INDIAN INSTITUTE OF TECHNOLOGY GANDHINAGAR
DISCIPLINE OF MATHEMATICS

MA 509: Topics in Real Analysis
COURSE PLAN, AUTUMN 2020-21

Instructor: ATUL DIXIT
Email: adixit@iitgn.ac.in
Office: Academic Block 5, Room 340

COURSE CONTENTS

- Real and complex number systems - Ordered sets, Real Fields and Complex Fields, Euclidean spaces etc.
- Basic Topology - Countability and uncountability of sets, metric spaces, compacts sets, Cantor sets, Bolzano-Weierstrass theorem, Baire category theorem etc.
- Numerical Sequences and Series - Convergent sequences, subsequences, Cauchy subsequences etc.
- Continuity - Limits, continuity and compactness, continuity and connectedness, monotonic functions etc.
- Derivatives for real functions, extreme values, Rolle's theorem, mean value theorem, Taylor's theorem.
- Riemann-Stieltjes integral, Fundamental Theorem of Calculus
- Sequence of functions, Pointwise and uniform convergence, interchange of limit and integration/differentiation
- Equicontinuity, Arzela-Ascoli's theorem, Stone-Weierstrass theorem
- (If time permits:) Construction of Lebesgue measure on the real line using outer measure.

BOOKS

Recommended book: For most part of the course, we will stick to the following book:

Principles of Mathematical Analysis by Walter Rudin, Third edition, McGraw-Hill International edition, 1976.

Reference books:

1. Tom M. Apostol, *Mathematical Analysis*, 2nd ed., Addison-Wesley, Reading, MA 1974.

2. Richard R. Goldberg, Methods of Real Analysis, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.

LECTURES AND TUTORIALS

Lectures: Tuesdays, Wednesdays and Fridays: 10:05 am - 11 am

Tutorials: Monday: 2:05 pm - 3 pm

Office hours: TBA

The lectures, tutorials as well as office hours will be held online at the following link:

`https://meet.google.com/dmo-bgxw-dvi`

HOMEWORK

Homework problems will be given periodically. It is absolutely imperative to work on each of the problems assigned for homework. Discussing in a group is allowed and encouraged, however, the homework solutions must be written in your own way. Mere copying of others' work is strictly prohibited.

POLICY FOR EVALUATION

Homework: 25%
Assessment 1: 25%
Assessment 2: 25%
Assessment 3: 25%

The mode of each assessment may be different and will be made clear shortly.

GRADING RUBRIC

Relative grading policy will be followed.