TEL AVIV UNIVERSITY אוניברסיטת תל אביב

Full Syllabus

Course Title

Ordinary Differential Equations 1

Lecturer

Arie Levant

Semester

A

Course requirements

Final grade components

20% homework (7-10 assignments) + 80% exam

Course schedule

Class no. / Date	Subject and Requirements (assignments, reading materials, tasks, etc.)
	Notation. Differential (recalling). Classification of differential equations (DEs). 1st order DEs: separable, linear, Bernoulli, homogeneous, exact DE. 1st integral. Integrating factor notion. Change of variables. Systems of DE, Lotka-Volterra system.
	Cauchy problem. Vector fields. Phase space. Methods of Picard and Euler. Lipschitz condition. Theorem of the existence and uniqueness of the solution. Fixed point of a contractive mapping.
	Solution dependence on the initial conditions, the right-hand side and parameters. Solution extension. Autonomous DE. Critical points. Linearization.
	System of 1st order linear DEs. Gronwall-Bellman lemma. Solution space. Fundamental solutions. Linear dependence of functions. Wronskian.
	Systems of 1st order DEs with constant coefficients. Matrix exponent: real and complex eigenvalues, multiplicity. Exponent calculation and solution of homogeneous systems.
	High order scalar linear DEs, homogeneous and non-homogeneous. Quasi-polynomials.
	Non-homogeneous system of 1st order DEs with constant coefficients. Vector quasi-polynomials. Method of undetermined coefficients in scalar and vector cases. Method of coefficient variation. Euler equations. Abel-Liouville theorem: vector, scalar cases. Decreasing the order of DE. Solution of differential equations via power series.
	Dynamic systems, Critical points in plane. Lyapunov stability and Lyapunov functions.

Required course reading

Notes and other materials will be provided

Optional course reading

Boyce W.E. and DiPrima R.C. Elementary Differential Equations and Boundary Value Problems
Arnold V.I. Ordinary Differential Equations

Comments

The course is taught in English.