BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI, Hyderabad Campus
INSTRUCTION DIVISION
FIRST SEMESTER 2016-2017

COURSE HANDOUT (PART-II)

Date: 01/08/2016

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

Course No. : MATH F312
Course Title : Ordinary Differential Equations
Instructor-In-Charge : **Dr. T S L Radhika**

SCOPE & OBJECTIVE:

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.

TEXT BOOK:

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

REFERENCE BOOKS:

R1. The qualitative theory of ordinary differential equations, an introduction, Fred Brauner and John A Nohel, Dover Publications.
R2. Stability theory of differential equations, Richard Bellman, Dover publications
R3. Theory of Ordinary Differential Equations, E.A. Coddington & N. Levinson, Tata McGraw-Hill
R4. 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 & Overview of the course Notation and Definitions	Ch. 1 section 1 &2
3 -8	Learn the existence and uniqueness theorems	Existence and Uniqueness of Solutions of Scalar Differential Equations, Existence	Ch.1 Section: 3 – 5

	for scalar equations and for a general system of equations	Theorems for system of equations, Differential & Integral Inequalities	
9 -16	Understand the properties of linear systems	Introduction to Linear Systems, FSS, Properties of Linear Homogeneous Systems, Inhomogeneous Linear Systems	Ch.2 Section: 1 – 3
17 -21	Learn how to find the behavior of linear equations of higher order	Behavior of Solutions of nth order Linear Homogeneous Equations, Asymptotic Behavior	Ch.2 Section: 4 – 5
22 - 24	Understand the concept of stability of a linear system	Introduction to stability, Continuous dependence and stability properties of Solutions	Ch.3 Section: 1 – 2
25 -33	Learn the stability analysis of weakly non-linear and 2-D systems	Linear Systems, Weakly Non linear Systems, Two Dimensional Systems	Ch.3 Section: 3 – 5
34 -38	Learn the Liapunov's method for stability analysis	Introduction to stability by Liapunov's second Method, Autonomous systems, Non Autonomous Systems	Ch.5 Section: 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	Ch.4 section 1-5

EVALUATION SCHEME:

Component	Duration	Weightage (%)	Date & Time	Nature of the component
1	Test-I	20	13/9, 10.00--11 AM	Closed book
2	Test-II	20	21/10, 10.00--11 AM	Open book
3	Assignments	20		Open book/ Take Home
4	Compre	40	14/12 AN	Closed book

CHAMBER CONSULTATION HOUR: Will be announced in the class.
NOTICES: All notices regarding MATH F312 will be put on CMS.
MAKE-UP Policy:

(i) NO MAKE UP will be given in Assignment components under any circumstances.
(ii) Make up of other evaluation components will be granted only in genuine cases. Permission must be taken in advance except in extreme cases.
(iii) No MAKE-MAKE-UP will be entertained.

Instructor–in-charge
MATH F312