



MANGALORE UNIVERSITY

DEPARTMENT OF MATHEMATICS

MSC MATHEMATICS

MTH 503	Measure and Integration	4 Credits (48 hours)
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Course Outcome: Students will have the knowledge and skills to apply the Measure Theory. The concepts are very much applicable in probability theory in Statistics

Course Specific Outcome: At the end of the course Students will have the knowledge and skills to understand, explain in depth and apply in various situations the concepts –

- Lebesgue outer measure, Lebesgue measure, and Lebesgue measurable functions.
- Fatou's lemma, Monotone convergence theorem, and Lebesgue Dominated convergence theorem.
- Characterize Riemann integrable functions on $[a, b]$.
- Vitali Covering lemma, Lebesgue theorem.
- Functions of bounded variation, Absolutely continuous function, and their importance in the study of differentiation of an integral.
- The extension theorem of Carathéodory.
- Product measure and Fubini theorem.

Unit I

Algebras of sets - Borel sets. Outer measure, Measurable sets and Lebesgue measure. Example of a non-measurable set. Measurable functions.

(12 Hours)

Unit II

The Riemann integral, The Lebesgue integral of a bounded function over a set of finite measure, The integral of a nonnegative function, The general Lebesgue integral.

(12 Hours)

Unit III

Differentiation and Integration, Differentiation of monotone functions, Functions of bounded variation, Differentiation of an integral, Absolute continuity.

(12 Hours)

Unit IV

Measure and outer measure, The extension theorem of Caratheodary, The product measures, The Fubini theorem.

(12 Hours)

References

- [1] H. L. Royden, *Real Analysis*, 3rd Ed., Prentice - Hall, 2003.
- [2] G. D. Barra, *Introduction to Measure Theory*, Van Nostrand Reinhold Company Ltd., 1974.
- [3] Walter Rudin, *Real and Complex Analysis*, 3rd Ed., Tata McGraw Hill Publishing Company, 1987.
- [4] P. R. Halmos, *Measure Theory*, Springer Verlag, 1974.
- [5] F. Hewitt and K. Stromberg, *Real and Abstract Analysis*, Springer Verlag, 1965.
- [6] Inder K. Rana, *An Introduction to Measure and Integration*, 2nd Ed., Narosa Publishing House, 1997.