BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI- HYDERABAD CAMPUS
FIRST SEMESTER 2022-2023
Course Handout (Part II)

Date: 29.8.2022

In addition to the 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: MANISH KUMAR
Instructors: Manish Kumar, Nijjwal Karak

1. Scope and objective of the Course:

The objective of this course is to train the students with the essential tools of modern mathematical analysis, train them in the art of logical, deductive & constructive thinking and thus equip them with enough background for courses that involve more in-depth mathematical analysis. Real analysis is needed in several science & engineering disciplines, in the study of dynamical systems, which are solutions of differential equations, theoretical study of differential equations, the concept of fractal & fractal dimension is usually studied in metric spaces. Riemann integral is basic integral on which advance theory of integration is developed. Integration theory is needed in the study of theoretical & numerical solutions of partial differential equations.

2. Course Description: Countable and uncountable sets; real numbers, metric spaces, continuous and uniformly continuous maps in metric spaces, connectedness, completeness, and compactness in a metric space, Numerical sequences and series, Riemann integral & Riemann Stieltjes Integral, Convergence & uniform convergence of the Sequence of functions, Approximation of continuous function, functions of several variables, the derivative of a function of several variables, inverse function theorem.

3. Text Book:

W. Rudin, Principles of Mathematical Analysis, McGraw, Hill 3rd edition, 1976.

4. Reference Books:

1. R.G. Bartle and D.R. Sherbert, Introduction to Real Analysis, 4th Edition, John Wiley.
2. Apostal: Mathematical Analysis, Addison Wesley, 1983.
3. Kenneth Ross: Elementary Analysis, Springer International Edition 2000.

5. Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1-3	Representation of real numbers	Ordered field, Construction of real numbers, the set of real numbers as ordered field, extended real numbers	Chapter 1, Sec: 1.1 to 1.23
4-5	Difference between countable & uncountable set	Finite, Countable & uncountable sets	Chapter 2, Sec: 2.1 to 2.14
6-10	Generalization of the	Metric spaces, compact sets, different	Chapter 2, Sec:

	concept of distance to abstract sets	Definition of compact sets, Cantor Intersection theorem, Contraction Principle	2.15 to 2.47
11-14	A convergence of Sequence and series of real numbers	Sequence and infinite series	Chapter: 3
15-20	Generalization of concept of limit & continuity to metric spaces	Continuous & uniformly continuous functions& their properties	Chapter 4
21-28	Integration with respect to a function	Riemann Stieltjes integral & properties	Chapter 6
29-35	Distinguish between uniform & pointwise convergence of Sequence of functions. Functions not differentiable but continuous	Point & uniform convergence of functions & related properties of integrability & differentiability	Chapter 7 sec: 7.1 to 7.27
36-40	How continuity & differentiability have generalization for the function of several variables	Linear Transformations, Differentiation of functions of several variables	Chapter 9 sec: 9.1 to 9.15

6. **Evaluation Scheme:**

Components	Duration (Minutes)	Weightage* (%)	Date & Time	Nature of Component
Quiz 1	30 min	10%	To be announced later	Open Book
Mid Sem	90 min	30%	31/10 9.00 - 10.30AM	Closed Book
Assignment 1	---	10%	To be announced later	Open Book
Quiz 2	30 min	10%	To be announced later	Open Book
Comprehensive Exam	180 min	40%	17/12 FN	Closed Book

*The total marks of all the components, taken together will be 100.

7. Chamber consultation hour: To be announced in the class.
8. Notices: Notices concerning this course will be displayed on the CMS Notice Board only.
9. Makeup: Make-up will be given only for very genuine cases, and prior permission has to be obtained from the I/C.
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
MATH F214