

# UM 204 : INTRODUCTION TO BASIC ANALYSIS

## SRING 2022

Instructor: GAUTAM BHARALI

<http://math.iisc.ac.in/~bharali/teaching.htm>

**PLEASE NOTE:** Most of what is stated below was conveyed during Lecture 1, a recording of which is posted on Teams. Information/policies that — due to temporary online teaching and other reasons — could not be stated in Lecture 1 are highlighted below in red.

**Course summary:** This course is intended as a first course in Analysis, treated rigorously. The aim of the course is to establish the principles of Analysis, highlighting fundamental ideas that recur in the proofs in this subject. **To students auditing the course:** please note that the emphasis of this course is not on computation but on learning how to justify strong, general mathematical statements about sequences, series and functions.

The notion of convergence will be the unifying theme of this course. This notion is of importance in physics and engineering as well as in mathematics. This course will present all of the formal rigour necessary to understand the different meanings of the word “convergence” in different circumstances.

### Recommended books:

1. Walter Rudin, *Principles of Mathematical Analysis*, 3rd Edition, McGraw-Hill International Editions, 1976.
2. Terence Tao, *Analysis–I*, 3rd Edition, TRIM Series, Hindustan Book Agency, 2014.
3. T.M. Apostol, *Mathematical Analysis*, 2nd Edition, Narosa, 1996.

Rudin’s book is quite self-contained, but terse. This book will influence, to a great extent, the sequence of topics presented. Tao’s book is extremely readable, and will be very helpful to students who would like a little more detail on concepts and results stated for subsets of  $\mathbb{R}$ .

### Meeting times:

*Lectures:* Mondays: 11:00–11:55 a.m., Wednesdays and Fridays, 11:00 a.m. to 12:00 noon

*Tutorials:* , 12:05–1:00 p.m.

**Assignments and quizzes:** During the course of the lectures, I shall assign problems for homework. It is **essential** for your own understanding of the course material that you work on these problems. On **most** weeks, a new assignment will be posted on the course webpage some time between 5:30 p.m. on Monday and 5:30 p.m. the next day.

You will not be asked to submit homework assignments. Instead, assignments will form the material for **quizzes** that shall be given during the tutorials. The problems on each quiz will be drawn from the the most recent assignment that has been up on the course webpage for at least 5 days.

**Assessment:** Your assessment will be based on:

One mid-term exam: 30%, Quizzes: 30%, Final exam: 40%

**Examinations:** Exams will be in the **in-person mode** at times announced by the UG Office.

### Tutors for this course:

- Kartick Ghosh (*e-mail*: [kartickghosh@iisc.ac.in](mailto:kartickghosh@iisc.ac.in))

P.T.O.

- Kiran Kumar Behera (*e-mail*: kiranbehera@iisc.ac.in)

**Things to bear in mind:**

- The tutorials will be the forum in which you will discuss any problems on the homework assignment that you had difficulties with. **Attendance at the tutorials is mandatory!** You are encouraged to talk to the teaching assistant (TA) leading your tutorial for hints on problems on which you got stuck.
- At the end of (almost) every tutorial, your TA will give you a 10- or 15-minute quiz. This quiz will be based on the most recent assignment, and will feature a problem adapted from it with minor modifications. **Quizzes will be unannounced.**
- The homework assignments are a necessary **but not sufficient** condition for understanding the material covered. It is in your interest to find and work out as many problems as you can. For example, problems from Rudin's book, selected from the chapter being discussed in class, will provide greater practice and an opportunity to exercise your grasp of the fundamental concepts/theorems.