problem, writing reports and presentations of the same.

Monitoring student work						
	Class attendance	2	Research		Practical work	1
	Experimental work		Paper		Homework assignments	1
	Essay		Seminar paper	1		
	Midterm exam		Oral exam			
	Written exam		Project			

Assessment and evaluation of student work	The conditions for passing the exam are: the ability to use existing programs for modelling biomacromolecules. Assessment through computer assisted exercises and seminars. The grade is concluded according to the evaluation of the student's commitment in class and the grade of the seminar.

Required literature	Title	Number of copies available	Availability via other media
	Essentials of Computational Chemistry: Theories and Models, Christopher J. Cramer, John Wiley & Sons Ltd, England, 2004		yes
	Molecular Simulations: Fundamentals and Practice, Saman Alavi, Wiley-VCH Verlag GmbH & Co., Germany, 2020		yes
	Understanding Molecular Simulation: From Algorithms to Applications Daan Frenkel and B. Smit, Academic Press, 2001		yes

Supplementary literature	[1] P. Allen & D. Tildesley, Computer Simulation of Liquids, Clarendon, Press, Oxford, 1987. [2] Scientific articles, lectures.
Quality assurance	Statistics of test results and student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split
Other (in the opinion of the proponent)	

Course name	Advanced Statistical Physics					
ID	PMP115	Study year	3.			
Lecturer	prof. dr. sc. Larisa Zoranić	ECTS workload	6.0			
Associates		Number of hours	L	S	E	P
			45	15	15	0
Course status	Compulsory	Online percentage	5%			

Course description	
Course aims	Understanding the behavior of systems of many particles through thermodynamics and statistical physics.
Enrolment requirements	Passed courses in General Physics, Modern Physics, Mathematics and attended introductory courses in statistical physics and classical mechanics.
Learning outcomes	After successfully completing the course, the student will be able to: 1. To connect thermodynamics and statistical physics in order to explain physical phenomena in multiparticle systems. 2. Formulate and apply ensemble theory to various physical systems. 3. Derive Liouville's theorem and discuss the ergodic hypothesis. 4. Analyze the properties of bosonic systems of many particles. 5. Analyze the properties of fermionic systems of many particles. 6. Analyze phase transitions and critical phenomena. 7. Discuss the concept of Brownian motion and diffusion processes. 8. Discuss the interrelationships of fluctuations, dissipation and macroscopic irreversibility.
Syllabus	The timetable worked out according to the weekly plan: 1. Introduction to the course. Statistical ensembles. Density function and probability density. Microcanonical and canonical ensemble. The ergotic hypothesis. Liouville's theorem. 2. Grand canonical ensemble. Canonical potential. Fluctuation of the number of particles. Chemical reactions. 3. Thermodynamic description of classical models (polymer, "zipper" model, two-state model, ideal gas) in different ensembles. 4. Comparison of classical and quantum approaches. Symmetric and antisymmetric states. Factor N! Density of states. Quantum distributions. 5. Fermi-Dirac distribution. An ideal Fermi gas at low temperatures. 6. Fermi energy. Sommerfeld's expansion. 7. Bose-Einstein distribution. An ideal Bose gas. 8. Blackbody radiation through Bose-Einstein statistics. Bose-Einstein condensation. 9. Thermodynamics and statistical mechanics of magnetism. 10. Phase transitions of the first type. Phase stability conditions. Clausius–Clapeyron relation. Phase transitions of another kind. Van der Waals model. 11. Behavior near the critical point. Critical exponents. 12. Ising's model. Mean field theory. Scaling. 13. Stochastic processes. Description of Brownian motion and diffusion. Einstein-Smoluchowski equation. 14. Langevin equation. Fokker-Planck equation. 15. Fluctuations and non-equilibrium processes. Fluctuation-dissipation theorem.

Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning		☐ Fieldwork ☑ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision		☐ ☐ ☐ ☐	
Student obligations	Attendance and commitment of students in class, solving tasks in class and at home. Participation in class discussions and debates.					
Monitoring student work	Class attendance	2	Research		Practical work	0.5
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam	1.5	Oral exam	2		
	Written exam		Project			
Assessment and evaluation of student work	Knowledge is tested by a written and oral exam. During classes, colloquia are organized (around three colloquia), and assignments are given approximately every two weeks. Students who do not pass the written part through colloquiums and assignments have 4 additional exam deadlines for passing the written part. The oral exam is taken after the written part.					

Required literature	Title	Number of copies available	Availability via other media
	Statistical mechanics–3rd ed. R. K. Pathria, Paul D. Beale, 2011 Elsevier Ltd		
	Elementary Statistical Physics, C. Kittel, Dover Publications, 2004		
	Script Statistical physics, D. Sunko		

Supplementary literature	Elementary Statistical Physics, C. Kittel, Dover Publications, 2004 Introduction to Statistical Physics, Kerson Huang, Taylor and Francis, 2001. K. Dill and S. Bromberg, Molecular Driving Forces: Statistical Thermodynamics in Biology, Chemistry, Physics, and Nanoscience, Garland Science; 2nd edition (2010) Feynman, The Feynman Lectures on Physics, (Chapters 39-46), 1963. Scientific articles, lectures
Quality assurance	The success of the program is monitored by the quality of knowledge demonstrated in the exams as well as by the assessment of the demonstrated enthusiasm for the subject. External evaluation includes student surveys. Statistics of exam results and student evaluation through an anonymous survey at the end of the course. The survey is conducted according to the rules of the University of Split.
Other (in the opinion of the proponent)	

Course name	Normed spaces					
ID	PMM605	Study year	1.			
Lecturer	prof. dr. sc. Saša Krešić Jurić	ECTS workload	6.0			
Associates		Number of hours	L	S	E	P
			45	0	0	0
Course status	Compulsory	Online percentage	30%			

Course description	
Course aims	The course objective is to introduce students with advanced knowledge of normed spaces with special emphasis on Hilbert and Banach space theory. This gives the basics for more advanced studies in modern functional analysis, in particular in operator algebra theory.
Enrolment requirements	Courses taken: Metric spaces, Vector spaces
Learning outcomes	It is expected that a student will - understand special properties of basic topological concepts (convergence, continuity, compactness) and metric concepts (boundedness, total boundedness, completness, uniform continuity) in normed spaces - be able to state and prove basic results about Hilbert and Banach spaces and bounded operators between such spaces - be able to apply the theory in the course to solve a variety of problems at an appropriate level of difficulty - be able to decide whether a simple statement about normed spaces and bounded operators is true, providing a proof or counterexample as appropriate - develop critical and analytical thinking and demonstrate skills in communicating mathematics orally and in writing
Syllabus	- Basic notions (12 hours) Algebraic basis and dimension of a vector space. Norm and inner product. Equivalence of norms. Bounded linear operators. Normed space of bounded linear operators. Dual space of a normed space. Complete normed space. Completion of a normed space. Riesz lemma. Finite-dimensional normed space. Schauder basis of a normed space. - Spaces lp and Lp (8 hours) Spaces lp and their dual spaces. Spaces Cp([a,b]) and their completions Lp([a,b]) - Separable inner product and Banach spaces (7 hours) Orthonormal basis. Structure theorems for infinite dimensional separable inner product and Banach spaces. - Hahn-Banach extension theorem and consequences (6 hours) - Hilber spaces (6 hours) Riesz projection theorem. Riesz representation theorem. Characterization of Hilbert spaces. - Classical theorems of functional analysis (6 hours) Uniform boundedness principle. Banach-Steinhaus theorem. The open mapping theorem. Banach inverse mapping theorem. The closed graph theorem.

Teaching types				
	☑ Lectures	☐ Fieldwork		
	☑ Seminars	☐ Independent work		
	☑ Practicals	☐ Multimedia		
	☐ Remote learning	☐ Laboratory		
	☐ Blended learning	☐ Supervision		

Student obligations	Attendance at lectures, seminars and exercises, written assignments, self-study using required and optional literature					
Monitoring student work	Class attendance	1.5	Research		Practical work	

	Experimental work		Paper		Ispit	4.5
	Essay		Seminar paper			
	Midterm exam		Oral exam			
	Written exam		Project			

Assessment and evaluation of student work	The exam consists of written and oral part. The oral part comes after positively graded (at least 50%) written part Both parts of the exam are equally evaluated in the final grade.		
Required literature	Title	Number of copies available	Availability via other media
	E. Kreyszig, Introductory functional analysis, John Wiley and sons, New York, 1978.		da
	S. Kurepa, Funkcionalna analiza, Liber, Zagreb, 1992		
	J.J. Koliha, Metrics, Norms, Integrals, World Scientific, London, 2008.		
Supplementary literature	G. Bachman, L. Narici, Functional analysis, Dover Publications, New York, 2000. W. Rudin, Functional analysis, McGraw-Hill, New York, 1973.		
Quality assurance	Exam statistics and students' quality evaluation through anonymous poles.		
Other (in the opinion of the proponent)			

Course name	Nuclear Physics					
ID	PMP203	Study year	1.			
Lecturer	doc. dr. sc. Ivana Weber	ECTS workload	6.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Compulsory	Online percentage	0%			

Course description	
Course aims	Understanding the basic properties of atomic nuclei. Understanding the fundamental models used to describe nuclear states and processes. Applying laws that describe processes in atomic nuclei.
Enrolment requirements	Learning outcomes anticipated from the courses of general physics (Mechanics, Electricity and Magnetism, Waves and Optics, and Thermodynamics) and attended the course of Quantum Physics.
Learning outcomes	1. Explain the basic properties of atomic nuclei. 2. Critically discuss and apply the fundamental models used to describe atomic nuclei. 3. Explain the spontaneous radioactive decays of atomic nuclei and apply relevant laws. 4. Explain nuclear reactions and apply them in given examples. 5. Critically discuss the application of nuclear processes and their impact on life.
Syllabus	1. Introduction. The structure of the nuclei, basic nuclear properties. 2. The mass and size of the nuclei. Nuclear properties in the ground state. 3.Nuclear forces. Total angular momentum, spin and magnetic momentum. 4. Nuclear models: Mean potential model. 5. Nuclear models: Fermi gas model. 6. Nuclear models: Liquid-drop model. 7. Nuclear models: Shell model. 8. Nuclear models: Collective model. 9. Radioactivity. 10. Nuclear decays: Alpha decay. Quantum-mechanical model of alpha-decay. 11. Nuclear decays: Beta decay, gamma decay. 12. Nuclear reactions. 13. Nuclear fission. Nuclear fusion. 14. Nuclear processes in stars. 15. Radiation and life.

Teaching types			
	☑ Lectures	☐ Fieldwork	☐
	☐ Seminars	☐ Independent work	☐
	☑ Practicals	☐ Multimedia	☐
	☐ Remote learning	☐ Laboratory	☐
	☐ Blended learning	☐ Supervision	

Student obligations	Attendance at classes and passing exams: problems and theory (either through partial exams or the entire curriculum in exam terms) - success in each part at least 50%.		
Assessment and evaluation of student work	The work of students is evaluated during classes, through two partial exams and/or a final exam. Problem-solving on the written exam and the theoretical part in the oral exam are evaluated separately.		
Required literature	Title	Number of copies available	Availability via other media
	J.Rich, M. Spiro, Fundamentals in Nuclear Physics, Springer 2005	3	
	Prezentacije predavanja i vježbi, I. Weber		Online – dostupno svima
Supplementary literature	1. S.M. Wong, Introductory Nuclear Physics, Second Edition, Wiley & Sons, New York, 1998 2. A. Beiser, Concepts of Modern Physics, Mc Graw-Hill, 2003. 3. W. N. Cottinghm, D.A. Greenwood, An Introduction to Nuclear Physics, Cambridge University Press, 2001		
Quality assurance	Regular validation of learning outcome during classes. Statistical analysis of exam results, and student evaluation through an anonymous survey at the end of the course. The survey is conducted according to the regulations of the University of Split.		
Other (in the opinion of the proponent)			

Course name	Numerical analysis					
ID	PMM118	Study year	1.			
Lecturer	prof. dr. sc. Jurica Perić	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Elective	Online percentage	40%			

Course description	
Course aims	Students will acquire knowledge and skills in numerical analysis, especially in the field of analysis of errors in computer arithmetic, numerical solution of ordinary differential equations and partial differential equations. This will enable them to solve problems that arise in practice, especially in the natural sciences (such as, physics), technical sciences, ... Also they will become familiar with some of the existing software packages which can be used in solving such problems.
Enrolment requirements	Successfully completed course „Introduction to numerical mathematics“.
Learning outcomes	The student is able to: - estimate and classify errors when executing algorithms in computer - explain and analyze advanteges and disadvanteges of representation of real and integer numbers into computer, IEEE arithmetic - choose one of the studied methods and solve the initial (or boundary) problem for ordinary differential equation - compare and relate concepts method order, consistency, convergence, stability - explain studied methods for numerical solving of partial differential equations
Syllabus	Representation of the number in computer, computer arithmetic - 4 hours Analysis of errors - 4 hours Ordinary differential equations: initial problem (one-step and multi-step methods, especially Runge-Kutta methods), boundary problem, variational approach – 14 hours Introduction to numerical solution of partial differential equations: elliptic, parabolic and hyperbolic differential equations - 8 hours

Teaching types						
	☑ Lectures		☐ Fieldwork		☐	
	☐ Seminars		☐ Independent work		☐	
	☑ Practicals		☐ Multimedia		☐	
	☐ Remote learning		☐ Laboratory		☐	
	☐ Blended learning		☐ Supervision		☐	

Student obligations	Attendance at 70% of lectures and 70% of exercises.					
Monitoring student work	Class attendance	1	Research		Practical work	
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam	1.5	Oral exam	1.5		
	Written exam	1	Project			
Assessment and evaluation of student work	The exam is taken in written and oral form. Written exam is preliminary part of the exam and requirement for the oral exam is to pass a written exam. The written form of the exam can be taken partially, during class, where curriculum provided. Activity in class, solving homework, colloquium, written and oral examination are the elements from which form the final grade is formed.					

Required literature	Title	Number of copies available	Availability via other media
	V. Hari at all, Numerička analiza, PMF-MO, Zagreb, 2003.		
	J. Stoer, R. Bulirsch, Introduction to Numerical Analysis, Springer, New York, 1993.		
	Nicholas J. Higham, Accuracy and Stability of Numerical Algorithms, SIAM, 2002.		
Supplementary literature	D. Kincaid, W. Cheney, Numerical Analysis - Mathematics of Scientific Computing, Brooks/Cole Publishing Company, 2002. D. N. Arnold, A Concise Introduction to Numerical Analysis, University of Minnesota, Minneapolis, 2001		
Quality assurance	Statistics of test results and student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split.		
Other (in the opinion of the proponent)			

Course name	Ordinary differential equations						
ID	PMM103	Study year	2.				
Lecturer	doc. dr. sc. Andrijana Ćurković	ECTS workload	6.0				
Associates		Number of hours	L	S	E	P	
			30	0	30	0	
Course status	Compulsory	Online percentage	40%				

Course description

Course aims	Introduce students to basic ideas of ordinary differential equations. Assure understanding of basic models. Demonstrate theorems of existence and uniqueness of solution as well as some of the commonly used techniques for finding solutions with emphasis on the theory of linear equations.
Enrolment requirements	Differential and Integral Calculus I
Learning outcomes	After completing the course, students are expected to: identify real-life problems which can be modeled by differential equations; explain in their own words conditions that ensures existence and uniqueness of a solution of the Cauchy problem; distinguish characteristic properties of linear equations and systems from nonlinear ones; select and apply appropriate methods to solve basic differential equations; identify and apply initial and boundary values to find particular solution. .
Syllabus	Introduction: Definitions and Terminology. Differential Equations as Mathematical Models (1 week) First Order Ordinary Differential Equations: Existence and Uniqueness of Solution. Different types of First Order Equations (including ODE with separable variables, homogeneous, Bernoulli, exact) Applications. (4 weeks) Higher Order Differential Equations: Reduction of Order. Homogeneous Linear Equations with Constant Coefficient. Nonhomogeneous Equations (Undetermined Coefficients, Variation of Parameters). Laplace Transform Methods (5 weeks) Linear System of First Order Differential Equations: Preliminary Theory. The eigenvalue method for homogeneous systems. Variation of Parameters (3 weeks) Orthogonal Functions: Orthogonal Functions. Sturm-Liouville Problem. Examples. (2 weeks)
Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning ☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision
Student obligations	Attend class regularly and take notes. Take exams when scheduled.

