NAME OF THE COURSE	Energetics					
Code	PMT168	Year of study	1. year graduate study			
Course teacher	Doc.dr.sc. Vladimir Pleština	Credits (ECTS)	4			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30	15		
Status of the course	Compulsory course	Percentage of application of e-learning	30%			

COURSE DESCRIPTION	
Course objectives	Adopt basic knowledge of energetics and energy conversion and form a critical opinion about the efficient use of energy sources.
Course enrolment requirements and entry competences required for the course	Course enrolment requirements: none.
Learning outcomes expected at the level of the course (4 to 10 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.
Course content broken down in detail by weekly class schedule (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.	
Format of instruction	☒ lectures ☒ seminars and workshops ☐ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ independent assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☐ robot demonstration (other)
Student responsibilities	Class attendance Independent planning and presentation of student paper	

	Active participation in the teaching process Exam.					
Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	1	Research		Practical training	
	Experimental work		Report	1	(Other)	
	Essay	0,5	Seminar essay		(Other)	
	Tests	1	Oral exam		(Other)	
	Written exam		Project		(Other)	

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

	Title	**Number of copies in the library**	**Availability via other media**
Required literature (available in the library and via other media)	Energetika - lectures - internal script and online materials.		
	B. Udovičić, Energetika, Školska Knjiga, Zagreb, 1993.		

Optional literature (at the time of submission of study programme proposal)	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 methods that ensure the acquisition of exit competences	Conversation with the students. Students opinions about the quality of teaching through anonymous polls. The success of students at exam. Self-evaluation.
Other (as the proposer wishes to add)	