7. Courses description

Core Courses

MAT 611 – Measure and Integration

Course Code & Number	Course Name	Credit Hours	Lec.	Lab.	Tut.	Prerequisites
MAT 611	Measure and Integration	4	3	0	1	

Syllabus:

Basics: Countable and uncountable sets, Axiom of Choice and Zorn's Lemma, Open and closed sets, Borel sets, σ-Algebras, Cauchy sequences and completeness of $\mathbb{R}$, continuity and uniform continuity.

Lebesgue Measure and Measurable Functions: Outer measure and measurable sets, σ-algebra of measurable sets, Countability of additivity, Zero measure and Cantor's Set, Non-measurable sets, Measurable functions and their properties, Simple functions and the simple approximation theorem, Lusin's Theorem.

The Lebesgue's Integral: The Riemann's integral, The Lebesgue integral of a bounded measurable function, The Lebesgue integral of a measurable nonnegative function, The general Lebesgue integral and its properties, Convergence in measure, Fatou's lemma, Monotone Convergence and Beppo-Levi theorem, Lebesgue dominated Theorem, Radon-Nikodym Theorem, product of sigma-algebra and product measure, Fubini Theorem, Change of variable formula.

L^p Spaces: Definition and Properties, Cauchy-Schwartz, Minkowski's inequality and Holder inequalities, Riesz-Fischer theorem and completeness of L^p spaces.

References

1. S. K. Berberian; ***Measure and Integration***, AMS/Chelsea Publishing, 2010. **(Main Reference)**
2. M. Capinski and P. E. Kopp; ***Measure, Integral and Probability***, Springer.
3. W. Rudin; ***Real and Complex Analysis***, McGraw Hill, 3rd Edition, 1987.
4. M. R. Spiegel; *Real Variables*; ***SCHAUM'S Series***; MacGraw Hill, 1st Ed. 1990.