UNIVERSITÀ DI PAVIA

Anno Accademico 2017/2018

DIFFERENTIAL EQUATIONS AND DYNAMICAL SYSTEMS

Enrollment year	2017/2018
Academic year	2017/2018
Regulations	DM270
Academic discipline	MAT/05 (MATHEMATICAL ANALYSIS)
Department	DEPARTMENT OF PHYSICS
Course	
Curriculum	Fisica della materia
Year of study	1°
Period	1st semester (02/10/2017 - 19/01/2018)
ECTS	6
Lesson hours	56 lesson hours
Language	Italian
Activity type	WRITTEN AND ORAL TEST
Teacher	SCHIMPERNA GIULIO FERNANDO (titolare) - 9 ECTS
Prerequisites	Differential and integral calculus for scalar and vector functions, matrices and linear transformations, sequences and series, power series, complex numbers, polar coordinates.
Learning outcomes	Learn the basic results and techniques of the theory of ordinary differential equations and dynamical systems. Acquire skill in manipulation and transforms of complex numbers and understand the first but deep results of complex function theory.
Course contents	The course is divided into two parts: the first one is devoted to the theory of ordinary differential equations and systems, with an introduction to the study of dynamical systems. The second part is an introduction to the theory of functions of one complex variable. Extended summary

	Models and examples of ODE's. General results concerning existence, uniqueness, comparison and stability for Cauchy problems. Elementary techniques for solving simple differential equations. Cauchy-Peano's theorem (existence without uniqueness). Linear systems of ODE's: general results and structure, exponential matrix. Asymptotic behaviour of dynamical systems, stability (linearisation and Lyapunov method). Examples of complex functions. Differentiability. Power series and contour integrals. Holomorphic functions. Cauchy's theorem. Singularities, Laurent expansion and residues. Cauchy theorem. Application to the evaluation of integrals. Analytic extension. Argument principle. Open mapping theorem. Further properties.
Teaching methods	Lectures and exercise sessions.
Reccomended or required readings	M. W. Hirsch, S. Smale, R. L. Devaney: Differential equations, dynamical systems, and an introduction to chaos. Pure and Applied Mathematics, Vol. 60. Elsevier/Academic Press, Amsterdam, 2004. S. Salsa, A. Squellati: Esercizi di analisi matematica 2. Masson, 1994. E. M. Stein - R. Shakarchi: Complex analysis, Princeton Lectures in Analysis II, Princeton University Press (2003) G. Gilardi, Analisi Matematica 3, McGraw- Hill Italia. Lecture notes will be also provided.
Assessment methods	Written and oral test. The written test will be constituted by a number of exercises. The oral exam will be aimed at verifying the comprehension of the main results of the theory and the capacity to illustrate them by means of concrete examples.
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Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile