



Bharati College
(University of Delhi)
Janak Puri, Delhi- 100058
www.bharaticollege.du.ac.in

Lesson Plan (CORE, Semester I, July to November 2022)

Name of Teacher	Dr. Ankit Gupta	Department	Mathematics
Course	B.Sc (H) Mathematics	Semester	FIRST
Paper	Elementary Real Analysis	Academic Year	2022-23

Learning Objectives

The course will develop a deep and rigorous understanding of:

- Real line \mathbb{R} with algebraic.
- Order and completeness properties to prove the results about convergence and divergence of sequences and series of real numbers.

Learning Outcomes

On successful completion of this course, the student will be able to:

- Understand the fundamental properties of the real numbers, including completeness and Archimedean, and density property of rational numbers in \mathbb{R} .
- Learn to define sequences in terms of functions from \mathbb{N} to a subset of \mathbb{R} and find the limit.
- Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate the limit superior and limit inferior of a bounded sequence.
- Apply limit comparison, ratio, root, and alternating series tests for convergence and absolute convergence of infinite series of real numbers.

Lesson Plan

Week No.	Theme/ Curriculum	Any Additional Information
Week 1-3	Unit I <ul style="list-style-type: none"> Algebraic and order properties of \mathbb{R}, Absolute value of a real number, Bounded above and bounded below sets, Supremum and infimum of a nonempty subset of \mathbb{R}, The completeness property of \mathbb{R}. 	Allocation of Assignment I (Last Date 20 th September 2023)
Week 4	<ul style="list-style-type: none"> Archimedean property, Density of rational numbers in \mathbb{R}. 	
Week 5 – 6	Unit 2 <ul style="list-style-type: none"> Sequences and their limits, Convergent sequence, Limit theorems 	Test Scheduled (Syllabus upto Limit Theorem)
Week 7-8	<ul style="list-style-type: none"> Monotone sequences, Monotone convergence theorem and applications. 	
Week 9-10	<ul style="list-style-type: none"> Subsequences, Bolzano-Weierstrass theorem, Notion of limit superior and limit inferior for bounded sequence with illustrations. Cauchy sequences of real numbers and Cauchy's convergence criterion. 	
Week 11	Unit 3: <ul style="list-style-type: none"> Convergence and divergence of infinite series, Sequence of partial sums of infinite series, Necessary condition for convergence, Cauchy criterion for convergence of series. 	Allocation of Assignment II
Week 12-13	<ul style="list-style-type: none"> Tests for convergence of positive term series: Statement of the integral test and convergence of p-series, Basic comparison test, Limit comparison test, Ratio, root and Raabe's tests. 	
Week 14-15	<ul style="list-style-type: none"> Alternating series, Leibniz test, Absolute and conditional convergence. 	

References

1. Bartle, Robert G., & Sherbert, Donald R. (2011). Introduction to Real Analysis (4th ed.). John Wiley & Sons. Wiley India Edition 2015.
2. Bilodeau, Gerald G., Thie, Paul R., & Keough, G. E. (2010). An Introduction to Analysis (2nd ed.). Jones and Bartlett India Pvt. Ltd. Student Edition. Reprinted 2015.
3. Denlinger, Charles G. (2011). Elements of Real Analysis. Jones and Bartlett India Pvt. Ltd. Student Edition. Reprinted 2015. Boehm, A., & Ruvalcaba, Z. (2018). Munarch's HTML5 and CCS3 (4th Edition). Mike Murach & Associates.

Additional Resources

1. Sarma, R. D; Gupta, Ankit; Singh Rajesh (2022). Concepts of Real Analysis (1st ed.). Sultan Chand and Sons.