Monitoring student work						
	Class attendance	2	Research		Practical work	
	Experimental work		Paper			
	Essay		Seminar paper			

	Midterm exam		Oral exam	2		
	Written exam	2	Project			

Assessment and evaluation of student work	The final exam consists of a written and an oral part. Successful written exam is required for taking the oral exam. Acceptable results achieved in midterm exams taken during the semester replace the written part of the exam.

Required literature	Title	Number of copies available	Availability via other media
	D.G. Zill and M.R. Cullen, Differential Equations with Boundary-Value Problems, Brooks/Cole, Cengage 2009.		

Supplementary literature	W.E. Boyce and R.C. DiPrima, Elementary Differential Equations and Boundary Value Problems, John Wiley & Sons, Inc., New York, 2012. M. Alić, Obične diferencijalne jednadžbe, skripta, PMF-Zagreb, Matematički odjel, 1994
Quality assurance	Statistics of test results and student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split.
Other (in the opinion of the proponent)	

Course name	Renewable Energy Sources					
ID	PMT179	Study year	2.			
Lecturer	doc. dr. sc. Ivan Peko	ECTS workload	2.0			
Associates		Number of hours	L	S	E	P
			15	15	0	0
Course status	Elective	Online percentage	30%			

Course description	
Course aims	Enabling students to: - Acquisition of basic knowledge in the field of renewable energy sources (their importance, potentials and limitations, advantages and disadvantages), - The permanent adoption and deepening of knowledge in the field of renewable energy, - Understanding of modern technologies for the exploitation of renewable energy sources, - Simple calculations of components and systems for exploitation of renewable energy sources.
Enrolment requirements	There are no requirements for course enrolment.
Learning outcomes	Students will be able to after successfully mastering the subject: 1. define and describe the various renewable energy sources (RES), 2. explain the need for renewable energy sources (RES) and critically assess their strengths and weaknesses, 3. sketch simple RES systems, 4. Apply the acquired knowledge in other courses as well as in future teaching practice.
Syllabus	Week 1: Lecture (2 hours): Introductory lecture. Introducing students to the rules, literature and teaching assignments. Getting to know with the content of the course. Introduction, definitions, problems with the current energy system, possible solutions. Energy statistics. Week 2: Lecture (1 hour): Solar energy and technology for its use; solar thermal systems. Seminar (1 hour): Distribution of seminar papers to students. Week 3: Lecture (2 hours): Solar energy and technology for its use; solar power plants and photovoltaic systems. Week 4: Lecture (2 hours): Wind energy; wind turbines. Week 5: Lecture (2 hours): Hydropower; hydroelectric power plants, water turbines. Week 6: Lecture (2 hours): Tidal power, energy of ocean currents, sea waves energy, geothermal energy and technology for its exploitation. Course content broken down in detail by weekly class schedule (syllabus) Week 1: Lecture (2 hours): Introductory lecture. Introducing students to the rules, literature and teaching assignments. Getting to know with the content of the course. Introduction, definitions, problems with the current energy system, possible solutions. Energy statistics. Week 2: Lecture (1 hour): Solar energy and technology for its use; solar thermal systems. Seminar (1 hour): Distribution of seminar papers to students. Week 3: Lecture (2 hours): Solar energy and technology for its use; solar power plants and photovoltaic systems. Week 4: Lecture (2 hours): Wind energy; wind turbines.

Week 5:
Lecture (2 hours): Hydropower; hydroelectric power plants, water turbines.
Week 6:
Lecture (2 hours): Tidal power, energy of ocean currents, sea waves energy, geothermal energy and technology for its exploitation.
Week 7:
Lecture (2 hours): Biomass energy.
Week 8:
Lecture (2 hours): Hydrogen Energy Technologies
Week 9:
Seminar (2 hours): Presentation of seminar papers.
Week 10:
Seminar (2 hours): Presentation of seminar papers.
Week 11:
Seminar (2 hours): Presentation of seminar papers.
Week 12:
Seminar (2 hours): Presentation of seminar papers.
Week 13:
Seminar (2 hours): Presentation of seminar papers.
Week 14:
Seminar (2 hours): Presentation of seminar papers.
15th week:
Seminar (2 hours): The future of renewable energy sources, conclusions.

Teaching types

☑ Lectures	☐ Fieldwork	☑ Consultations
☑ Seminars	☑ Independent work	☐
☐ Practicals	☐ Multimedia	☐
☐ Remote learning	☐ Laboratory	☐
☐ Blended learning	☐ Supervision	

Student obligations

Active participation in lectures. Independent preparation and presentation of the seminar. Active participation in the teaching process.

Monitoring student work

Class attendance	1	Research		Practical work	
Experimental work		Paper			
Essay		Seminar paper	1		
Midterm exam		Oral exam			
Written exam		Project			

Assessment and evaluation of student work

The exam or checking of acquired competences will be done through seminars. Each student or group of students will receive two tasks / themes that they need to be processed in two seminars and present them to the teacher and their colleagues

Required literature

Title	Number of copies available	Availability via other media
1. Online lectures about renewable Energy sources,		
2. B. Labudović, Obnovljivi izvori energije, Energetika marketing, Zagreb, 2002.		

Supplementary literature	1. A. Azapagic, R. Clift, Sustainable Development in Practice, John Wiley & Sons, NY, 2004. 2. V. Knapp, Novi izvori energije, Školska knjiga, Zagreb, 1993. 3. V. Paar, Energetska kriza: gdje (ni)je izlaz?, Školska knjiga, Zagreb, 1984 4. Godfey Boyle, Renewable Energy, Oxford Univesity Press, 2004. 5. Internet
Quality assurance	- Taking attendance at lectures; - The annual analysis of the success of the examination; - Student survey in order to evaluate teachers; - Feedback from students who have already graduated from the relevance of the course content, - Self-evaluation.
Other (in the opinion of the proponent)	

Course name	Full Stack Development					
ID	PMIC61	Study year	2.			
Lecturer	izv. prof. dr. sc. Goran Zaharija	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	15	0	0
Course status	Compulsory	Online percentage	20%			

Course description	
Course aims	Introduction to techniques and tools for creating web applications, with emphasis on all aspects of development - user and server-side. The goal of the subject is to familiarize students with all phases of web application development, as well as deploying the application in a production environment. Current development, management, and monitoring tools would be used for this purpose.
Enrolment requirements	Web Application Programing (Programiranje mrežnih aplikacija) Databases (Baze podataka)
Learning outcomes	1. Set up a development environment for web applications 2. Manage the development phase of the application lifecycle 3. Understand the basics of development on the user side (frontend) 4. Understand the basics of development on the server-side (backend) 5. Design and implement databases 6. Use production systems and deploy the program solution to a production server.
Syllabus	1. Web application development, technologies, development environment 2. Application version control (Git) 3. Running the application in a production environment (Heroku, Azure) 4. UI/UX - user interface and user experience 5. Responsive design of the application, layout (Flexbox) 6. CSS preprocessors 7. Designing applications using existing frameworks (Bootstrap, Materialize, PureCSS) 8. React, Vue - JavaScript development frameworks for building web applications 9. Node.js - creating the backend part of the application (server) 10. Midterm exam 11. Types of web requests and routing 12. API services - using and creating your own API server 13. Relational and non-relational databases in web application development 14. User authentication - internal and external solutions 15. Monitoring, management, and upgrading of an active application.

Teaching types			
	☑ Lectures	☐ Fieldwork	☑
	☑ Seminars	☑ Independent work	Workshops
	☐ Practicals	☐ Multimedia	☐
	☐ Remote learning	☐ Laboratory	☐
	☐ Blended learning	☐ Supervision	☐

Student obligations	

Monitoring student work	Class attendance	2	Research		Practical work	2
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam		Oral exam	0.5		
	Written exam	0.5	Project			

Assessment and evaluation of student work	Attendance (10%) Practical work (30%) Written / oral exam (60%)		
Required literature	Title	Number of copies available	Availability via other media
	Ben Frain, Responsive Web Design with HTML5 and CSS3, Packt Publishing; second edition (2017)		
	Chris Aquino, Todd Gandee; Front-End Web Development: The Big Nerd Ranch Guide; Big Nerd Ranch Guides; first edition (2016)		
	Vasan Subramanian; Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node; Apress; first edition (2017)		
Supplementary literature	Teaching materials available on the Internet, including solutions to selected tasks and additional scientific literature		
Quality assurance	Conversation with students, anonymous student survey, student success on the course, self-analysis.		
Other (in the opinion of the proponent)			

Course name	Operators on Normed Spaces					
ID	PMM607	Study year	2.			
Lecturer	prof. dr. sc. Saša Krešić Jurić	ECTS workload	6.0			
Associates		Number of hours	L	S	E	P
			45	0	0	0
Course status	Compulsory	Online percentage	30%			

Course description	
Course aims	The course objective is to introduce students to the fundamentals of the theory of bounded operators on normed spaces, and in particular on unitary spaces. The emphasis is on the spectral theory of bounded operators, hence the students are introduced first to the theory of Banach algebras and then to the main results about the spectrum of bounded operators. Finally, the students are also introduced to some results about compact operators.
Enrolment requirements	Taken course Normed spaces.
Learning outcomes	The student is able to: Explain the importance of bounded operators on normed (Banach) spaces and in particular on unitary (Hilbert) spaces. Define all special subclasses of bounded operators (e.g. positive operators, compact operators, finite rank operators, etc.) and illustrate each case with examples and/or counterexamples. Define the notion of normed (Banach) algebra, the resolvent and spectrum of an element of a Banach algebra or the resolvent and spectrum of a bounded operator, and illustrate these notions with examples and/or counterexamples. State the basic theorems about the spectrum of an element of a Banach algebra or about the spectrum of a bounded operator from some of the special subclasses. Prove the stated theorems. Apply the theorems to concrete examples.
Syllabus	Bounded operators on unitary spaces: the adjoint of a bounded operator, positive operators, the polar decomposition of an operator (10 hours). Normed algebras: Banach algebras, the spectrum, the spectral radius and the resolvent of an element of a Banach algebra (8 hours). Bounded operators: the spectrum of a bounded operator, the point spectrum, the continuous spectrum and the residual spectrum, the resolvent set and the resolvent of an operator (10 hours). Compact operators: compact operators on normed spaces, compact operators on Hilbert spaces, finite rank operators (10 hours). Compactness of some integral operators (7 hours).

Teaching types	☑ Lectures ☑ Seminars ☐ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☐ ☐ ☐ ☐

Student obligations	Class and seminar attendance, solving and discussing homework problems at seminars, self-learning of prescribed material by using the obligatory and optional literature.

Monitoring student work						
	Class attendance	0.5	Research		Practical work	
	Experimental work		Paper		Ispit	4
	Essay		Seminar paper	1.5		
	Midterm exam		Oral exam			
	Written exam		Project			

Assessment and evaluation of student work	Final written and oral exam. Positive grade of the written exam is required to take the oral exam. The written and oral exam are equally weighted in the final grade.

Required literature	Title	Number of copies available	Availability via other media
	E. Kreyszig, Introductory functional analysis, John		da
	Wiley and sons, New York, 1978.		
	S. Kurepa, Funkcionalna analiza, Liber, Zagreb, 1992		

Supplementary literature	G. Bachman, L. Narici, Functional analysis, Dover Publications, New York, 2000. W. Rudin, Functional analysis, McGraw-Hill, New York, 1973.
Quality assurance	Anonymous student evaluations at the end of semestar according to the regulations of the University of Split.
Other (in the opinion of the proponent)	

Course name	Basic algebraic structures		
ID	PMM715	Study year	2.
Lecturer	doc. dr. sc. Gordan Radobolja	ECTS workload	6.0
Associates		Number of hours	L: 30, S: 0, E: 30, P: 0
Course status	Elective	Online percentage	0%

Course description	
Course aims	Adopt basics of commutative rings theory, arithemtic of polynomials and solvability of algebraic equations.
Enrolment requirements	Prerequisites: completed courses Introduction to Algebra with Analytic Geometry or Linear algebra and Matrix Calculus Required competencies: knowledge of fundamentals of linear algebra and elementary mathematics.
Learning outcomes	It is expected that the student will be able to: - Geometrically interpet complex numbers, roots of unity and operations with them - Distinguish between a formal polynomial and a polynomial function, between root and a zero-point - State basic definitions and theorems in theory of commutative rings - State, prove and apply the fundamental theorem of arithmetics for polynomials (check reducibility of and factorise a rational polynomial) - Apply Euclidean algorithm - Solve cubics and quartics - Apply Vieta's formulas - Explain the concepts of splitting fields, Galois group and solvability in radicals - Distinguish algebraic and transcendental numbers, and algebraically closed and open fields
Syllabus	Classical algebra (6 hours) Elementary number theory, fundamental theorem of arithmetic. Number systems. Complex numbers. Roots of unity. Commutative rings (6 hours) Basics Domains and rings of fractions Polynomial ring and polynomial functions Homomorphisms Arithmetic of polynomials (6 hours) Divisibility Roots Factorisation Irreducibility and criteria. Cyclotomic polynomials Field theory (6 hours) Quotient ring

Field extensions
Algebraic extensions
Splitting fields

Solvability in radicals (6 hours)
Groups
Radical extensions
Galois theory
Insolvability of the quintic

Teaching types

☑ Lectures	☐ Fieldwork	☐
☐ Seminars	☐ Independent work	☐
☑ Practicals	☐ Multimedia	☐
☐ Remote learning	☐ Laboratory	☐
☐ Blended learning	☐ Supervision	

Student obligations

Class attendance, short tests, partial written exams, and final oral exam.

Monitoring student work

Class attendance	2	Research		Practical work	
Experimental work		Paper		Kratki testovi	0.5
Essay		Seminar paper			
Midterm exam	2.5	Oral exam	1		
Written exam		Project			

Assessment and evaluation of student work

Short tests (30%), two partial written exams (50%) and final exam (20%).

