

King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics

SYLLABUS

Semester I: 2017-2018 (171)

Instructor: Dr. A. Bonfoh
Course #: MATH 465
Title: Ordinary Differential Equations

Textbook: The qualitative theory of ordinary differential equations: an introduction. By F. Brauer and J. A. Nohel, Dover Publications, Inc. NY (1969).

Objectives: The course aims to introduce basic concepts of existence, uniqueness, asymptotic behavior and stability of solutions to ordinary differential equations.

Course Description: Existence, uniqueness and continuation of solutions to initial value problems: scalar, 1st order systems and linear systems. Linear systems: solution matrix, fundamental matrix. Variation of constants method. Phase space analysis. Autonomous systems. Definitions of stability. Stability for linear and almost linear systems. Basic concepts of Lyapunov's method.

Prerequisites: MATH202, or MATH280.

Learning outcomes: Upon completion of this course, students should be able to:

1. Solve 1st order linear systems with constant coefficients.
2. Prove existence, uniqueness and continuation of solutions to 1st order systems.
3. Analyze the asymptotic behavior of solutions to linear systems.
4. Obtain phase portrait of 2-dimensional autonomous systems.
5. Prove stability of linear and almost linear systems (perturbation method, Lyapunov's second method).

Week	Date	Ch.	Topics	Homework Problems
1-3	Sep 17- Oct 5, 2018	1	Systems of differential equations	
4-7	Oct 8- Nov 2, 2018	2	Linear systems with an introduction to phase space analysis	
8-10	Nov 5- Nov 23, 2018	3	Existence theory	
11-13	Nov 26-Dec 14, 2018	4	Stability of linear and almost linear systems	
14-15	Dec 17-Dec 28, 2018	5	Lyapunov's second method	

Grading:

Exam I, II (Weeks 5 and 10, resp.)	20% each
Class work (homework assignments, projects)	30%
Final Exam	30%