BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani

Pilani Campus

INSTRUCTION DIVISION

FIRST SEMESTER 2015-2016

Course Handout (Part II)

Date: 3/8/2015

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 F214
Course Title : Elementary Real Analysis
Instructor-in-charge : AMIT K. VERMA

1. Scope and objective of the Course :

The objective of this course is to train the students with the basic tools of Modern Mathematical analysis, train them in art of logical, deductive & constructive thinking and thus equip them with enough back ground for courses which involve deeper Mathematical analysis. Real analysis is needed in several science & enginnering disciplines, in study of dynamical systems, which are solutions of differential equations, theoretical study of differential equations, concept of fractal & fractal dimension is usually studied in Metric Spaces. Riemann integration technique is the basic technique of integration on which advance theory of integration is developed. Integration theory is also needed in study of theoretical & numerical solution of partial differential equations.

2. Course Description :

Real numbers, Countable and uncountable sets, Metric spaces, Continuous and uniformly continuous maps in metric spaces, Connectedness, Completeness and Compactness in a metric space, Numerical sequences and series, Riemann integration & Riemann Stieltjes Integral, Convergence & uniform convergence of sequence of functions, Approximation of continuous function, functions of several variables, derivative of function of several variables, inverse function theorem.

3. Text Book :

W. Rudin, Principles of Mathematical Analysis, McGraw, Hill India 3rd Edition, 2013.

4. Reference Books :

1. Apostal : Mathematical Analysis, Addison Wesley, 1983.
2. Real Analysis : John M Howie Springer Verlag, 2001.
3. Kenneth Ross : Elementary Analysis : The Theory of Calculus, Springer International Edition, 2000.

5. Course Plan :

Lect. No.	Learners Objective	Subject Matter	Ref.
1-2	Review	Review of certain concepts	Ross, Rudin

3-6	Representation of real numbers	Ordered field, Construction of real numbers, the set of real numbers as ordered field, extended real numbers	Ch. 1 Rudin Sec : 1.1 to 1.23
7-8	Difference between countable & uncountable set. Sequences	Finite, Countable & uncountable sets,	Ch. 2 Rudin Sec : 2.1 to 2.14
9-11	Sequences	limsup & liminf of sequences, monotone sequences	Ch. 2 Ross
11-15	Generalization of concept of Euclidean distance to abstract sets	Metric spaces, compact sets, different definition of compact sets, Cantor Intersection theorem, Contraction Principle	Ch. 2 Rudin Sec : 2.15 to 2.47
16-20	Generalization of concept of continuity & limit to metric spaces	Continuous & uniformly continuous functions & their properties	Ch. 4 Rudin
21-23	How Riemann integral can be written as limit of sum	Elementary Riemann Integral & its properties	Ch. 6 Ross
24-28	Integration with respect to a function	Riemann Stieltjes Integral & Properties	Ch. 6 Ross
29-33	Distinguish between uniform & point wise convergence of sequence of functions. Functions not differentiable but continuous	Point & uniform convergence of functions & related properties of integrability & differentiability	Ch. 7 Rudin
34-35	How bad functions can be approximated with polynomials	Some approximation theorems of continuous functions	Ch. 7 Rudin
36-40	How continuity & differentiability have generalization for function of several variables	Functions of several variables, Inverse Function Theorem	Ch. 9 Rudin

6. **Evaluation Scheme:**

Components	Durations	Weightage	Date & Time	Remarks
Mid Semester Exam	90 min.	30%	8/10 2:00 - 3:30 PM	Closed Book (CB)
Quiz / Assignments / Viva		30%		Open Book or CB
Comprehensive Exam	3 hrs.	40%	9/12 FN	Open Book & CB

7. Chamber consultation hour : To be announced in class.
8. Notices : Check Nalanda. All matters will also be discussed in class.
9. **Extra Problems :** Problem sheets will be given for the type of problems to be done.
10. **Make up :** Prior permission is needed for makeup examination. Makeup will be given only to genuine cases. Application must be supported by relevant documents.

INSTRUCTOR-IN-CHARGE