Continuous assessment		
Evaluation elements	Performance (min)	Weight in grade (%)
Short tests		30
Two partial exams		50
Class attendance	70	0

Final assessment		
Evaluation elements	Performance (min)	Weight in grade (%)
Final exam	40%	20

Evaluation		
Points (%)	Criterion	Grade
90 - 100		5
75 - 89		4

	60 - 74		3
	50 - 59		2

Required literature	Title	Number of copies available	Availability via other media
	A. Cuoco, J. J. Rotman, Learning modern algebra		
Supplementary literature	D.S. Dummit, R.M. Foote, Abstract Algebra, treće izdanje, John Wiley and Sons, 2004.		
Quality assurance	Anonymous student evaluations at the end of semester according to the regulations of the University of Split.		
Other (in the opinion of the proponent)			

Course name	History of Classical Physics							
ID	PMP009	Study year	2.					
Lecturer	izv. prof. dr. sc. Željka Sanader Maršić	ECTS workload	3.0					
Associates		Number of hours	L	S	E	P		
			30	0	0	0		
Course status	Elective	Online percentage	10%					

Course description								
Course aims	To understand the development of physical concepts.							
Enrolment requirements	None.							
Learning outcomes	To be able to explain the role physical concepts in: 1. Mechanics 2. Electrodynamics 3. Thermodynamics 4. Statistical mechanics							
Syllabus	The following concepts are elaborated: 1. Space, time, motion 2. Force, energy 3. Electric and magnetic field 4. Electromagnetic waves 5. Heat and temperature 6. Free energy and entropy							
Teaching types	☑ Lectures ☑ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning		☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☑ Supervision		☑ Sokratovski dijalog ☐ ☐ ☐			
Student obligations	Attending all forms of teaching.							
Monitoring student work	Class attendance	1	Research		Practical work			
	Experimental work		Paper					
	Essay		Seminar paper	2				
	Midterm exam		Oral exam					
	Written exam		Project					
Assessment and evaluation of student work	Activity during classes seminar and final exam							

Required literature	Title	Number of copies available	Availability via other media
	James T. Cushing: Philosophical Concepts in Physics: The Historical Relation between Philosophy and Scientific Theories, Cambridge University Press, 1998.		
Supplementary literature	1. Peter Michael Harman: Energy, Force and Matter: The Conceptual Development of Nineteenth-Century Physics, Cambridge University Press, 1982. 2. Robert D. Purrington: Physics in the Nineteenth Century, Rutgers University Press, 1997		
Quality assurance	Tests. Statistics of the results of exams. Exam results statistics and student evaluation through an anonymous survey at the end of the course. The survey is conducted according to the regulations of the University of Split.		
Other (in the opinion of the proponent)			

Course name	History of Modern Physics					
ID	PMP103	Study year	2.			
Lecturer	prof. dr. sc. Mile Dželalija	ECTS workload	3.0			
Associates		Number of hours	L	S	E	P
			30	0	0	0
Course status	Elective	Online percentage	30%			

Course description	
Course aims	Critical understanding of historical development of basic concepts and principles in relativistic physics, quantum physics, elementary particle physics and cosmology.
Enrolment requirements	Basic knowledge of relativistic physics, quantum physics, elementary particle physics, and cosmology.
Learning outcomes	Explain key conceptual elements that characterised classical mechanics, electromagnetism, thermodynamics, and historical cosmologies; Explain philosophical and historical background for development of modern physics; Discus the contribution of main physicists to the development of special relativity, quantum physics, particle physics and cosmology; Describe experiments and events that characterised the development of ideas and experimental techniques in special relativity, quantum physics, particle physics and cosmology; Critically analyse conceptual evolution of knowledge in special relativity, quantum physics, particle physics and cosmology; Discuss methods and tools for historical analyses of development of modern physics; Discuss key challenges of modern physics.
Syllabus	(2h) Key concepts in classical mechanics, electromagnetism, thermodynamics, and historical cosmologies (2h) Key challenges in classical physics (2h) Selected historical experiments related to special theory of relativity (4h) Development of new ideas, models and theories leading to special theory of relativity (2h) Selected historical experiments related to quantum physics (4h) Development of new idea, models and theories leading to quantum physics (2h) Selected historical experiments related to particle physics (4h) Development of new ideas, models and theories leading to models and theories of atoms, nucleus and elementary particles (2h) Selected historical experiments related to development of cosmology (2h) Development of new ideas, models and theories leading to modern cosmology (4h) Challenges of models and theories in modern physics

Teaching types			
☑ Lectures	☐ Fieldwork	☑ Domaće zadaće	
☐ Seminars	☐ Independent work	☐	
☐ Practicals	☐ Multimedia	☐	
☐ Remote learning	☐ Laboratory	☐	
☑ Blended learning	☐ Supervision	☐	

Student obligations	Homework assignments during semester. Written exam.					
Monitoring student work	Class attendance		Research		Practical work	
	Experimental work		Paper		Domaće zadaće	1
	Essay		Seminar paper	1	Završni ispit	1
	Midterm exam		Oral exam			

	Written exam		Project			
Assessment and evaluation of student work	Homework assignments during semester: 50 %; written exam: 50 %.					
Required literature	Title				Number of copies available	Availability via other media
	M. Dželalija: History of Modern Physics, University of Split, Faculty of Science, Split, 2020.					
	Selected famous historical research articles in relativistic physics, quantum physics, particle physics and cosmology.					
Supplementary literature	James T. Cushing: Philosophical Concepts in Physics: The Historical Relation between Philosophy and Scientific Theories, Cambridge University Press, 1998. Ž. Dadić, Povijest metoda i ideja u matematici I fizici, ŠK, Zagreb, 1992. I. Supek, Povijest fizike, ŠK, Zagreb, 1980.					
Quality assurance	Discussion with students and analysing their progress in solving problem and assignments. Statistics of exam results and evaluation of efficacy in accordance with the learning outcomes. Student evaluation by anonymous survey conducted according to the rules of the University of Split.					
Other (in the opinion of the proponent)						

Course name	Natural Science and the Environment					
ID	PMP162	Study year	3.			
Lecturer	doc. dr. sc. Ivana Weber	ECTS workload	4.0			
Associates		Number of hours	L	S	E	P
			30	0	10	0
Course status	Elective	Online percentage	20%			

Course description	
Course aims	To understand and apply fundamental physical concepts, laws and approaches in physics and interdisciplinary with other disciplines on the environment.
Enrolment requirements	No
Learning outcomes	· Explain and apply the basic thermodynamics to the human environment · Explain the basic composition, structure and dynamics of the atmosphere · Explain the operation of the hydrologic cycle and discuss the mechanisms of water transport in the atmosphere and in the ground · Discuss specific environmental problems such as noise pollution, ozone depletion and global warming in the context of an overall understanding of the environment and the application of the laws in physics · Discuss the problems of energy demand and explain the possible contributions of renewables to energy sources · Understand other environmental issues in relation to laws of physics (selected by students)
Syllabus	(5) Application of the laws of thermodynamics (5) Energy transfers (2) Noise pollution (2) Structure and comosition of the atmosphere (2) Ozone in the atmosphere (2) Greenhouse effect (2) Earth radiation (2) Global warming (5) Water in the atmosphere and clouds (5) Physics of wind creation (2) Physics of ground (2) Energy demand (2) Renewable energy resources (2) Selected topics

Teaching types			
	☑ Lectures ☑ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☑ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☑ Predavanja korištenjem prezentacija i rasprava sa studentima. ☑ Rješavanje odabranih jednostavnih

							primjera, samostalno i u grupi, ☑ Studentske prezentacije i rasprave pojedinih tema na seminaru. ☐
Student obligations	Active participation on classes and assignments. Prepare and present a seminar on a selected topics Solve the given numerical problems by using the concepts and laws from physics Critically discuss selected concepts and laws and their applicability						
Monitoring student work	Class attendance		Research		Practical work		
	Experimental work		Paper		aktivno sudjelovati u nastavi svojim komentarima, pitanjima i odgovorima na pitanja - pripremiti i prezentirati seminarski rad o odabranoj temi - riješiti zadane numeričke zadatke primijenjujući pojmove i zakone u navedenim sadržajima - kritički raspraviti odabrane pojmove i zakone te njihovu primjenjivost	2	
	Essay		Seminar paper	2			
	Midterm exam		Oral exam				
	Written exam		Project				
Assessment and evaluation of student work	Preparation and presentation of seminars (50%) Critical discussion of concepts and laws (40%) Solve simple numerical problems (10%) The final grade is formed according to the following list: [50,60>% = D (2) [60,75>% = C (3) [75,90>% = B (4) [90,100]% = A (5)						
Required literature	Title					Number of copies available	Availability via other media
	Nigel Mason and Peter Hughes: Introduction to Environmental Physics: Planet Earth, Life and Climate, Taylor and Francis, 2001.						
	M. Dželalija, Environmental Physics, Skripta, 2004.						
Supplementary literature	Presentations, examples and course book, M. Dželalija By choice from various disciplines with topics on the environment						

Quality assurance	- Analysis of achieved learning outcomes at the end of the class, compared to those at the beginning of the class - Monitoring the success of students in the following subjects - Other surveys of students according to the rules of the University of Split.
Other (in the opinion of the proponent)	

Course name	Mobile Applications Programming					
ID	PMID35	Study year	2.			
Lecturer	izv. prof. dr. sc. Goran Zaharija	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Elective	Online percentage	25%			

Course description			
Course aims	The goal of the course is to introduce main concepts related to the design and development of the applications for mobile phone platforms. Describe several main environments and development platforms for mobile development. Students will during the course develop their own simple mobile application using appropriate tools and development environments.		
Enrolment requirements	Basic knowledge of programming concepts with the focus on OOP paradigm. Basic knowledge of HTML, CSS and JavaScript		
Learning outcomes	After finishing the course, students will be able to: Describe the difference between classic and mobile applications. Define the basic structure of mobile application. Recognize the main challenges in mobile application development (screen sizes, memory constraints, CPU) and how to address them. Design and develop their own simple application. Describe the complete process of mobile application development - design, development, testing and deployment.		
Syllabus	1. Mobile application development basics (2+2). 2. Overview of mobile platforms (iOS, Android, Mobile 8) (2+2). 3. Developing Cross-platform mobile applications(2+2). 4. Introduction to the development environment (2+2). 5. Building a simple mobile application (2+2). 6. User Interface design (2+2). 7. Life-cycle of different application parts (2+2). 8. Handling data in mobile applications (2+2). 9. Resource management and permissions (2+2) 10. Event handling (touchscreen, gestures, device orientation) (1/2) (2+2). 11. Event handling (touchscreen, gestures, device orientation) (2/2) (2+2). 12. Project discussion and design. (2+2). 13. Project - development (2+2). 14. Project - testing (2+2). 15. Project - final presentation (2+2).		
Teaching types	☑ Lectures ☐ Seminars ☐ Practicals ☐ Remote learning ☑ Blended learning	☐ Fieldwork ☑ Independent work ☐ Multimedia ☑ Laboratory ☐ Supervision	☑ Domaće zadaće ☐ ☐ ☐
Student obligations	Lecture and laboratory attendance, active participation in course activities, homework and project realization, final exam.		

Monitoring student work	Class attendance	1	Research		Practical work	1
	Experimental work		Paper		Domaće zadaće	0.5
	Essay		Seminar paper			
	Midterm exam		Oral exam	1		
	Written exam	0.5	Project	1		

Assessment and evaluation of student work	Class attendance (10%) Final project (45%) Oral exam (45%)		
Required literature	Title	Number of copies available	Availability via other media
	Lee, Schneider, and Schell, Mobile Applications: Architecture, Design, and Development, Prentice Hall, 2004.		
	Brian Fling, Mobile Design and Development, O'Reilly Media, 2009		
Supplementary literature	Course materials available online		
Quality assurance	Student discussion, anonymous student evaluation questionnaire, student success rate, self-assessment		
Other (in the opinion of the proponent)			

Course name	Network Application Programming		
ID	PMIC60	Study year	3.
Lecturer	izv. prof. dr. sc. Goran Zaharija Dino Nejašmić, pred.	ECTS workload	5.0
Associates		Number of hours	L: 30 / S: 0 / E: 30 / P: 0
Course status	Elective	Online percentage	0%

Course description	
Course aims	This subject begins with an in-depth study of XHTML, the universal language of the Web. CSS is studied as it relates to enhancing the presentation of web content. Client-side programming is taught using JavaScript and the DOM, technologies used to create dynamic content and provide a true interactive experience for the Web site visitor. Course continues by addressing the technical skills and business knowledge required to develop data-driven web sites hosted on the Microsoft Web Platform. The course continues to focus on server-side ASP.NET programming technologies and the C# language. Students work with current and full-featured data access technologies, and interact with a local database.
Enrolment requirements	Basic knowledge of programming.
Learning outcomes	Upon successful completion of this subject students should be able to: 1. Analyze a given problem, and use JavaScript to program a browser-based solution to that problem. 2. Explain key design concepts essential to communicating with web site users. 3. Combine XHTML, CSS, and JavaScript to create dynamic web pages and integrated web sites. 4. Analyze the requirements for a web-enabled application, and use both ASP.NET and web client technologies to program a solution to the problem. 5. Use the design and productivity tools provided with Visual Studio 6. Design a suitable data access strategy, and use the appropriate technologies to work with the data
Syllabus	1. Introduction to the Internet (2h) 2. Introduction to HTML/XHTML (2h) 3. Web Site Design (2h) 4. JavaScript (6h) 5. Dynamic Content with JavaScript (2h) 6. Midterm 7. ASP.NET technologies (2h) 8. ASP.NET user interface controls (2h) 9. Web applications (2h) 10. Data-driven web applications (2h) 11. Multilanguage support (2h) 12. Stored procedures in web applications (2h) 13. Security challenges in web application (2h) 14. Project (2h)

Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☑ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☐ ☐ ☐ ☐

Student obligations	The course is conducted according to the model of integrated teaching and continuous student evaluation. Student obligations include: - attendance at lectures and exercises, - active participation in teaching activities, - solving short knowledge tests, - partial midterm exam during the semester, - homework, - project development and presentation, - partial final exam.

Monitoring student work						
	Class attendance	1	Research		Practical work	
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam		Oral exam			
	Written exam	2	Project	2		

Assessment and evaluation of student work	Class attendance and short knowledge tests (20%) Project development and presentation (40%) Midterm and final exam (40%)

Required literature	Title	Number of copies available	Availability via other media
	Osnove programiranja za web, Sveučilište u Splitu Filozofski fakultet, 2007. Lada Maleš, Saša Mladenović		
	JavaScript: The Definitive Guide, David Flanagan, O'Reilly (2011.)		
	Beginning ASP.NET 4.5 in C# Matthew MacDonald (2012.)		

Supplementary literature	Online Student material, including solutions to selected problems and additional reading
Quality assurance	Student discussion, anonymous student evaluation questionnaire, student success rate, self-assessment
Other (in the opinion of the proponent)	

Course name	Computational methods in physics					
ID	PMP073	Study year	1.			
Lecturer	izv. prof. dr. sc. Toni Šćulac	ECTS workload	4.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Compulsory	Online percentage	10%			

Course description	
Course aims	Understand, adopt, and learn the algorithmic approach to problem-solving and writing simple computer programs. Understand, adopt, and learn the basic concept of programming from the perspective of programming instructions for data input, data processing, data storage, and distribution of processing results, with applications in physics. Understand, adopt, and learn the basic concept of data storage and reuse, with applications in physics.
Enrolment requirements	None.
Learning outcomes	After successfully completing the course, the student will be able to: 1.) Formulate algorithmic solutions to problems. 2.) Write programs in the Python programming language. 3.) Identify errors in program solutions. 4.) Develop and use computer programs for simulating physical models of complex systems, as well as for analyzing and presenting the obtained results.
Syllabus	1.) Introduction to the course. Algorithmic problem-solving. Program input and output. 2.) Types of variables, operators, branching. 3.) For and while loops. If conditions. 4.) Arrays, lists, and matrices. Functions and modules. 5.) Functions and modules. 6.) Application of existing modules in mathematics and physics. 7.) Development of algorithms for solving simple problems in physics. 8.) Multidimensional arrays. 9.) Data analysis and processing. Plotting graphs. 10.) Simple animations. 11.) Files. Reading and storing data. 12.) Dictionaries and lists. 13.) Objects and classes. The concept of object-oriented and functional programming. 14.) Application of computational methods in physics. 15.) Advanced application of computational methods in physics.

Teaching types			
	☑ Lectures	☐ Fieldwork	☐
	☐ Seminars	☑ Independent work	☐
	☑ Practicals	☑ Multimedia	☐
	☐ Remote learning	☐ Laboratory	☐
	☐ Blended learning	☐ Supervision	☐

Student obligations	Attend at least 70% of lectures and 70% of exercises. Participation and engagement in class, completion of tasks during class, completion of assignments at home, preparation of a seminar that includes independent numerical solving of a physical problem, writing a report on the process, and presenting the results.

Monitoring student work	Class attendance	2	Research		Practical work	0.5
	Experimental work		Paper			
	Essay		Seminar paper	0.5		
	Midterm exam	1	Oral exam			
	Written exam		Project			

Assessment and evaluation of student work

Student participation and attendance in class. Written component: 2 midterm exams. Preparation of student seminars, written report, and oral presentation.

