**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI- HYDERABAD CAMPUS**

### FIRST SEMESTER 2019‑2020

**Course Handout (Part II)**

#### 01-08-2019

#### 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 : MANISH KUMAR**

**Instructors : Manish Kumar, N. Kishore Kumar**

**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 the art of logical, deductive & constructive thinking and thus equip them with enough background for courses which involve deeper 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 solution 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 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 3rd edition, 1976.

**4. Reference Books:**

1. Apostal: Mathematical Analysis, Addision Wesley,1983.

2. R.G. Bartle and D.R. Sherbert, Introduction to Real Analysis, 4th Edition, John Wiley.

3. Kenneth Ross: Elementary Analysis, Springer International Edition 2000.

**5. Course Plan:**

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| --- | --- | --- | --- |
| **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 |
| 4-6 | Difference between countable  & uncountable set | Finite, Countable & uncountable sets | Chapter 2, Sec : 2.1 to 2.14 |
| 7-10 | Generalization of concept of distance to abstract sets | Metric spaces, compact sets, different  Definition of compact sets, Cantor Intersection theorem, Contraction Principle | Chapter 2, Sec: 2.15 to 2.47 |
| 11-15 | Convergence of Sequence and series of real numbers | Sequence and infinite series | Chapter: 3 |
| 16-21 | Generalization of concept of limit & continuity to metric spaces | Continuous & uniformly continuous functions& their properties | Chapter 4 |
| 22-29 | Integration with respect to a function | Riemann Stieltjes integral & properties | Chapter 6 |
| 30-37 | 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 |
| 38-42 | How continuity & differentiability have generalization for function of several variables | Linear Transformations, Differentiation of functions of several variables | Chapter 9 sec: 9.1 to 9.15 |

1. **Evaluation Scheme:**

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| --- | --- | --- | --- | --- |
| **Components** | **Duration** | **Weightage** | **Date & Time** | **Nature of Component** |
| Quizzes (5)\* | ------ | 20% | To be announced in the class | Closed Book |
| Mid Sem | 90 min. | 35% | 30/9, 11.00 -- 12.30 PM | Open Book |
| Comprehensive Exam | 3 hrs. | 45% | 4/12 AN | Closed Book |

\* Best four will be considered for grading.

**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. Make up:** Make-up will be given only for very genuine cases and prior permission has to be obtained from the I/C.

**10. 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**