COURSE HANDOUT (PART-II)

Date: 1/8/2016

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 : **BALRAM DUBEY**

Instructors :

1. COURSE DESCRIPTION:

Existence and uniqueness theorems; properties of linear systems; behavior of solutions of nth order equations; asymptotic behavior of linear systems; stability of linear and weakly nonlinear systems; conditions for boundedness and the number of zeros of the nontrivial solutions of second order equations; stability by Lyapunov's direct method; autonomous and non-autonomous systems.

2. 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.

3. TEXT BOOK:

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

4. REFERENCE BOOKS:

R1. The qualitative theory of ordinary differential equations, an introduction, Fred Brauner and John A Nohel, Dover Publications, 1969.

R2. Theory of Ordinary Differential Equations, E.A. Coddington & N. Levinson, Tata McGraw- Hill, 1972.

5. COURSE PLAN:

Topics to be covered	Ref. To Text Book	Lecture No.
Introduction & Overview of the course Notation and Definitions	Ch. 1 section 1 &2	1-2
Existence and Uniqueness of Solutions of Scalar Differential Equations, Existence Theorems, Differential & Integral Inequalities	Ch.1 Section: 3 – 5	3 -8
Introduction to Linear Systems, FSS, Properties of Linear Homogeneous Systems, Inhomogeneous Linear Systems	Ch.2 Section: 1 – 3	9 -12
Behavior of Solutions of nth order Linear Homogeneous Equations, Asymptotic Behavior	Ch.2 Section: 4 – 5	13 -16
Introduction to stability, Continuous dependence and stability properties of Solutions	Ch.3 Section: 1 – 2	17 - 21
Linear Systems, Weakly Non linear Systems, Two Dimensional Systems	Ch.3 Section: 3 – 5	22 -25
Introduction to stability by Liapunov's second Method, Autonomous systems, Non Autonomous Systems	Ch.5 Section: 1 – 3	26 -35
Second order differential equations boundedness of solutions Oscillatory equations, Classical equations	Ch.4 section 1-5	36-40

6. EVALUATION SCHEME:

Component	Duration	Tentative Weightage (%)	Date & Time	Remarks
Mid Sem Exam	90 mins	35%		Closed Book
Compre Exam	3 hrs	45%		Open & Closed Book
Quizes/Assignments (announced/ unannounced)		20%		Quizes may be conducted in regular or common hour.

Note: minimum weightage of open book/take home exam will be 20%.

7. CHAMBER CONSULTATION HOUR: Will be announced in the class.

8. MAKE-UP Policy: Prior permission is needed for makeup, Makeup will only be given if enough evidence is available for not being able to take regular test.

9. NOTICES: All notices will be displayed on the Notice Board of the Mathematics Department/online Nalanda NB. Normally information will also be conveyed in the class.

Instructor–in-charge
MATH F312