Continuous assessment		
Evaluation elements	Performance (min)	Weight in grade (%)
Independent problem solving and oral presentation of results	50	40
Homework	25	20

Final assessment		
Evaluation elements	Performance (min)	Weight in grade (%)
Preparation and presentation of a seminar	50	40

Evaluation		
Points (%)	Criterion	Grade
0-49		1
50-59		2
60-74		3
75-89		4
90-100		5

Required literature	Title	Number of copies available	Availability via other media
	M. Newman: Computational Physics		
	C. Fuehrer, J.E. Solem, O. Verdier: Scientific Computing with Python 3		
Supplementary literature	Lecture slides.		
Quality assurance	Discussion with students, anonymous student survey, student performance in the course, self-analysis.		
Other (in the opinion of the proponent)			

Course name	Computer vision					
ID	PMII60	Study year	1.			
Lecturer	dr. sc. Barbara Džaja, prof. stručn. stud.	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Elective	Online percentage	0%			

Course description	
Course aims	Adopt basic knowledge about the elements of the system, algorithms and methods used in computer vision applications. Independent student's ability to adapt and apply computer vision algorithms for specific problem.
Enrolment requirements	Course enrolment requirements: none.
Learning outcomes	After this course, students will be able to: - Analyze and identify a given problem in the field of computer vision - Classify algorithms of computer vision - Identify the types of images - Write algorithm for image processing in Python using OpenCV library - Identify the method of processing for a given problem - Apply the algorithm to its own problem
Syllabus	An introductory lecture, introducing students to the rules of the class rules attendance, Introduction to the computer vision, an overview of the program, learning objectives and tasks of students. Introduction to literature Introduction to Python and libraries that will be used. How to install plug-ins that are required for image processing. Picture, cameras, models, calibration, perception of light Exercise 1. Basic manipulation with images The basic relations between the pixels, processing of binary images Exercise 2. Advanced manipulation with images The projections, length coding algorithms and binary (filter size, Euler number, the edge region, area, perimeter, compactness, transformation distance, the central axis, thinning, expansion and contraction) Exercise 3. Mathematical operations on the image Morphological operators, basic operations, dilation, erosion, closing, opening, binary morphology, Exercise 4. Image processing Improving the properties of gray images, the exponential transformation, histogram modeling, linear filters (convolution, filter spatial averaging, Gaussian filter, Median filter). Exercise 5. Image derivation Filtering in the frequency domain - Fourier transform 1st colloquium Image segmentation Exercise 6. Morphological operators – Objects labeling Image segmentation - edge detection, gradient operators, operators of other derivatives, log detector edge, Canny edge detector Exercise 7. Morphological operators - dilation, erosion, opening and closing Textures and colors in images, color models, the physiology of the eye

Exercise 8. OpenCV
3D space points in 3D space, transformation of coordinate system, internal orientation and calibration
Exercise 9. OpenCV - Arithmetic operations on images
Objects in motion - detection of changes and segmentation based on changes
Exercise 10. OpenCV - Finding and marking objects
Objects in motion - tracking of moving objects
Exercise 11. OpenCV - Working with video
Object recognition
Exercise 12th OpenCV - Tracking objects
Student papers and the second colloquium

Teaching types

☑ Lectures		☐ Fieldwork	☐
☑ Seminars		☑ Independent work	☐
☐ Practicals		☐ Multimedia	☐
☐ Remote learning		☑ Laboratory	☐
☐ Blended learning		☐ Supervision	

Student obligations

Class attendance
Independently preparation of exercise.
Making exercise reports
Independent planning and presentation of student paper
Active participation in the teaching process
Exam.

Monitoring student work

Class attendance	2	Research		Practical work	
Experimental work		Paper			
Essay		Seminar paper	1		
Midterm exam		Oral exam	2		
Written exam		Project			

Assessment and evaluation of student work

Total scoring (100%):
Exam or 2 colloquiums - 80%, student paper 10%, exercises 10%
1. Colloquium 1: 40% (or exam)
2. Colloquium 2: 40% (or exam)
3. Student paper: 10% (obligatory)
4. Excercises: 10% (obligatory)
Rating by percentage:
50% to 62% - sufficient (2)
63% to 75% - good (3)
76% to 88% - very good (4)
89% to 100% - excellent (5)

Required literature

Title	Number of copies available	Availability via other media

	Obrada slika i računalni vid, interna skripta.		
	Ramesh Jain, Rangachar Kasturi, Brian G.Schunck, Machine Vision, McGraw-Hill, 1995.		
	Prezentacije s predavanja		
Supplementary literature	1. Linda G. Shapiro, George C. Stockman, Computer Vision, Prentice Hall, 2001. 2. Wesley E.Snyder, Hairong Qi, Machine Vision, Cambridge University Press, 2004. 3. D.A. Forsyth, J. Ponce, Computer Vision A Modern Approach, Prentice Hall, 2003 4. Foley, Computer Graphics: Principles and Practice (second edition in C), Addison-Wesley Publishing Company, 1996.		
Quality assurance	Conversation with the students. Students opinions about the quality of teaching through anonymous polls. The success of students at exam. Self-evaluation.		
Other (in the opinion of the proponent)			

Course name	Computer aided product design (CAD)					
ID	PMT112	Study year	2.			
Lecturer	doc. dr. sc. Ivan Peko	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Elective	Online percentage	0%			

Course description	
Course aims	- Familiarize participants with computer-aided product design (CAD) with special emphasis on 3D modeling - Develop skills for 3D design of various models and assemblies in various fields of application: industry, science, education - Develop skills for computer-supported simulations based on designed models and assemblies - Develop the ability to apply computer-aided 3D design in creating innovative products in various industries.
Enrolment requirements	- None.
Learning outcomes	- Search and analyze literature on computer-aided design (CAD) of models and assemblies - Analyze the function and application of computer-aided 3D design in modern industry, product development and optimization - Apply CAD in the creation of computer 3D models, assemblies and simulations - Apply CAD in parametric 3D modeling - Analyze and validate geometric 3D models and assemblies - Evaluate tools and procedures in computer-aided product design - Connect 3D computer-supported design with other advanced digital technologies: 3D printing, 3D scanning, artificial intelligence, machine learning...
Syllabus	1. Introduction to computer-aided design 2. Historical development of technology 3. Overview of softwares used for 3D computer-aided product design 4. Phases of the computer-aided 3D product design process 5. Parametric 3D modeling 6. Creation of 3D assemblies 7. Computer-supported 3D simulations 8. 3D modeling with surfaces 9. Optimization of 3D models (Generative shape design) 10. Additive technologies (3D printing technologies) 11. Connecting 3D design with other advanced digital technologies: 3D scanning, 3D printing, artificial intelligence (AI), Internet of Things (IoT)... 12. Application of CAD 3D product design in the automotive industry, aerospace industry, machinery and equipment industry, shipbuilding, medical industry, etc.

Teaching types			
	☑ Lectures ☑ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☑ Independent work ☑ Multimedia ☑ Laboratory ☑ Supervision	☐ ☐ ☐ ☐

Student obligations	Attending classes, active participation in the teaching process					
Monitoring student work	Class attendance	1	Research		Practical work	1
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam	1	Oral exam			
	Written exam		Project	2		
Assessment and evaluation of student work	2 midterms / exams Grade = (K1 + K2)/2 (K1: result of 1st midterm, K2: result of 2nd midterm) Grade by percentage: 50 - 62%: sufficient (2), 63 - 75%: good (3), 76 - 87%: very good (4), 88 - 100%: excellent (5)					

Required literature	Title	Number of copies available	Availability via other media
	Presentations from lectures and exercises		

Supplementary literature	1. K. Lee, "Principles of CAD/CAM/CAE Systems", Addison-Wesley, USA 1999. 2. C. McMahon, J. Browne, “CADCAM: principles, practice and manufacturing management”, PrenticeHall, Harlow 1998. 3. S. Dogra, ''Autodesk Fusion 360 – A Power Guide for Beginners and Intermediate Users'', CADArtifex, 2020. 4. R. Shih, ''Parametric Modeling with Autodesk Fusion 360 (Spring 2020 Edition)'', SDC Publications, USA 2020. 5. S. Dogra, ''Autodesk Fusion 360: Introduction to Surface and T-Spline Modeling'', CADArtifex, 2021. 6. A. Gebhardt, JS. Hötter, ''Additive Manufacturing - 3D Printing for Prototyping and Manufacturing'', Hanser Publications, Cincinnati, 2016. 7. B. Redwood, F. Schöffer, B. Garret, ''The 3D Printing Handbook -Technologies, design and applications'', 3D Hubs, Amsterdam, 2017. 8. P. Kyratsis, A. Manavis, J. P. Davim, ''Computational design and digital manufacturing'', Springer, Cham, 2023
Quality assurance	Conversation with students, student evaluation using an anonymous survey, student success in the exam, self-assessment.
Other (in the opinion of the proponent)	

Course name	Distributed systems					
ID	PMIC50	Study year	1.			
Lecturer	prof. dr. sc. Marko Rosić Dino Nejašmić, pred.	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Compulsory	Online percentage	0%			

Course description	
Course aims	Acquiring fundamental knowledge about distributed computing and related systems. Mastery of fundamental principles related to the application, validation and modelling of distributed systems.
Enrolment requirements	None
Learning outcomes	1. Enumerate the characteristics, advantages and shortcoming of distributed systems 2. Comprehend the software particularities of distributed systems 3. Understand various communication algorithms for distributed systems 4. Understand logical, vector and matrix clocks, along with the motivation behind them 5. Enumerate and comprehend ways for sharing resources and achieving mutual exclusion using various algorithms in a distributed system 6. Describe the peer-to-peer model
Syllabus	Lecture on Introduction to distributed systems (2h), definition of distributed systems, advantages and shortcomings of distributed systems (2h), characteristics of distributed systems (2h), resource sharing (2h), hardware settings of distributed systems (3h), operating systems in distributed systems (3h), middleware programs (2h), communication in distributed systems (4h), logical, vector and matrix clocks (4h), mutual exclusion (2h), client-server model (2h), Peer-to-peer networks (2h). Laboratory exercises accompany the lecture topics with the same number of work hours.
Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning ☐ Fieldwork ☑ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision
Student obligations	Lecture and laboratory exercises attendance in accordance with the regulations on studying. The implementation of given seminar.

Monitoring student work						
	Class attendance	0.5	Research		Practical work	0.5
	Experimental work		Paper			
	Essay		Seminar paper	2		
	Midterm exam		Oral exam	0		
	Written exam	2	Project			

Assessment and evaluation of student work	Class attendance (20%), Seminar (40%), Exam(40%).

Required literature	Title	Number of copies available	Availability via other media
	M. Van Steen, A. Tannebaum, Distributed Systems: Principles and Paradigms, Prentice Hall		
Supplementary literature	R. Orfali, D. Harkley, J. Edwards: The Essential Distributed Object Survival Guide, John Wiley		
Quality assurance	Student consultations, anonymous student survey, exam success, self-analysis		
Other (in the opinion of the proponent)			

Course name	Elementary Mathematics in basic education					
ID	PMM161	Study year	2.			
Lecturer	doc. dr. sc. Gordan Radobolja	ECTS workload	4.0			
Associates		Number of hours	L	S	E	P
			0	45	0	0
Course status	Elective	Online percentage	0%			

Course description	
Course aims	To cover certain topics in elementary math, geometry, linear algebra, mathematical analysis and other fundamental areas which are skipped within other courses. To prepare students for finding literature, independently processing topics from multiple sources and presenting while starting a discussion with colleagues. To develop the ability of oral expression with the use of mathematical terminology.
Enrolment requirements	Elementary mathematics
Learning outcomes	After passing this course, students are expected to be able to: By searching literature and materials available on the Internet, work on a given topic independently or in a group Present the topic in front of colleagues To interest and engage listeners and stimulate discussion To improve their understanding and linking knowledge among the fundamental branches of mathematics
Syllabus	Some of the seminar topics may be chosen from the following areas: Analytical geometry Curves and surfaces Trigonometry Construction of number sets Homogeneous coordinates and projective geometry Topology Group theory Mathematical analysis Examples of topics: Möbius strip, torus and Klein bottle; Fourier series; Rubik's Cube; QR factorization and least squares method; visual group theory; matrices and transformations of the real plane; curve and area integral with applications; linear programming.

Teaching types						
	☐ Lectures ☑ Seminars ☐ Practicals ☐ Remote learning ☐ Blended learning		☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision		☐ ☐ ☐ ☐	
Student obligations	Attendance.					
Monitoring student work	Class attendance	1.5	Research		Practical work	
	Experimental work		Paper			

	Essay		Seminar paper	2.5		
	Midterm exam		Oral exam			
	Written exam		Project			

Assessment and evaluation of student work	Preparation and presentation of the seminar paper. Active participation in other students' presentations.		
Required literature	Title	Number of copies available	Availability via other media
	-		
Supplementary literature			
Quality assurance	Student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split.		
Other (in the opinion of the proponent)			

Course name	Sigurnost računalnih učionica					
ID	PMIC40	Study year	2.			
Lecturer	izv. prof. dr. sc. Goran Zaharija	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			15	30	0	0
Course status	Elective	Online percentage	0%			

Course description	
Course aims	Cilj kolegija je upoznati studente sa problematikom vezanom uz postavljanje i održavanje računalnih učionica. Studenti bi se trebali kroz niz praktičnih vježbi upoznati sa aktualnim tehnikama i alatima za održavanje i nadzor računalnih učionica.
Enrolment requirements	Uvod u računarstvo
Learning outcomes	Nakon završetka kolegija studenti bi trebali biti u mogućnosti: 1. Razumjeti probleme sigurnosti računalnih učionice u kontekstu sigurne uporabe računala od strane učenika. 2. Opisati glavne teme, primjenu i područja istraživanja vezana uz sigurnost računalnih učionica, uključujući načine upravljanja korisnicima i pripadajućim pravima, planiranje iprovođenje izrade sigurnostnih kopija, virtualizacije, antivirusnu zaštitu i zaštitu od neovlaštenog pristupa, zaštitu osobnih podataka, probleme sigurnosti pri dijeljenju resursa, zaštitu od neprimjerenih internetskih sadržaja. 3. Primijeniti osnovne za povećanje razine sigurnosti u računalnim učionicama. 4. Raspravljati o ulozi sigurnosti u svakodnevnom životu i društvu koje se oslanja na informacijsko komunikacijsku tehnologiju. 5. Prepoznati granice sposobnosti zaštite trenutnih metoda tehnika i alata s naglaskom na odgovorno korištenje istih.
Syllabus	1. Uvod u probleme sigurnosti računalnih učionica 2. Virtualizacija i instalacija više operacijskih sustava 3. Profili korisnika i upravljanje korisničkim pravima 4. Postavljanje ograničenja na uporabu pojedinih programa i usluga 5. RAID, princip rada i odabir razine 6. Izrada plana i upravljanje sigurnosnim kopijama 7. Oporavak učionice nakon nepredviđenog događaja 8. Automatizacija procesa pomoću specijaliziranih skripti 9. Antivirusna zaštita 10. Zaštita od neovlaštenog pristupa 11. Nadzor rada korisnika učionice 12. Konfiguriranje i aktualizacija programske podrške računalne učionice 13. Dijeljenje resursa i problem sigurnosti 14. Zaštita osobnih podataka 15. Primjerenost sadržaja na internetu Vježbe prate predavanja u istoj satnici i raspodjeli tema.

