<table>
<tr><td>Name of the course</td><td colspan="4">TEACHING METHODS IN PHYSICS III</td></tr>
<tr><td>Code</td><td>79687</td><td>Year of study</td><td colspan="3">2nd year of Masters</td></tr>
<tr><td>Course lecturer</td><td>Assoc. Prof. Ivica Aviani, PhD</td><td>Credits (ECTS)</td><td colspan="3">6</td></tr>
<tr><td rowspan="2">Associate Lecturer</td><td rowspan="2">Lucija Krce</td><td rowspan="2">Type of subject teaching (number of hours)</td><td>L</td><td>S</td><td>LE</td></tr>
<tr><td>30</td><td>30</td><td>30</td></tr>
<tr><td>Course status</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="3">20</td></tr>
<tr><td colspan="5">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="4">• To capacitate students in lecture plan writing and teaching lessons in physics in high school using different teaching tools.
• To develop the ability of evaluation of pupil’s conceptual knowledge in physics.
• To be acquainted with the possibilities and demands of evaluation on a large scale.
• To develop knowledge of the influence of education research on the development of efficient methods in teaching.
• To be familiarized with the latest achievements in educational physics and to be acquainted with the application of newer and different methods in active learning and teaching.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="4">• Teaching methods in physics I
• Teaching methods in physics II</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="4">• To be able to use professional literature and other relevant information sources in order to write lecture plans.
• To adapt old or to produce new teaching materials in order for it to be motivating for active learning of all pupils.
• To analyze the possibilities, demands and results of large scale testing.
• To apply basic experimental techniques and measured data processing.
• To define measurable learning outcomes of physics classes in accordance with curriculum.
• To apply knowledge in psychology, pedagogy, didactics and methodology in teaching physics.
• To use ICT technologies in physics classes.
• To apply modern tools and methods for interactive physics teaching.</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule</td><td colspan="4">*Lectures* (L) – 30 hours:
1. Introduction lesson (introducing students and lecturers, description of work methods, student obligations and evaluations of achievements).
2. Implications of research in teaching physics (approaches, methodologies, qualitative and quantitative research).
3. Construction of tests and psychometric models.
4. Standardized instruments for evaluation of the level of adoption of physical concepts.
5. Implication of cognitive models in learning and teaching.
6. Cognitive levels of knowledge and taxonomy.
7. Basic principles of evaluation of pupil’s accomplishments in physics.
8. Program for International Student Assessment (PISA).
9. Trends in International Mathematics and Science Study (TIMSS).
10. Lifelong professional development of teachers.</td></tr>
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	11. Scientific and professional journals for physics teachers. 12. How to get and keep pupils interested in a teaching lesson. 13. Few efficient methods of teaching (flipped classroom, peer learning, models of the classroom). 14. Tools for interactive teaching in physics. 15. Student projects, working in groups, e-learning. *Laboratory exercises* (LE) – 30 hours: Students prepare experimental setup, run experiments, describe and explain results that will be done by them or their pupils in high schools. *Seminar and praxis in high or higher school* (S) – 30 hours: Sitting in on classes and experiential participations in classes, writing seminar papers under supervision of a mentor (school teacher), course lecturer and associate lecturer.
Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work ☒ independent assignments ☒ multimedia ☒ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	Attendance of at least 50% of lectures and 80% of laboratory exercises. Sitting in on 30 classes in high school. Written lecture plans for at least two lessons and at least two lectures given in front of a high school class. Seminar given on the sit in classes and classes given by their peers.

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 work	1.5
	Experimental work	1	Report		Homework	0.5
	Essay		Seminar essay	0.5	(Other)	
	Colloquia		Oral exam	1	(Other)	
	Written exam	0.5	Project		(Other)	

Grading and evaluating student work in class and at the final exam	
	Student's achievements and activities are graded as follows: • class attendance and homework - up to 10 points • Written lecture plans for high school – up to 14 points • Two lectures given in a high school school– up to 16 points • Seminar given on the sit in classes and classes given by their peers – analysis and self-analysis, notes from sit in classes – up to 10 points • written exam - up to 10 points • oral exam – up to 20 points • laboratory exercises - up to 20 points Written exam is consisted of problems (exercises) that are appropriate for high school physics level. Oral exam is consisted of 5 conceptual questions randomly selected from a pre-given list of questions. Each question is from a different teaching unit. Final grade is given as follows: • 89 - 100 points: excellent • 76 - 88 points: very good • 63 - 75 points: good • 50 - 62 points: enough

Required literature (available in the library and via	**Title**	**Number of copies in the library**	**Availability via other media**
	E. F. Redish, Teaching Physics with the Physics		

other media)	Suite, John Wiley & Sons Inc. 2003.		
	E. Mazur, Peer Instruction: A User's Manual, Prentice Hall, 1997		
	Papers from current periodicals: Am. J. Phys, Phys. Teach, Phys. Educ, Int. J. of Sci. Educ.		
	Approved physics textbooks for high and higher school.		
Optional literature	• B. Arons, *Teaching Introductory Physics*, John Wiley & Sons Inc. 1996. • Paul G. Hewitt, *Conceptual Physics*, 12th Edition, Addison-Wesley, 2014.		
Quality assurance methods that ensure the acquisition of exit competences	• Evaluation of student achievements in accordance with expected outcomes • Lecturer's self-evaluation • Student feedback through questionnaires • In-institution and out-institution review		
Other (as the proposer wishes to add)			