Birla Institute of Technology & Science, Pilani
Hyderabad Campus

INSTRUCTION DIVISION
FIRST SEMESTER 2017 - 2018
Course Handout Part II

01-08-2017

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : *MATH F312*
Course Title : *Ordinary Differential Equations*
Instructor-in-Charge : ***Dr. J. Jagan Mohan***

Scope and Objective of the Course:
Ordinary Differential Equations frequently occurs as mathematical models in many branches of science, engineering and economy. For a mathematician confronted with such a model there are a number of issues to address and various approaches to choose from:
Is the problem well posed? Do you expect the differential equation to have a solution? If so, is there a unique solution satisfying the given initial or boundary conditions?
Can you find an explicit analytical solution? This is only possible in rare circumstances.
Geometric or qualitative methods: These methods give insights into general, qualitative features of solutions and do not require solving the differential equation.
Stability and dependence on parameters: Having obtained a solution by any method, we would like to know how the solution changes if we change the initial data by a small amount (stability analysis) and if we change parameters in the differential equation (parameter dependence). Course helps deeper understanding of the complicated models that are there in the real life.

Textbooks:

1. **S Ahmad & M R M Rao**: Theory of Ordinary Differential Equations with Applications in Biology and Engineering, East West Press, 1999.

Reference books

1. The Qualitative Theory of Ordinary Differential Equations - An Introduction, Fred Brauer and John A Nohel, Dover Publications.
2. Stability Theory of Differential Equations, Richard Bellman, Dover Publications.**3**
3. Theory of Ordinary Differential Equations, E A Coddington & N Levinson, Tata Mc Graw - Hill Publications.
4. Differential Equations and Dynamical Systems, Lawrence Perko, Springer.

Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book

1 - 2	Know the basic definitions and notations	Introduction and Overview of the Course, Notation and Definitions	Chapter 1 Sections 1 - 2
3 - 8	Learn the existence and uniqueness theorems for scalar equations and for a general system of equations	Existence and Uniqueness of Solutions of Scalar Differential Equations, Existence Theorems for System of Equations, Differential and Integral Inequalities	Chapter 1 Sections 3 – 5
9 -16	Understand the properties of linear systems	Introduction to Linear Systems, FSS, Properties of Linear Homogeneous Systems, Inhomogeneous Linear Systems	Chapter 2 Sections 1 – 3
17 - 21	Learn how to find the behavior of linear equations of higher order	Behavior of Solutions of *n*th order Linear Homogeneous Equations, Asymptotic Behavior	Chapter 2 Sections 4 – 5
22 - 24	Understand the concept of stability of a linear system	Introduction to Stability, Continuous Dependence and Stability Properties of Solutions	Chapter 3 Sections 1 – 2
25 - 33	Learn the stability analysis of weakly non-linear and 2-D systems	Linear Systems, Weakly Nonlinear Systems, Two Dimensional Systems	Chapter 3 Sections 3 – 5
34 - 38	Learn the Liapunov method for stability analysis	Introduction to Stability by Liapunov Second Method, Autonomous Systems, Non - Autonomous Systems	Chapter 5 Sections 1 – 3
39 - 42	Understanding more about the behavior of solutions of second order equations	Second Order Differential Equations, Boundedness of Solutions, Oscillatory Equations, Classical Equations	Chapter 4 Sections 1 - 5

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid Semester Test	90 Min.	30	12/10 9.00 -- 10.30 AM	Closed
Comprehensive Examination	180 Min.	40	08/12 FN	Closed
Quiz	40 Min.	10	To Be Announced	Closed
Assignment	-	20	To Be Announced	Open

Chamber Consultation Hour: To be announced in the class.
Notices: All notices regarding MATH F312 will be displayed on CMS
Make-up Policy: Make up of other evaluation components will be granted only in genuine cases. Permission must be taken in advance except in extreme cases.
Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable

INSTRUCTOR-IN-CHARGE