Teaching types			
	☑ Lectures ☑ Seminars ☐ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☑ Independent work ☐ Multimedia ☑ Laboratory ☐ Supervision	☐ ☐ ☐ ☐

Student obligations	Prisustvo na predavanjima i vježbama, aktivno sudjelovanje na nastavnim aktivnostima, izrada domaćih radova, izrada završnog projekta, ispit.					
Monitoring student work	Class attendance	0.5	Research	0.5	Practical work	1
	Experimental work		Paper			
	Essay		Seminar paper	3		
	Midterm exam		Oral exam			
	Written exam		Project			
Assessment and evaluation of student work	Prisustvo/sudjelovanje na nastavi (10%) Završni ispit (90%)					

Required literature	Title	Number of copies available	Availability via other media
	Security in Computing, 6th Edition by Charles Pfleeger, Shari Lawrence Pfleeger, Lizzie Coles-Kemp Released August 2023 Publisher(s): Addison-Wesley Professional ISBN: 9780137891375		
	Computer Security Fundamentals, 5th Edition by William Chuck Easttom Released February 2023 Publisher(s): Pearson IT Certification ISBN: 9780137984756		

Supplementary literature	Nastavni materijali dostupni na Internetu, uključujući rješenja odabranih zadataka tedodatna znanstvena literatura.
Quality assurance	Razgovor sa studentima, anonimna studentska anketa, uspješnost studenata nakolegiju, samoanaliza.
Other (in the opinion of the proponent)	

Course name	Complexity of algorithms					
ID	PMM920	Study year	2.			
Lecturer	prof. dr. sc. Jurica Perić	ECTS workload	6.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Compulsory	Online percentage	40%			

Course description	
Course aims	Students will acquire knowledge in advanced algorithmic concepts. They will become familiar with designing efficient algorithms and precise analysis of their complexity.
Enrolment requirements	
Learning outcomes	The student is able to: - apply studied material for the development of new algorithms and calculate complexity of these algorithms - analyze each algorithm and analyze its basic properties (input, output, efficiency, ...) - argue the importance of sorting algorithms, reproduce and compare sorting algorithms - argue advantages and disadvantages of greedy algorithms, support claims on solving optimization problems (minimum spanning tree, ...) - distinguish which method of constructing algorithms should be used for solving particular problems, compare the chosen method with other methods
Syllabus	Introduction. Algorithms, basic properties, complexity. - 2 hours Asymptotic behavior of functions. - 2 hours Recursive algorithms. - 4 hours Fast matrix multiplication, algorithms for multiplication and division, quicksort. - 4 hours Greedy algorithm. - 2 hours Algorithms on graphs. - 2 hours Dijkstra, Prim, Kruskal algorithms. - 4 hours Minimum spanning tree, graph search, cycles - 6 hours Dynamic programming - 4 hours

Teaching types			
	☑ Lectures	☐ Fieldwork	☐
	☐ Seminars	☐ Independent work	☐
	☑ Practicals	☐ Multimedia	☐
	☐ Remote learning	☐ Laboratory	☐
	☐ Blended learning	☐ Supervision	☐

Student obligations	Attendance at 70% of lectures and 70% of exercises.

Monitoring student work						
	Class attendance	1	Research		Practical work	
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam	1.5	Oral exam	2.5		
	Written exam	1	Project			

Assessment and evaluation of student work	The exam is taken in written and oral form. Written exam is preliminary part of the exam and requirement for the oral exam is to pass a written exam. The written form of the exam can be taken partially, during class, where curriculum provided. Activity in class, solving homework, colloquium, written and oral examination are the elements from which form the final grade is formed.		
Required literature	Title	Number of copies available	Availability via other media
	T. H. Cormen, C. E. Leiserson, R. L. Rivest, Introduction to Algorithms, MIT Press, Cambridge, Massachusetts, 1990.		
	D. Knuth, The Art of Computer Programming, Vol. 1, Fundamental Algorithms, Addison-Wesley, Reading, MA, USA, 1997.		
Supplementary literature			
Quality assurance	Statistics of test results and student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split.		
Other (in the opinion of the proponent)			

Course name	Statistical Physics					
ID	PMP114	Study year	3.			
Lecturer	prof. dr. sc. Larisa Zoranić	ECTS workload	6.0			
Associates		Number of hours	L	S	E	P
			45	0	30	0
Course status	Compulsory	Online percentage	5%			

Course description	
Course aims	Introducing students to the basic properties and description of many-particle systems through the concepts of thermodynamics and statistical physics. A qualitative understanding of the experimentally observed phenomena of microscopic physical models and the ability to quantitatively describe and solve problems using the appropriate mathematical formalism are expected.
Enrolment requirements	Passed courses in General Physics I, II and Mathematics and completed courses in General Physics III and IV and Classical Mechanics
Learning outcomes	After successfully completing the course, the student will be able to: 1. Explain the foundations of statistical physics (Brownian motion, multiparticle systems, thermalization, postulate of equal probabilities, distribution functions and probability functions). 2. Derive the Boltzmann distribution, discuss the properties of this distribution, and apply it to interpret the equipartition theorem. 3. Formulate ensemble theory. 4. Describe macroscopic systems within the framework of microcanonical and canonical ensembles and derive thermodynamic quantities. 5. Compare classical and quantum statistical description and discuss the limits of their applicability. 6. Derive and apply Fermi-Dirac and Bose-Einstein distributions, discuss conditions of applicability and behavior in classical limes. 7. Identify and describe the statistical nature of concepts and laws in thermodynamics such as entropy, temperature, chemical potential. 8. Compare the classical and quantum description of an ideal gas and a linear harmonic oscillator. 9. Formulate and apply the blackbody radiation model and the crystal lattice oscillation model. 10. Describe and analyze a highly degenerate Fermi gas.
Syllabus	The timetable worked out according to the weekly plan: 1. Introduction to the course. Thermodynamics. Basic concepts of statistics and probability theory. Statistical behavior of many-particle systems. Maxwell's distribution. Brownian motion. Thermalization. 2. Statistical ensembles. Equilibrium. Density function and probability density. Phase space. Average values of physical quantities and partition function. 3. Microcanonical ensemble. Entropy. System stability conditions. 4. Canonic ensemble. The most probable distribution. Boltzmann distribution. Lagrange multipliers. 5. Ideal gas in the canonical ensemble. Comparison of microcanonical and canonical ensemble. Free energy. 6. Explanation of the second law of thermodynamics. Thermal properties of an ideal gas. Law on equipartition of energy. 7. Classic harmonic oscillator. Heat capacity of crystal lattice, ideal gas and two-state model. 8. Fluctuations in statistical physics. 9. Quantization of energy levels. Identical particles. Symmetry of wave functions. 10. Explanation of the third law of thermodynamics. Limits of classical statistics. 11. Quantum harmonic oscillator. 12. Black body radiation: Planck distribution. Rayleigh-Jeans formula, Stefan-Boltzmann law, Wien's law. Photons. 13. Vibration of atoms in crystals: Einstein's and Debye's model. Phonons. 14. Bose-Einstein and Fermi-Dirac distributions. 15. Density function of states. Highly degenerate Fermi systems.

Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☑ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☐ ☐ ☐ ☐

Student obligations	Prisustvo i zalaganje studenata na satu, rješavanje zadataka na satu i kod kuće. Sudjelovanje u raspravama i diskusijama na satu.

Monitoring student work						
	Class attendance	2	Research		Practical work	0.5
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam	1.5	Oral exam	2		
	Written exam		Project			

Assessment and evaluation of student work	Knowledge is tested by a written and oral exam. Colloquiums are organized during classes. Students who do not pass the written part through the colloquium have 4 additional exam deadlines for passing the written part. The oral exam is taken after the written part.

Required literature	Title	Number of copies available	Availability via other media
	Statistical mechanics–3rd ed. R. K. Pathria, Paul D. Beale, 2011 Elsevier Ltd. Concepts in thermal physics, S. Blundell and K. M. Blundell, 2006 Oxford University Press		
	Statistical physics, Z. Glumac, online script		

Supplementary literature	Elementary Statistical Physics, C. Kittel, Dover Publications, 2004 Introduction to Statistical Physics, Kerson Huang, Taylor and Francis, 2001. K. Dill and S. Bromberg, Molecular Driving Forces: Statistical Thermodynamics in Biology, Chemistry, Physics, and Nanoscience, Garland Science; 2nd edition (2010) Feynman, The Feynman Lectures on Physics, (Chapters 39-46), 1963. Scientific articles, lecturesa
Quality assurance	The success of the program is monitored by the quality of knowledge demonstrated in the exams as well as by the assessment of the demonstrated enthusiasm for the subject. External evaluation includes student surveys. Statistics of exam results and student evaluation through an anonymous survey at the end of the course. The survey is conducted according to the rules of the University of Split
Other (in the opinion of the proponent)	

Course name	Stochastic Simulations in Classical and Quantum Physics		
ID	PMP271	Study year	1.
Lecturer	izv. prof. dr. sc. Petar Stipanović prof. dr. sc. Leandra Vranješ Markić	ECTS workload	6.0
Associates		Number of hours	L: 30, S: 0, E: 30, P: 0
Course status	Compulsory	Online percentage	10%

Course description	
Course aims	Deeper understanding of selected topics of classical and quantum physics. Understanding the advantages and limitations of Monte Carlo simulations. Testing and developing simpler simulations. The ability to visualise and critically evaluate obtained results.
Enrolment requirements	Basic knowledge of statistical and quantum physics, as well as programming.
Learning outcomes	1. Know several Monte Carlo simulation methods. 2. Be able to independently develop and apply Metropolis algorithm for a given probability distribution. 3. Be able to evaluate the efficiency and validity of the results of a given Monte Carlo algorithm. 4. Understand the advantages and limitations of stochastic simulations of phase transitions. 5. Be able to apply the learned methods to selected problems of classical and quantum many-body physics and to interpret the obtained results. 6. Adapt the program to run on high performance computing (HPC) clusters.
Syllabus	Basic techniques of stochastic simulations are introduced and applied to different physical systems and models. The exercises on computers follow the following content of the lectures according to the same schedule. DETERMINISTIC RANDOMNESS (1h) Pseudorandom number generators. (1h) Testing for randomness and uniformity. (2h) Simulating random variables. Random walk. (4h) Brownian dynamics. Diffusion and entropy. (2h) Distributions. Percolation. (2h) Radioactive decay. (1h) Distribution transformation methods and rejection methods. (1h) Multidimensional integration using Monte Carlo methods. (2h) Markov chains. Metropolis algorithm. (2h) Estimation of statistical errors. MONTE CARLO SIMULATIONS OF THERMAL SYSTEMS (2h) Ideal gas. Demon algorithm. (2h) Ising model. Periodic boundary conditions. (2h) Simulation on High Performance Computing (HPC) clusters. (3h) Simulation of continuous systems. Classical fluids. QUANTUM MONTE CARLO METHODS (3h) Variational Monte Carlo. Diffusion Monte Carlo.

Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☑ Independent work ☐ Multimedia ☑ Laboratory ☐ Supervision	☐ ☐ ☐ ☐
Student obligations	Homework during semester. Final project and presentation.		

Monitoring student work						
	Class attendance	2	Research		Practical work	2
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam		Oral exam			
	Written exam		Project	2		

Assessment and evaluation of student work	Homework and the final project, in which the student should independently develop the program using the appropriate Monte Carlo method, and presentation are evaluated. For homework and project, the students should write a report in which they answer the questions asked and critically evaluate obtained results.

Required literature	Title	Number of copies available	Availability via other media
	[1] L. Vranješ Markić, P. Stipanović: "Stohastičke simulacije u klasičnoj i kvantnoj fizici", skripta, PMFST, Split, 2016.		yes
	[2] Harvey Gould, Jan Tobochnik, and Wolfgang Christian: "An Introduction to Computer Simulation Methods", 3rd revised edition, 2016. URL: https://www.compadre.org		yes

Supplementary literature	[3] R. H. Landau & M. J. Paez: "Computational Problems for Physics", CRC Press, Taylor & Francis, 2018. [4] M. P. Allen & D. Tildesley: "Computer Simulation of Liquids", Clarendon Press, Oxford, 1987. [5] Different web pages.
Quality assurance	Lecturers who teach subjects, which have correlated learning outcomes, collaborate and take care of teaching quality. Discussion with students and analyzing their progress in solving problem and project tasks. Statistics of exam results and evaluation of efficacy in accordance with the learning outcomes. Student evaluation by anonymous survey conducted according to the rules of the University of Split.
Other (in the opinion of the proponent)	

Course name	English for Specific Purposes I					
ID	PMS252	Study year	1.			
Lecturer	Ana Mršić Zdilar, v. pred.	ECTS workload	2.0			
Associates		Number of hours	L	S	E	P
			0	30	0	0
Course status	Elective	Online percentage	0%			

Course description	
Course aims	- upoznati studente s osnovnim zakonitostima prevođenja stručnih tekstova iz područja biologije i kemije - razvijati vještine i tehnike čitanja s razumijevanjem stručnih i znanstvenih tekstova na engleskom jeziku iz područja prirodnih znanosti - poticati usvajanje stručne terminologije iz područja biologije i kemije - ponavljati i proširivati gramatičke kategorije engleskog jezika, osobito one karakteristične za stručne tekstove - razvijati pismene i usmene komunikacijske vještine studenata na engleskom jeziku
Enrolment requirements	Četverogodišnje srednjoškolsko obrazovanje s engleskim jezikom kao prvim ili drugim stranim jezikom.
Learning outcomes	Nakon odslušanog i položenog predmeta, student će moći: - s razumijevanjem pročitati stručni tekst na engleskom jeziku i prevesti ga na hrvatski jezik - jezično i sadržajno analizirati stručni tekst na engleskom jeziku - realizirati usmeno izlaganje na engleskom jeziku, odnosno prezentaciju na određenu temu iz struke - napisati kraći tekst na engleskom jeziku s temom iz područja biologije i kemije - temeljem stečenih kompetencija u domeni stručnog vokabulara na engleskom jeziku, uspješno pretraživati i koristiti relevantnu stručnu literaturu - pravilno se služiti različitim gramatičkim kategorijama tipičnim za stručne tekstove (npr. pasivne konstrukcije, neodređene zamjenice, složenice i dr.) .
Syllabus	1. Biology-the Study of living Organisms 2. The Characteristics of Living Things 3. The Differences between Plants and Animals 4. The Characteristics of Plants and Animals 5. The Need for Energy-Autotrophs and Heterotrophs 6. Photosynthesis 7. Food Webs, Energy Flow, and Nutrient Cycles 8. Ecology 9. Introduction to Chemistry /Elements, Compounds and Mixtures 10. Solutions and Water 11. Suspensions, Colloidal Suspensions, Emulsions 12. Crystals 13. Purification of Water 14. Oxygen/ Hydrogen 15. Atomic Structure I/II

Teaching types	☐ Lectures ☑ Seminars ☐ Practicals ☐ Remote learning ☐ Blended learning		☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision		☐ ☐ ☐ ☐	
Student obligations	Nazočnost na nastavi, aktivno sudjelovanje u nastavi, realizacija prezentacije (usmenog izlaganja) na engleskom jeziku na zadanu temu iz struke, polaganje dvaju kolokvija ili ispita					
Monitoring student work	Class attendance	0.5	Research		Practical work	
	Experimental work		Paper	0.5		
	Essay		Seminar paper			
	Midterm exam	1	Oral exam			
	Written exam		Project			

Assessment and evaluation of student work	Nazočnost na nastavi, praćenje aktivnosti studenata na nastavi, prezentacija, dva kolokvija, ispit (ako mu student pristupi).		
Required literature	Title	Number of copies available	Availability via other media
	-		
Supplementary literature	Jovanović, T:: English for Chemistry, Sveučilište u Zagrebu, Zagreb 1989		
Quality assurance	Statistics of test results and student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split		
Other (in the opinion of the proponent)	Nema.		

