

**MANGALORE UNIVERSITY**  
**DEPARTMENT OF MATHEMATICS**  
**MSC MATHEMATICS**

<b>MTH 403</b>	<b>Real Analysis-I</b>	<b>4 Credits (48 hours)</b>
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**Course Outcome:** Students will have the knowledge and skills to explain the fundamental concepts of the real number system, Perfect sets, Connected sets, explain the concepts of convergent sequences, subsequences, Cauchy sequences, Series, the derivative of a real function, Mean value theorems, L'Hospital's rule, Taylor's theorem and its applications, differential equations and more generally in mathematical analysis.

**Course Specific Outcome:** At the end of the course students will have the knowledge and skills

- To study the real number system and their properties in detail.
- To develop skills to work with sequences in arbitrary metric spaces.
- To develop skills to work with series of real numbers.
- To study the concepts of continuous functions and differentiable functions.

### Unit I

**The Real and Complex Number System:** Introduction, Ordered sets, Fields, **The real field, The extended real number system, The complex field**, Euclidean spaces, Inequalities.

**Basic Topology:** Finite, countable and uncountable sets, **Metric spaces**, Compact sets, Perfect sets, Connected sets.

**(16 Hours)**

### Unit II - Numerical Sequences and Series:

**Convergent sequences**, Subsequences, Cauchy sequences, **Upper and lower limits**, Some special sequences, **Series, Series of non-negative terms, The number  $e$** , The root and ratio tests, Power series, Summation by parts, Absolute convergence, Addition and multiplication of series. **Rearrangements.**

**(12 Hours)**

### Unit III - Continuity:

Limits of functions, Continuous functions, Continuity and compactness, Continuity and connectedness, Discontinuities, Monotonic functions, Infinite limits and limits at infinity.


(12  
Hour  
s)

### Unit IV - Differentiation:

The derivative of a real function, Mean value theorems, The continuity of derivatives, L'Hospital's rule, Derivatives of higher order, Taylor's theorems, Differentiation of vector valued functions.

(8 Hours)

### References

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- [1] Walter Rudin, Principles of Mathematical Analysis, 3rd Ed., McGraw Hill, 1976.
- [2] Robert. G. Bartle, The Elements of Real Analysis, 2nd Ed., Wiley International Ed., New York, 1976.
- [3] T. M. Apostol, Mathematical Analysis, 2nd Ed., Narosa Publishers, 1985.
- [4] Ajith Kumar and S. Kumaresan, A Basic Course in Real Analysis, CRC Press, 2014.
- [5] R. R. Goldberg , Methods of Real Analysis, 2nd Ed., Oxford & I. B. H. Publishing Co., New Delhi, 1970.
- [6] N. L. Carothers, Real Analysis, Cambridge University Press, 2000.

Russel A. Gordon, Real Analysis - A First Course, 2nd Ed., Pearson, 2011