COURSE NAME	DIFFERENTIAL EQUATIONS					
Code	PMM950	Year of study	2nd or 3rd year of undergraduate study			
Course teacher	TANJA VUČIČIĆ	Credits (ECTS)	6			
Associate teachers		Type of instruction (number of hours)	L	S	E	
			30		30	
Status of the course	COMPULSORY AND ELECTIVE	Percentage of application of e-learning	40%			

COURSE DESCRIPTION	
Course objectives	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.
Course enrolment requirements and entry competences required for the course	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 expected at the level of the course (4 to 10 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 $x'=Ax$, $x(t_0)=x^0$ 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.
Course content broken down in detail by weekly class schedule (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 *n*th order LDE. (2 hours) 7. LDE of *n*th order with constant coefficients. Nonhomogeneous LDE of *n*th 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

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<tr><td></td><td>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)</td></tr>
<tr><td>Format of Instruction</td><td>Lectures and exercises</td></tr>
<tr><td>Student responsibilities</td><td>Attending lectures and exercises and taking exams.</td></tr>
<tr><td>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)</td><td>Attending classes: 2 ECTS
Written test: 2 ECTS
Oral exam: 2 ECTS</td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td>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.</td></tr>
<tr><td>Required literature (available in the library and via other media)</td><td><table><tr><th>Title</th><th>No. of copies in the library</th><th>Availability through other media</th></tr><tr><td>W.E. Boyce and R.C. DiPrima, Elementary Differential Equations and Boundary Value Problems, John Wiley & Sons, Inc., New York, 2012.</td><td></td><td>Pdf file on the Moodle platform</td></tr></table></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td>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.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td>Exam results statistics. Students' quality assessment at the end of the semester carried out by the University authorized committee through anonymous polls.</td></tr>
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