Course name	English for Specific Purposes II		
ID	PMS251	Study year	1.
Lecturer	Ana Mršić Zdilar, v. pred.	ECTS workload	2.0
Associates		Number of hours	L: 0, S: 30, E: 0, P: 0
Course status	Elective	Online percentage	0%

Course description	
Course aims	- to acquire insight into basic translation procedures of texts related to mathematics, computer science, polytechnics and physics - to develop reading skills and techniques in order to understand scientific and technical texts in English - to encourage the learning of terminology related to mathematics, computer science, polytechnics and physics - to revise and extend the knowledge of English grammar, especially related to technical and scientific texts - to develop students' written and oral communication skills in English
Enrolment requirements	Four years of high school education, English language being the first or second foreign language.
Learning outcomes	After attending the classes and passing the exam, students should be able to: - understand a text in English and translate it into Croatian - analyse the language features and the content of a technical text in English - give an oral presentation related to mathematics, computer science, polytechnics and physics in English - write a short text in English covering science related topics - successfully search for relevant technical literature and use it with the help of acquired lexical competence understand different language structures and use them correctly (e.g. the passive voice, non-defining relative clauses, compound words etc.)
Syllabus	1.Equations and formulae 2. Lines and angles 3. Two-dimensional figures / The triangle/ The circle /More 2-dimensional figures 4. Three-dimensional figures 5. Force 6. Motion 7. Work, energy and power 8. Health and safety / Computer ergonomics / Electronic rubbish / The risks of using mobiles and in-car computers 9. Operating systems and the GUI 10. Graphics and design / Multimedia 11. Sound and music /Audio files on the Web / Digital audio players / Other audio applications 12. Computers and work / Jobs in computing / Computers and jobs: new ways, new profiles /E-commerce 13. Web design / HTML / Basic elements / Video, animations and sound/Chatting and video conferences 14. Internet security /Internet crime

	/Malware: viruses, worms, trojans and spyware /preventive tips 15. Robots, androids, AI /Robots and automata /Uses for robots/ Artificial Intelligence/Inteligent homes

Teaching types	☐ Lectures ☑ Seminars ☐ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☐ ☐ ☐ ☐

Student obligations	Students are expected to attend the classes regularly and participate actively in classes. They are also expected to give an oral presentation on a course related topic in English and pass two preliminary exams or a written exam.

Monitoring student work						
	Class attendance	0.5	Research		Practical work	
	Experimental work		Paper	0.5		
	Essay		Seminar paper			
	Midterm exam	1	Oral exam			
	Written exam		Project			

Assessment and evaluation of student work	Regular attendance, participation in classes, oral presentation, two preliminary exams.

Required literature	Title	Number of copies available	Availability via other media
	Ferčec, Ivanka: A Course in Scientific English, Odjel za matematiku, Sveučilište u Osijeku, Osijek, 2001.		
	Fabre, E. M./ Esteras, S. R.: Professional English in Use (Intermediate to advanced), Cambridge University Press, Cambridge 2007.		

Supplementary literature	Allen, J. P. B i Widdowson, H. G.: English in Physical Science, Oxford University Press, 1978. Glendinning, E. H.: English in Mechanical Engineering, Oxford University Press, 1979.
Quality assurance	Consultations, discussion, active participation, evaluation.
Other (in the opinion of the proponent)	

Course name	English for Specific Purposes (II)					
ID	PMS253	Study year	1.			
Lecturer	Ana Mršić Zdilar, v. pred.	ECTS workload	2.0			
Associates		Number of hours	L	S	E	P
			0	30	0	0
Course status	Elective	Online percentage	0%			

Course description	
Course aims	- upoznati studente s osnovnim zakonitostima prevođenja stručnih tekstova iz područja biologije i kemije - razvijati vještine i tehnike čitanja s razumijevanjem stručnih i znanstvenih tekstova na engleskom jeziku iz područja prirodnih znanosti - poticati usvajanje stručne terminologije iz područja biologije i kemije - ponavljati i proširivati gramatičke kategorije engleskog jezika, osobito one karakteristične za stručne tekstove - razvijati pismene i usmene komunikacijske vještine studenata na engleskom jeziku
Enrolment requirements	Četverogodišnje srednjoškolsko obrazovanje s engleskim jezikom kao prvim ili drugim stranim jezikom
Learning outcomes	Nakon odslušanog i položenog predmeta, student će moći: - s razumijevanjem pročitati stručni tekst na engleskom jeziku i prevesti ga na hrvatski jezik - jezično i sadržajno analizirati stručni tekst na engleskom jeziku - realizirati usmeno izlaganje na engleskom jeziku, odnosno prezentaciju na određenu temu iz struke - napisati kraći tekst na engleskom jeziku s temom iz područja biologije i kemije - temeljem stečenih kompetencija u domeni stručnog vokabulara na engleskom jeziku, uspješno pretraživati i koristiti relevantnu stručnu literaturu - pravilno se služiti različitim gramatičkim kategorijama tipičnim za stručne tekstove (npr. pasivne konstrukcije, neodređene zamjenice, složenice i d
Syllabus	1. Reproduction 2. The Importance of Sexual Reproduction 3. Species and their Adaptations 4. Adaptations 5. The Evidence for Evolution 6. Natural Selection 7. The Diversity of Life 8. Man and the Ecosystem 9. Metals and Non-metals 10. The Periodic Table 11. Symbols, formulas and equations 12. Ionization I 13. Ionization II 14. Acids 15. Bases

Teaching types	☐ Lectures ☑ Seminars ☐ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☐ ☐ ☐ ☐

Student obligations	Nazočnost na nastavi, aktivno sudjelovanje u nastavi, realizacija prezentacije (usmenog izlaganja) na engleskom jeziku na zadanu temu iz struke, polaganje dvaju kolokvija ili ispita.					
Monitoring student work	Class attendance	0.5	Research		Practical work	
	Experimental work		Paper	0.5		
	Essay		Seminar paper			
	Midterm exam	1	Oral exam			
	Written exam		Project			

Assessment and evaluation of student work	Nazočnost na nastavi, praćenje aktivnosti studenata na nastavi, prezentacija, dva kolokvija, ispit (ako mu student pristupi)		
Required literature	Title	Number of copies available	Availability via other media
	-		
Supplementary literature	Jovanović, T: English for Chemistry, Sveučilište u Zagrebu, Zagreb 1989		
Quality assurance	Statistics of test results and student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split		
Other (in the opinion of the proponent)	Nema		

Course name	Processing of materials		
ID	PMT157	Study year	3.
Lecturer	doc. dr. sc. Ivan Peko	ECTS workload	5.0
Associates		Number of hours	L: 30, S: 0, E: 30, P: 0
Course status	Compulsory	Online percentage	0%

Course description	
Course aims	Adopting basic knowledge for Materials Processing Technology: metal casting, deformation, particle separation, welding and the possibilities of application of these procedures.
Enrolment requirements	None
Learning outcomes	After this course, students will be able to: 1.Classify Materials Processing Technology 2.Classify procedures of particle separation and explain their importance. 3. Presentation and application of machine tools 4.Classify procedures for connecting and separating materials 5. Analyze the characteristics of the merging and separation procedures 6.Categorize procedures of casting , deformation , and minting
Syllabus	Week 1 Definition of production , Definition and classification of technology , procedures of particle separation , Advantages and disadvantages of procedures of particle separation , Historical Development Week 2 Basic technology concepts of particle separation, tool and workpiece geometry Exercise 1 Introduction to machine tools in the laboratory . Turning. The geometry of the tool and workpiece . Types of separate particles , materials for cutting tools Week 3 Formation and forms of separate particles. Exercise 2 Turning Week 4 Thermal phenomena in processing of particle separation Exercise 3 Planing and gouging Week 5 Tool wear Exercise 4 Methods for makeing holes : drilling , countersinking and reaming Week 6 Materials for cutting tools Exercise 5 Sawing and broaching Week 7 Classification of machine tools . The structure and technical specifications of machine tools. Exercise 6 Milling Week 8 Colloquium 1 Week 9 The importance and types of deformation procedures. The concept of plastic deformation and indicators of material plasticity Exercise 7 Finishing procedures methods: grinding, honing, superfinishing , polishing Week 10 Changes in the material caused by deformation; anisotropy; Exercise 8 Wood processing Week 11 The degree and rate of deformation ; Flow curve and flow curves ; Procedures of compacting and forging Exercise 9 Wood processing Week 12 Base casting process ; Flow and solidification of metals . The procedures of casting in sand. Materials and methods of making molds and cores . Exercise 10 Wood processing Week 13 Procedures of compacting and forging Exercise 11 Wood processing Week 14 Definitions of procedures and principles of weld joints . Types of joints and welding positions. The forms of energy for welding . The flow of heat in welding. Exercise 12 Wood processing Week 15 Colloquium 2
Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Fieldwork ☐ Independent work ☐ Multimedia

	☐ Remote learning ☐ Blended learning		☑ Laboratory ☐ Supervision		☐	
Student obligations	Class attendance Independently preparation of exercise. Making exercise reports Active participation in the teaching process. Exam.5					
Monitoring student work	Class attendance	1	Research		Practical work	1
	Experimental work	1	Paper			
	Essay		Seminar paper			
	Midterm exam		Oral exam			
	Written exam	2	Project			
Assessment and evaluation of student work	Total scoring (100%): Exam or 2 colloquiums - 80%, student exercises 20% 1. Colloquium 1: 40% (or exam) 2. Colloquium 2: 40% (or exam) 4. Excercises: 20% (obligatory) Rating by percentage: 50% to 62% - sufficient (2) 63% to 75% - good (3) 76% to 88% - very good (4) 89% to 100% - excellent (5)					

Required literature	Title	Number of copies available	Availability via other media
	Fučko G, Interna skripta 2004.		
	Šavar Š., Obrada odvajanjem čestica I i II, ŠK, Zagreb, 1993.		
Supplementary literature	Lindberg A.R Processes and materials of manufucture, Boston, 1990.		
Quality assurance	Conversation with the students. Students opinions about the quality of teaching through anonymous polls. The success of students at exam. Self-evaluation.		
Other (in the opinion of the proponent)			

Course name	Relativity					
ID	PMP401	Study year	2.			
Lecturer	izv. prof. dr. sc. Toni Šćulac	ECTS workload	6.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Elective	Online percentage	0%			

Course description			
Course aims			
Enrolment requirements			
Learning outcomes			
Teaching types	☐ Lectures ☐ Seminars ☐ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☐ ☐ ☐ ☐
Student obligations			
Assessment and evaluation of student work			

Required literature	Title	Number of copies available	Availability via other media
	-		
Supplementary literature			
Quality assurance			
Other (in the opinion of the proponent)			

Course name	Classroom management		
ID	PMS160	Study year	2.
Lecturer	doc. dr. sc. Anna Alajbeg	ECTS workload	2.0
Associates		Number of hours	L: 15, S: 15, E: 0, P: 0
Course status	Elective	Online percentage	0%

Course description	
Course aims	Course objectives are training students for high-quality decision-making in the learning process with special emphasis on creating quality teaching atmosphere and environment, acquiring knowledge and skills which can help them prevent and resolve conflicts in a variety of teaching situations and train them for high-quality classroom management as well as for conducting parent-teacher conferences and meetings
Enrolment requirements	
Learning outcomes	Upon completion of the course, the student will be able to: 1. recognize, differentiate and evaluate different teaching and educational styles 2. understand, analyze and evaluate determinants of quality teaching environment and communication, namely classroom environment 3. define, assess and evaluate characteristics of effective teaching process 4. understand, differentiate and evaluate causes of indiscipline in schools, and ways to motivate students depending on their developmental characteristics 5. understand, differentiate and evaluate ways of achieving discipline in the teaching process taking into account developmental characteristics of students, and improve competences in handling a variety of teaching situations 6. organize high-quality parent-teacher conferences and meetings.
Syllabus	1.The relationship between traditional and modern school with regard to the participants' role in the teaching process, methods of acquiring knowledge and skills; curricular, competence- based and co- constructivist approach to building modern school (2L) 2. features of effective teaching process in modern school (1L) 3. classroom management with respect to developmental characteristics of students (age, gender, social, emotional, health) (2L) 4. teacher's teaching and educational styles (1L) 5. motivation in modern education process (1L) 6. assessment impact on the quality of the classroom environment (1L) 7. characteristics of teaching atmosphere and environment in modern teaching process and in major reform pedagogies (2L)

8. effective teaching communication (1L)
9. Causes of school discipline and establishing discipline in the teaching process (2L)
10. organization of parent – teacher conference
11. parent-teacher meetings (1L)
Seminars are organized as workshops in which students prepare, critically cogitate and discuss issues, current events and problems important for classroom management and plan new strategies of prevention and resolution of detected problems. In the implementation of the seminar active participation, cooperative learning and teamwork are expected from students.

Teaching types

☑ Lectures		☐ Fieldwork	☐
☑ Seminars		☑ Independent work	☐
☐ Practicals		☐ Multimedia	☐
☐ Remote learning		☐ Laboratory	☐
☐ Blended learning		☐ Supervision	

Student obligations

Students are, in accordance with the existing regulations, obliged to participate in all forms of instruction.

Monitoring student work

Class attendance	1	Research		Practical work	
Experimental work		Paper			
Essay		Seminar paper	0.5		
Midterm exam		Oral exam	0.5		
Written exam		Project			

Assessment and evaluation of student work

Assessment of knowledge, skills and competence is carried out during the semester by evaluating students' activities during lectures and seminars, including oral examination.

Required literature

Title	Number of copies available	Availability via other media
Ilić, I.; Ištvanić, I.; Letica, J.; Sirovatka, G.; Vican, D. (2012), Upravljanje razredom. Zagreb: Agencija za strukovno obrazovanje i obrazovanje odraslih u suradnji s British Councilom.		dostupno
Vizek Vidović, V.; Rijavec, M.; Vlahović -Štetić, V.; Miljković, D: (2014), Psihologija obrazovanja. Zagreb: IEP VERN. (odabrana poglavlja)		
Kyriacou, C. (2001), Temeljna nastavna umijeća. Zagreb: Educa. (odabrana poglavlja)		

Supplementary literature

Jensen, E. (2003), Super nastava. Zagreb: Educa.
Glasser, W. (1995), Nastavnik u kvalitetnoj školi. Zagreb: Educa.
Ajduković, M.; Pečnik, N. (20029, Nenasilno rješavanje sukoba. Zagreb: Alinea.
Bičanić, J. (20019, Vježbanje životnih vještina. Priručnik za razrednike. Zagreb: Alinea

	Matijević, M. (2001), Alternativne škole. Zagreb: Tipex. Matijević, M.; Radovanović, D. (2011), Nastava usmjerena na učenika. Zagreb: Školske novine.
Quality assurance	Advisory hours, conversation, active participation, evaluation conducted by the Quality Assurance Board
Other (in the opinion of the proponent)	

Course name	Uvod u biofiziku stanice					
ID	PMB711	Study year	2.			
Lecturer	prof. dr. sc. Larisa Zoranić	ECTS workload	3.0			
Associates		Number of hours	L	S	E	P
			30	5	10	0
Course status	Elective	Online percentage	10%			

Course description	
Course aims	Basic understanding of biophysics, models of biological macromolecules and biological processes, described through the ideas of classical mechanics, thermodynamics and statistical mechanics.
Enrolment requirements	Molecular biology, biochemistry, basics of physics
Learning outcomes	On completion of this course, a student should be able to: 1. recognize the ideas and importance of a quantitative approach in biology 2. describe the basis of thermodynamics and statistical mechanics through examples from biophysics 3. describe some of the mechanical models used in the description of biological systems 4. explain some of the biological processes using physical models
Syllabus	Weekly class schedule: 1. Introduction to biophysics. Spatio-temporal scales of biological systems. 2. Basic models in biophysics.3. Mechanical and chemical equilibrium in a cell. 4. Free energy. Configuration energy. 5. Statistical description of biological systems. Entropy. Models of two states. 6. Ligand-receptor binding. Hill's equation. ATP hydrolysis. 7. Water as the most important biological solvent. pH. 8. Description of the structure of biological macromolecules - polymer model. 9. Protein folding. Hydrophobic effect and hydrophobic force 10. Models of biological membranes. Spring model. 11. Dynamics in cells. Diffusion. 12. Models of chemical reactions. 13. Enzyme kinetics. Michaelis-Menten model. 14.-15. Project-oriented teaching - depending on the chosen topics, examples: hemoglobin, charges in the cell, osmosis.

