<table>
<tr><td>Name of the course</td><td colspan="5">TEACHING METHODS IN PHYSICS II</td></tr>
<tr><td>Code</td><td>PMP102</td><td>Year of study</td><td colspan="3">1st 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="6">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="5">• To gain knowledge, skills and attitudes required in the field of teaching physics.
• To link knowledge in physics with pedagogical knowledge and their methodological aspects.
• To deepen understanding of basic physical concepts.
• To develop the ability of teaching of physical concepts in an appropriate way for pupil’s age and foreknowledge.
• To capacitate students for lecture plan writing and teaching lessons in high school physics using different teaching tools and experiments.
• To be acquainted with the latest accomplishments 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="5">• Teaching methods in physics 1</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="5">• To be able to use professional literature and other relevant information sources in order to write lecture plans for high school physics
• To adjust old or make new motivating class materials that will enable active learning of all students
• To design, prepare and give a physics lesson in high school
• To construct curricula for elementary and high school physics
• To construct appropriate physical models based on analysis of real problems
• To apply basic experimental techniques and processing of measured data
• To define measurable outcomes of learning in physics classes in accordance with curriculum.
• To apply knowledge in psychology, pedagogy, didactics methodology of teaching physics during class
• To clearly and concisely present complex ideas in physics
• To apply modern technologies during physics class
• To apply special educational activities for gifted pupils (peer contest, teaching outside of classroom, cooperation with the local community and associations that promote interest in physics)</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule</td><td colspan="5">*Lectures* (L) – 30 hours:
1. Introduction lesson (introducing students and lecturers, description of work methods, student obligations and evaluations of achievements).
2. Planning and evaluating physics classes. Physics Curricula for high school. Educational outcomes.</td></tr>
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	3. Resources physics lecture plans in high school (methodological handbooks, textbooks, workbooks, web content). 4. Teaching tools for physics classes in high school. 5. The role of history of physics in teaching high school physics. 6. The role of mathematics and mathematical formalism in the development of physical concepts (pupil's mathematical-logical difficulties in understanding physics). 7. Usage of photography and sketch in a physics class. 8. Usage of film and animation in a physics class. 9. Usage of computer simulations in a physics class. 10.Usage of informational – communicational technologies in a physics class (Moodle, web applications). 11. Usage of a computer as a measuring device in a physics class (Tracker, Audacity, Oscilloscope). 12. Basic computer techniques of gaining, processing and displaying measured data. 13. Educational standards and laws related to elementary and high school. 14. Individualized physics classes (inclusion, gifted pupils, pupil's projects, contests). 15. Standards for constructing a curriculum in physics. *Laboratory exercises* (LE) – 30 hours: Students prepare experimental setup, run experiments, describe and explain results that will be done by them or their pupils. *Seminar and praxis in elementary 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 for at least two lessons and at least two lectures given in front of an 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	Evaluation of student's achievements and activities are graded as follows: • class attendance and homework - up to 10 points • Written high school lecture plans – up to 14 points • Two lectures given in a high 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

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<tr><td></td><td colspan="3">Written exam is consisted of problems (exercises) that are appropriate 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</td></tr>
<tr><td rowspan="9">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>R. Krsnik, Suvremene ideje u metodici nastave fizike, Školska knjiga, Zagreb, 2008.</td><td></td><td></td></tr>
<tr><td>V. Mešić, Uvod u didaktiku fizike, PMF Univerziteta u Sarajevu, Sarajevo 2015.</td><td></td><td></td></tr>
<tr><td>Ž, Jakopović, Kurikulum i nastava fizike, Školska knjiga, Zagreb 2016</td><td></td><td></td></tr>
<tr><td>Approved high school physics textbooks</td><td></td><td></td></tr>
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<tr><td></td><td></td><td></td></tr>
<tr><td>Optional literature</td><td colspan="3">• B. Arons, Teaching Introductory Physics, John Wiley & Sons Inc. 1996.
• E. F. Redish, Teaching Physics with the Physics Suite, John Wiley & Sons Inc. 2003.
• Paul G. Hewitt, Conceptual Physics, 12th Edition, Addison-Wesley, 2014.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">• Evaluation of student achievements in accordance with expected outcomes
• Lecturer's self-evaluation
• Student feedback through questionnaires
• In-institution and out-institution review</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
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