Teaching types						
	☑ Lectures		☐ Fieldwork		☐	
	☐ Seminars		☑ Independent work		☐	
	☑ Practicals		☐ Multimedia		☐	
	☐ Remote learning		☐ Laboratory		☐	
	☐ Blended learning		☐ Supervision		☐	

Student obligations	Attendance, student commitment in class, problem solving and seminars.					
Monitoring student work	Class attendance	1	Research		Practical work	
	Experimental work		Paper			
	Essay		Seminar paper	0.5		

	Midterm exam		Oral exam	1			
	Written exam		Project	0.5			

Assessment and evaluation of student work	Commitment, preparation of homework and seminars, participation in the project part of teaching, and oral exam are assessed.

Required literature	Title	Number of copies available	Availability via other media
	Physical Biology of the Cell, Rob Phillips, Jane Kondev, Julie Theriot and Hernan G. Garcia, Garland Science, Taylor & Francis Group, 2013.	2	online
	Molekularna biofizika , Antonio Šiber , skripta, 2012.		online

Supplementary literature	1. Molecular and Cellular Biophysics Meyer B. Jackson, University of Wisconsin Medical School, Cambridge University Press 2006 . 2. Bioenergetika, rad membranskih proteina Juretić Davor, Informator, Zagreb, 1997. 3. Scientific articles, lectures
Quality assurance	The success of the program is monitored by the quality of knowledge shown in exams as well as the assessment of enthusiasm for the subject, through conversation with students, student progress during classes, and student participation in discussions of articles. External evaluation includes student surveys.
Other (in the opinion of the proponent)	

Course name	Introduction to Physics					
ID	PMP096	Study year	1.			
Lecturer	izv. prof. dr. sc. Martina Požar	ECTS workload	4.0			
Associates		Number of hours	L	S	E	P
			45	0	15	0
Course status	Compulsory	Online percentage	0%			

Course description	
Course aims	Acquire knowledge and understanding of the basics in mechanics, physics of condensed matter, optics and quantum physics. Acquire computational knowledge in solving physical problems and develop competence in construction of mathematical models for real mechanical problems
Enrolment requirements	Enrollment in the 1st year of undergraduate study
Learning outcomes	Upon passing the course on Introduction to physics, the student will be able to: 1. demonstrate knowledge of the kinematics of motion in one, two and three dimensions; 2. identify and explain Newton's laws of motion and apply them in numerical problems; 3. explain the concepts of work , kinetic and potential energy, momentum and impulse and apply the laws of conservation of energy and momentum in realistic examples; 4. demonstrate knowledge of kinematics and dynamics of rigid bodies rotations and solve simple problems involving the rotation of a rigid body; 5. identify and explain Newton's law of gravitation and Kepler’s laws and apply them in the description of the Solar system 6. identify and explain the properties of solids, liquids and gases and solve problems in hydromechanics; 7. explain the motion of a simple harmonic oscillator and describe the propagation of waves, the interference, the resonance and the Doppler effect; 8. demonstrate the knowledge of optics in solving problems; 9. identify and explain Plack's radiation law and the photoelectric effect.
Syllabus	Lectures per weeks (15 weeks in total): 1. Units and physical quantities (2L+1E) 2. Motion along a straight line (2L+1E) 3. Motion in two or three dimensions (4L+1E) 4. Newton's laws of motion (4L+1E) 5. Applying Newton's laws (3L+1E) 6. Work and kinetic energy (3L+1E) 7. Potential energy and energy conservation (3L+1E) 8. Momentum, impulse, and collisions (3L+1E) 9. Rotation of Rigid Bodies (6L+1E)

10. Newton's law of gravitation and Kepler's laws (2L+1E)
11. Solids, liquids and gases (3L+1E)
12. Oscillations (2L+1E)
13. Waves (2L+1E)
14. Optics (3L+1E)
15. Introduction to Quantum Physics (3L+1E)

Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☐ ☐ ☐ ☐

Student obligations	Students have to attend at least 70% of the lectures and 80% of the exercises. Students have to solve at least 50% from each of the two written partial exams or to solve 50% from the final written exam. Students have to pass an oral exam.

Monitoring student work						
	Class attendance	2	Research		Practical work	
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam		Oral exam	1		
	Written exam	1	Project			

Assessment and evaluation of student work	Contribution to the final grade: 1. written exam (or two partial exams) – 50% 2. oral exam - 50%

Required literature	Title	Number of copies available	Availability via other media
	[1] D. Halliday, R. Resnick, J. Walker, Fundamentals of Physics. 9th Edition, John Wiley, New York 2011.	21	

Supplementary literature	[1] P. G. Hewitt, Conceptual Physics, 12th Edition, Pearson 2010. [2] H. D. Young, R. A. Freedman, Sears and Zemansky's University Physics, 12th Edition, Pearson, 2008
Quality assurance	Statistics of the exam results and student evaluation via an anonymous survey conducted by the University of Split
Other (in the opinion of the proponent)	

Course name	Introduction to Environmental Physics		
ID	PMP160	Study year	3.
Lecturer	doc. dr. sc. Marin Vojković izv. prof. dr. sc. Jadranka Šepić	ECTS workload	4.0
Associates		Number of hours	L: 30, S: 0, E: 15, P: 0
Course status	Elective	Online percentage	10%

Course description	
Course aims	Provide knowledge on: - Solar and Earth radiation - Atmospheric composition, structure and dynamics - Ocean structure and dynamics - Climate change: causes and manifestation
Enrolment requirements	Prerequisites - Basic physics - Basic mathematics
Learning outcomes	Understanding of Solar and Earth radiation budget Knowledge of atmospheric structure and dynamics Knowledge of ocean structure and dynamics Understanding of natural and anthropogenic climate change
Syllabus	1. Solar radiation and global energy budget (2 h) 2. Absorption spectra of the atmosphere (2 h) 3. Greenhouse effect (2 h) 4. Vertical profile of the atmosphere: temperature, density and air pressure (2 h) 5. Convective processes, dry and moist-adiabatic processes, formation of clouds (2 h) 6. Meridional structure of the atmosphere (2 h) 7. Global circulation of the atmosphere (2 h) 8. Ocean properties (2 h) 9. Profiles of ocean density, temperature and salinity (2 h) 10. Thermohaline circulation (2 h) 11. Wind circulation (2 h) 12. Climate of the Mediterranean region (4 h) 13. Climate change in the atmosphere and ocean: natural variability (2 h) 14. Climate change in the atmosphere and ocean: anthropogenic impact (2 h)

Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☐ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☑ Homework ☐ ☐ ☐

Student obligations	Attend at least 70% of all lectures; write homework					
Monitoring student work	Class attendance	1.5	Research		Practical work	
	Experimental work		Paper		Domaći rad	1.0
	Essay		Seminar paper			
	Midterm exam		Oral exam	1.5		
	Written exam		Project			

Assessment and evaluation of student work	Final grade is based on: - Oral exam - Homework		
Required literature	Title	Number of copies available	Availability via other media
	Mirko Orlić, 2022. Uvod u fizičku oceanografiju, ELEMENT, Zagreb. 335 str.	6	NO
	John Marshall, R. Alan Plumb, Atmosphere, Ocean, and Climate Dynamics: An Introductory Text, Elsevier, 319 str.	0	YES
Supplementary literature			
Quality assurance	Exam results statistics and student evaluation through an anonymous survey at the end of the course. The survey is conducted according to the regulations of the University of Split.		
Other (in the opinion of the proponent)			

Course name	Introduction to mathematical analysis					
ID	PMM151	Study year	1.			
Lecturer	izv. prof. dr. sc. Marija Bliznac Trebješanin	ECTS workload	8.5			
Associates		Number of hours	L	S	E	P
			45	0	60	0
Course status	Compulsory	Online percentage	20%			

Course description	
Course aims	The course objective is to acquaint the student with the properties of the space of real numbers and the concept and properties of sequences and series of real numbers and properties of real-valued functions such as continuity. In the first part of the course, they will observe the sequences and series of real numbers and examine their convergence. In the second part of the course, they will systematize the known properties of elementary functions and adopt the concepts of limit value and continuity of a real-valued function of a real variable. This will be applied to the demonstration of claims and proofs of the properties of continuous functions on a segment.
Enrolment requirements	None.
Learning outcomes	The student will be able to: - recognize algebraic and order properties of subsets of real numbers - distinguish and give examples of convergent and divergent sequences and series of real numbers; - give examples of subsequences of a given sequence of real numbers - apply the properties of limits of sequences of real numbers - apply series convergence tests - list elementary real-valued functions and determine their domains and images - find the limit of a function at a point and use this limit to determine continuity of a function in said point - determine and give examples of continuous and non-continuous functions - list properties of continuous functions on a segment
Syllabus	The space of real numbers – 6 hours Sequences and series of real numbers (convergence, limits calculus, subsequences, series convergence tests) - 15 hours Elementary real-valued functions – 9 hours

	Limits and continuity of real-valued functions (definitions and characterizations, limits in the extended space of real numbers, properties of continuous functions) – 15 hours

Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☑ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☑ On line testovi znanja ☐ ☐ ☐

Student obligations	Class and tutorial sessions attendance.

Monitoring student work						
	Class attendance	3	Research		Practical work	
	Experimental work		Paper		Grupni rad	1
	Essay		Seminar paper			
	Midterm exam		Oral exam			
	Written exam	4.5	Project			

Assessment and evaluation of student work	At class lectures and tutorial sessions, students will have problem solving sessions (individual and group activity). Also, students will take short quiz tests during lectures and online. Both activities will be valued in the final grade but earning points in thiese activities is not mandatory for finishing the course. The final exam is taken in written and oral form. Passing grade on a written form of the exam is a requirement for taking the oral exam. The exam can be taken partially, during class. .

Required literature	Title	Number of copies available	Availability via other media
	G. B. Thomas, Thomas' Calculus, Pearson, 2016.,13. izdanje	2	da
	S. Abbott, Understanding analysis, Springer-Verlag, New York, 2016., drugo izdanje	2	da
	B. Guljaš, Matematička analiza 1 i 2, skripta PMF –a u Zagrebu, 2018.		da

Supplementary literature	J. Stewart, D. Clagg, S. Watson, Calculus, Eraly Transcendetals, Cengage Learning, 2021., 8. izdanje R. Larson, B. Edwards, Calculus, Cengage Learning, 2016., 11. izdanje V. Matijević, Matematička analiza 1 i 2, skripta PMF-a u Splitu, 2020.
Quality assurance	During the semester, anonymous surveys will be administered to students to determine which concepts have been least understood thus far, which will help instructors to adapt the course. Statistics of exam results and student evaluation through anonymous questionnaires at the end of the course. The survey will be conducted according to the rules of the University of Split.
Other (in the opinion of the proponent)	

Course name	Introduction to Fluid Mechanics					
ID	PMP261	Study year	2.			
Lecturer	izv. prof. dr. sc. Bernarda Lovrinčević	ECTS workload	6.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Elective	Online percentage	20%			

Course description	
Course aims	Understanding the physical properties of fluids and their influence on fluid kinematics, accurate application of the law of conservation of mass, momentum and energy to fluid flow, and application of mathematical tools needed to describe fluid flow.
Enrolment requirements	The student must have adopted the following learning outcomes: · apply the laws of classical mechanics to a particle system · apply the laws of conservation of momentum, angular momentum and energy · solve problems of motion in one dimension and motion in a medium with resistance · solve physical problems using Lagrange's and Hamilton's formulation of classical mechanics · define and discuss the laws of thermodynamics · understand the physical interpretations of differential operators · use vector analysis in rectangular and curved coordinates · explain the basics of tensor analysis · apply methods for solving linear differential equations of the second order
Learning outcomes	· to classify fluids based on their physical properties · to calculate the kinematic properties of the fluid element · when describing fluid flow, to apply the laws of conservation of mass, momentum and energy · to explain the formation of a boundary layer in a fluid · to apply dimensional analysis to the obtained results
Syllabus	The content is divided into the following twelve teaching units: 1. Lagrange and Euler's description of motion (2 hours of lectures and 2 hours of exercises) 2. Fluid properties (4 hours of lectures and 4 hours of exercises) 3. Fluid statics (4 hours of lectures and 4 hours of exercises) 4. Control volume (2 hours of lectures and 2 hours of exercises) 5. Laminar flow (2 hours of lectures and 2 hours of exercises) 6. Equation of continuity (2 hours of lectures and 2 hours of exercises) 7. The first law of thermodynamics for fluid (2 hours of lectures and 2 hours of exercises) 8. Viscosity (2 hours of lectures and 2 hours of exercises) 9. Motion equations for fluid (4 hours of lectures and 4 hours of exercises) 10. Turbulent flow (2 hours of lectures and 2 hours of exercises) 11. A boundary layer (2 hours of lectures and 2 hours of exercises) 12. Dimensional analysis (2 hours of lectures and 2 hours of exercises)

Teaching types			
	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning	☐ Fieldwork ☐ Independent work ☑ Multimedia ☐ Laboratory	☑ domaće zadaće ☐ ☐

	☐ Blended learning	☐ Supervision	☐

Student obligations	Writing reports on the conducted experiments. Attendance.						
Monitoring student work	Class attendance	1.5	Research		Practical work		
	Experimental work		Paper		Domaće zadaće		0.5
	Essay		Seminar paper				
	Midterm exam		Oral exam	2			
	Written exam	2	Project				

Assessment and evaluation of student work	Twice during the semester, students take a written pre-exam. Students that reach more than 50% of possible points were acquitted of taking the written exam and can access the oral exam directly. Furthermore, those students that in the first written pre-exam achieve 50% points or more, can take the oral exam in two parts The final grade is based on written (pre-)exam (1/2 of the score) and the oral exam (1/2 of the score).		
Required literature	Title	Number of copies available	Availability via other media
	Philip J. Pritchard, John W. Mitchell, Fox and McDonald's Introduction to Fluid Mechanics John Wiley & Sons, 2011.		
Supplementary literature	D. J. Acheson Elementary Fluid Dynamics Clarendon Press, 2005. Y. Nakayama & R. F. Boucher Introduction to Fluid Mechanics Butterworth, 2000.		
Quality assurance	Statistics of test results and student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split		
Other (in the opinion of the proponent)			

Course name	Introduction to Data Analysis							
ID	PMP165		Study year	1.				
Lecturer	izv. prof. dr. sc. Žarko Kovač		ECTS workload	5.0				
Associates			Number of hours	L	S	E	P	
				20	0	30	0	
Course status	Compulsory		Online percentage	0%				

Course description							
Course aims	- acquiring basic knowledge of measurement methods in environmental physics - acquiring the basic skills needed to load and graphically display data - train students to apply optimization methods for data processing and noise removal - to train students for independent processing of time series - to acquaint students with more advanced methods of processing time series						
Enrolment requirements	- basics of physics - basics of mathematics - basic programming						
Learning outcomes	1. Introductory knowledge of measurement methods in environmental physics. 2. Knowledge of reading and graphically displaying data. 3. Knowledge of linear and nonlinear regression. 4. Knowledge and the use of optimization methods in data processing. 5. Detection of trend and seasonal signal in a time series. 6. Usage of a moving mean as a filter. 7. Introductory theoretical knowledge and application of the Fourier transform. 8. Introductory theoretical knowledge and application of empirical orthogonal functions.						
Syllabus	1. Sampling and measurement methods in environmental physics (1 hour of lectures and 2 hours of exercises) 2. Normal distribution (1 hour of lectures and 2 hours of exercises) 3. Least squares method (2 hours of lectures and 4 hours of exercises) 4. Linear regression (2 hours of lectures and 4 hours of exercises) 5. Nonlinear regression (2 hours of lectures and 4 hours of exercises) 6. Trend and seasonal signal (1 hour of lectures and 2 hours of exercises) 7. Moving mean (1 hour of lectures and 2 hours of exercises) 8. Fourier transform (2 hours of lectures and 4 hours of exercises) 9. Empirical orthogonal functions (3 hours of lectures and 6 hours of exercises)						
Teaching types	☑ Lectures ☐ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning		☐ Fieldwork ☑ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision		☑ domaće zadaće ☐ ☐ ☐		
Student obligations	Attend at least 70% of lectures and 70% of exercises.						
Monitoring student work	Class attendance	1.7	Research		Practical work	1.3	

	Experimental work		Paper				
	Essay		Seminar paper				
	Midterm exam		Oral exam	1			
	Written exam		Project	1			

Assessment and evaluation of student work	During the first 7 weeks of classes, students receive 5 homework assignments from the first 5 teaching units. These assignments are handed over at the end of the 8th week of classes. During the next 7 weeks of classes, students receive 5 new homework assignments from the last 4 teaching units. These assignments are handed over at the end of the 15th week of class. Students who submit assignments on time and achieve more than 50% of the possible points are exempted from writing the written part of the exam. Students who do not pass assignments or achieve less than 50% of the possible points must take a written exam. In the 8th week of classes, students are given a project assignment that they must submit by the end of the semester. The final grade is formed on the basis of homework / exam (1/3 of the grade), project assignment (1/3) and answers to the oral exam (1/3) of the grade.		
Required literature	Title	Number of copies available	Availability via other media
	William Menke, Joshua Menke Environmental Data Analysis with MATLAB Elsevier, 2016		
Supplementary literature	Zhihua Zhang: Environmental data analysis: Methods and applications, Walter de Gruyter, 2017. David M. Glover, William J. Jenkins, Scott C Dooney: Modelling methods for marine science, Cambridge University Press, 2011.		
Quality assurance	Exam results statistics and student evaluation through an anonymous survey at the end of the course. The survey is conducted according to the regulations of the University of Split.		
Other (in the opinion of the proponent)			

Course name	Introduction to Artificial Intelligence					
ID	PMII10	Study year	2.			
Lecturer	prof. dr. sc. Saša Mladenović	ECTS workload	5.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Elective	Online percentage	25%			

Course description	
Course aims	Artificial Intelligence (AI) is devoted to the computational study of intelligent behavior. The element that the fields of AI have in common is the creation of agents/machines that can "think". This course will cover a broad introduction to the techniques that enable agents/computers to behave intelligently: problem solving, representing knowledge, reasoning, learning, perceiving, and interpreting. The bulk of this course reflects this diversity. We will examine the fundamental questions and issues of AI and will explore the essential techniques. The course is project oriented, with programming assignments spread throughout the semester using the LISP based NetLogo programming environment and Prolog programming language.
Enrolment requirements	None.
Learning outcomes	Upon successful completion of this course, the student will be able to: 1. To understand the modern view of AI as the study of agents that receive percepts from the environment and perform actions 2. Describe the major applications, topics, and research areas of artificial intelligence (AI), including search, machine learning, knowledge representation and inference, natural language processing, vision, and robotics. 3. Apply basic techniques of AI in computational solutions to problems. 4. Discuss the role of AI research areas in growing the understanding of human intelligence. 5. Identify the boundaries of the capabilities of current AI systems.
Syllabus	1. Introduction to concept of intelligence (2h) 2. Multiple types of intelligence (2h) 3. Intelligent Agents and environments (2h) 4. Problem Solving by Search (2h) 5. Uninformed Search algorithms (4h) 6. Informed Search algorithms (2h) 7. Midterm 8. Artificial Neural Networks (2h) 9. Multiagent systems (2h) 10. Knowledge representation (2h) 11. Genetic algorithms (2h) 12. Special Topics: Learning, Robots in education (2h) 13. Practical examples of artificial intelligence usage (2h) 14. Artificial intelligence and ethical problems (2h) 15. Project (2h) Laboratory exercises match lecture topics and schedule.

Teaching types	☑ Lectures ☐ Seminars ☐ Practicals ☐ Remote learning ☑ Blended learning		☐ Fieldwork ☑ Independent work ☐ Multimedia ☑ Laboratory ☐ Supervision		☐ ☐ ☐ ☐			
Student obligations	Lecture and laboratory attendance, active participation in course activities, homework and project realization, final exam.							
Monitoring student work	Class attendance	1	Research	0.5	Practical work	1		
	Experimental work		Paper					
	Essay		Seminar paper					
	Midterm exam	0.5	Oral exam	0.5				
	Written exam	0.5	Project	1				
Assessment and evaluation of student work	Attendance/Participation (20%) Midterm / Project (40%) Final/Oral Exam (40%)							

Required literature	Title	Number of copies available	Availability via other media
	Artificial Intelligence: A Modern Approach. Stuart Russell and Peter Norvig Prentice Hall, 2009 ISBN:0136042597 9780136042594		
	Lecture notes: Uvod u umjetnu inteligenciju, Saša Mladenović, Goran Zaharija		

Supplementary literature	Online Student material, including solutions to selected problems and additional reading
Quality assurance	Student discussion, anonymous student evaluation questionnaire, student success rate, self-assessment
Other (in the opinion of the proponent)	

Course name	Waves and Optics					
ID	PMP006	Study year	2.			
Lecturer	izv. prof. dr. sc. Toni Šćulac	ECTS workload	9.0			
Associates		Number of hours	L	S	E	P
			60	15	30	0
Course status	Compulsory	Online percentage	0%			

Course description	
Course aims	Allow understanding and application of physics terms and laws of oscillations, waves, and optics with the goal of solving problems, explening natural phenomena and how different instruments work.
Enrolment requirements	Mehanics (passed)
Learning outcomes	1. Derive and use equation for mechanical and electromagnetic oscilatory systems that transfer energy, discuss the limits of the equation its starting conditions and boundry conditions 2. Define and anlyse normal modes of oscillations for two or more systems that are connected 3. Derive and use the wave equation for different mechanical and electromagnetic systems, discuss the limits of the equation its starting conditions and boundry conditions 4. Analyse and explain superposition of two or more wave sources, difraction, and interference and conditions needed for them to occure 5. Analyse wave propagation in different media, discuss dispersion nad group and phase velocity of waves 6. Discuss and use concepts and laws of geometrical optic to describe and explain optical instruments, their usage and limitations 7. Discuss main experiments of the wave nature of light 8. Critically discuss application of the laws of oscillations, waves, and optics in eveyday life 9. Use analitical and numerical methods to solve problems for mechanical and electromagnetic oscillations, waves, and optics
Syllabus	1. OScillations. Simple harmonic oscillator. Damping. Forced oscillations. (4 + 1 + 2 hours) 2. Addition of harmonic oscillators. (4 + 1 + 2 hours) 3. Transversal and longitudinal waves. Wave equation. (4 + 1 + 2 hours) 4. Velocity of transversal waves. Energy and power of the wave. Wave packet.(4 + 1 + 2 hours) 5. Interferention. Standing waves. Reflection. Standing waves. Resonance. (4 + 1 + 2 hours) 6. Fourier analysis. (4 + 1 + 2 hours) 7. Sound waves. Doppler effect. (4 + 1 + 2 hours) 8. Waves in solid state medium. (4 + 1 + 2 hours) 9. Electromagnetic oscillations. (4 + 1 + 2 hours) 10. Polarisation and dispersion. (4 + 1 + 2 hours) 11. Optics, mirrors, and lenses. (4 + 1 + 2 hours) 12. Wave optics. Interferention. Difraction. (4 + 1 + 2 hours) 13. Optical instruments (4 + 1 + 2 hours) 14. Spectral analysis. Lasers. (4 + 1 + 2 hours) 15. Dual properties of particles and waves. (4 + 1 + 2 hours)

Teaching types	☑ Lectures ☑ Seminars ☑ Practicals ☐ Remote learning ☐ Blended learning	☐ Fieldwork ☑ Independent work ☐ Multimedia ☐ Laboratory ☐ Supervision	☐ ☐ ☐ ☐

Student obligations	1. Active participation during classes with critical judgment and argumented opinion, questions, and answers to questions 2. Solving given problems 3. Critical discussions

Monitoring student work						
	Class attendance	3.5	Research		Practical work	
	Experimental work		Paper		Problem solving	1
	Essay		Seminar paper			
	Midterm exam		Oral exam	2.5		
	Written exam	2	Project			

Assessment and evaluation of student work	Solutions of problems from exercises will be graded together with the oral exam.

Required literature	Title	Number of copies available	Availability via other media
	Halliday, Resnick, Walker: Fundamentals of Physics, John Wiley & Sons, 2003.	6	yes
	Mile Dželalija, slides from lectures, 2015.		yes (free access)

Supplementary literature	- F.S. Crawford. Waves. Berkeley Physics Course III, McGraww-Hill, New York - Babić, R. Krsnik i M. Očko, Zbirka riješenih zadataka iz fizike. Školska knjiga, Zagreb 1982. - F.W. Sears, M.W. Zemansky, H. D.Young, R. A. Freedman. University Physics. Addison Wesley London, 2000. - R.P. Feynman, R.B. Leighton, M. Sands. The Feynman lectures on physics I, Addison-Wesley, London 1975. - M. Paić, Osnove fizike I,IV, Liber, Zagreb, 1978-1983.
Quality assurance	1. Lecturers who have subjects with correlated learning outcomes work together to ensure quality of learning. 2. Statistics of test scores and assessment of performance in accordance with established learning outcomes. 3. Evaluation of students through an anonymous survey conducted in accordance with the regulations of the University of Split.
Other (in the opinion of the proponent)	

Course name	Vector spaces I					
ID	PMM201	Study year	2.			
Lecturer	doc. dr. sc. Gordan Radobolja	ECTS workload	6.0			
Associates		Number of hours	L	S	E	P
			30	0	30	0
Course status	Elective	Online percentage	30%			

Course description	
Course aims	Deepen knowledge on vector spaces and linear operators Introduce Jordan form Introduce inner product spaces and analyse typical operators on them
Enrolment requirements	Courses passed: Introduction to algebra with analythic geometry, Linear algebra Courses taken: algebraic structures
Learning outcomes	Students will be able to: analyze finite and infinite dimensional vector spaces and their properties, including the basis structure of vector spaces; give examples of fundamental notions and constructions in three dimensional Euclidean space; use the definition and properties of linear transformations and matrices of linear transformations and change of basis, including kernel, range and isomorphism; compute with the characteristic and minimal polynomial, eigenvalues and eigenspaces, find the geometric and algebraic multiplicities of an eigenvalue use methods from complex analysis in defining and calculate with operator function; compute inner products and determine orthogonality on vector spaces, including Gram-Schmidt orthogonalization.
Syllabus	Finite dimensional vector spaces (3) Linear operators and their matrices (4) Dual space and dual operator (3) Minimal polynomial and spectrum (6) -- 1st partial exam (2) Diagonalisation (4) Jordan normal form of a linear operator (8) Inner product spaces and norm (4) Orthogonal complement. Adjoint operator (4) -- 2nd partial exam (2) Operators on inner product spaces. Spectral theorem (4) Positive and unitary operators (6)

Polar and singular decomposition with application (6)
-- 3rd partial exam (2)

Teaching types			
	☑ Lectures	☐ Fieldwork	☐
	☐ Seminars	☐ Independent work	☐
	☑ Practicals	☐ Multimedia	☐
	☐ Remote learning	☐ Laboratory	☐
	☑ Blended learning	☐ Supervision	☐

Student obligations

Student responsibilities

Lectures and exercises attendances are obligatory.

Monitoring student work						
	Class attendance	2	Research		Practical work	
	Experimental work		Paper			
	Essay		Seminar paper			
	Midterm exam	3	Oral exam	1		
	Written exam		Project			

Assessment and evaluation of student work

- 4 tests (5 pts each)
- 3 partial exams (20 pts each)
- final exam (20 pts)

Continuous assessment		
Evaluation elements	Performance (min)	Weight in grade (%)
Short tests		20
Three partial exams		60
Attendance	70	0

Final assessment		
Evaluation elements	Performance (min)	Weight in grade (%)
Final exam	40%	20

Evaluation		
Points (%)	Criterion	Grade
90 - 100		5
80 - 89		4
70 - 79		3
60 - 69		2

Required literature	Title	Number of copies available	Availability via other media
	H. Kraljević, Vektorski prostori, skripta, Sveučilište u Osijeku, 2008.		
	S. Kurepa, Konačno dimenzionalni vektorski prostori i primjene, Liber, Zagreb, 1992.		
	J. S. Golan, The Linear Algebra a Beginning Graduate Student Ought to Know, Kluwer, 2004.		
Supplementary literature	P. R. Halmos, Finite Dimensional Vector Spaces, Van Nostrand, New York, 1958. S. Lang, Linear algebra, Addiseon-Wesley, Reading, 1973. K. Horvatić, Linearna algebra, PMF – Matematički odjel, HMD, Zagreb, 1995.		
Quality assurance	Discussion in classes and official student survey.		
Other (in the opinion of the proponent)			

Course name	Scientific Communication		
ID	PMP105	Study year	2.
Lecturer	izv. prof. dr. sc. Bernarda Lovrinčević izv. prof. dr. sc. Martina Požar	ECTS workload	2.0
Associates		Number of hours	L: 20, S: 10, E: 0, P: 0
Course status	Elective	Online percentage	50%

Course description	
Course aims	- developing the ability to communicate with the general population, especially young people, on scientific topics - acquiring the skills needed to popularize science - introduction to the process of publishing a scientific paper and the structure of the Croatian scientific community - presentation of scientific content in written and audiovisual form in a way that is appropriate for non-scientific audiences, but also for other scientists
Enrolment requirements	
Learning outcomes	1. present the scientific problem, its analysis and results in the form of a text intended for non-scientific audiences, 2. recognize the most important results and conclusions of the scientific text in order for the wider (non-scientific) audience to get the correct information, avoiding the use of too professional language and expressions, 3. present a scientific topic in audiovisual form (short film, interview, etc.) with the aim of popularizing science, 4. present the scientific problem, its analysis and results in discussion with fellow scientists.
Syllabus	1. Introduction to scientific communication. Essay writing. 2. How to successfully communicate about science with a non-scientific audience. 3. How to write a scientific paper. 4. The process of publishing a scientific paper. Scientific bases. 5. How to successfully hold a scientific presentation at a conference. 6. How to successfully present your work in the form of a poster. 7. How to successfully present your work in the form of a video (documentary, interview). 8. How to present your work through a website. 9. Classification of scientists in Croatia (scientific conditions). 10. Science journalism: challenges of the digital age. 11. The role of scientists in the public. How does one become a science popularizer? 12. Scientists as Popular Persons: Advantages and Disadvantages. 13. Popular science books: from public education to science bestsellers. 14. Science and technology in film art. 15. Presentation of student homeworks and projects. 2S
Teaching types	☑ Lectures ☑ Seminars ☐ Practicals ☐ Remote learning ☐ Blended learning ☐ Fieldwork ☑ Independent work ☑ Multimedia ☐ Laboratory ☐ Supervision

Student obligations	1. The student is required to attend lectures and seminars, at least 70% of lectures and 80% of seminars. 2. The student is required to make a project in the form of a video aimed at promoting science. 3. The student is required to write homework.					
Monitoring student work	Class attendance	1	Research		Practical work	
	Experimental work		Paper		Homework assignments	0.5
	Essay		Seminar paper			
	Midterm exam		Oral exam			
	Written exam		Project	0.5		
Assessment and evaluation of student work	1. Homework - 30% of the grade. 2. Project - 70% of the grade.					

Required literature	Title	Number of copies available	Availability via other media
	D. Meredith, Explaining Research: How to Reach Key Audiences to Advance Your Work (2010, Oxford University Press, USA)		web
	Routledge Handbook of Public Communication of Science and Technology (2014, Ed. M. Bucchi, B. Trench, 2nd edition, Routledge, London).		web

Supplementary literature	
Quality assurance	1.Exam results statistics and student evaluation through an anonymous survey at the end of the course. The survey is conducted according to the regulations of the University of Split. 2. Talking to students and monitoring their homework activities.
Other (in the opinion of the proponent)	