Prerequisites: Topology and Measure Theory	3	2	0	4

Course Category	Elective
Course Type	Theory
Course Objective	This course will lay the foundation to Locally compact second countable spaces, Measure Theory on LCSC spaces and some basic knowledge in Topological groups.
Course Outcome(s)	Students would acquire adequate knowledge in Locally compact second countable spaces, Measure Theory on LCSC spaces, Measure Theory and Functional Analysis, Linear groups - some basic facts, Topological groups - basics, Characters, Dual groups, Sample results about the structure of LCSC abelian groups, Some Major Theorems (without proof) and their consequences, Abstract Fourier Transform. Peter-Weyn Theorem, Pontryagin Duality.

Syllabus:

Locally compact second countable spaces, Measure Theory on LCSC spaces, Measure Theory and Functional Analysis, Linear groups - some basic facts, Topological groups - basics, Characters, Dual groups, Sample results about the structure of LCSC abelian groups, Some Major Theorems (without proof) and their consequences, Abstract Fourier Transform. Peter Weyn Theorem, Pontryagin Duality..

Text books:

1. Sidney A. Morris, Pontryagin duality and the structure of locally compact abelian groups, Cambridge University Press, 1977.
2. P. J. Higgins, An Introduction to Topological Groups, London Mathematical Society, Cambridge University Press, 1975.
3. Nelson G. Markley, Topological Groups: An Introduction, Wiley, 2010.

References:

1 H. Helson, Harmonic Analysis, Addison-wesley Publishers, 1983.
2. W. Rudin, Fourier Analysis on Groups, Wiely-Interscience, 1990.

Code:MAT5023: Introduction to Distribution Theory	L	T	P	Credit

Prerequisites:	3	2	0	4

Course Category	Elective
Course Type	Theory
Course Objective	The aim of the course is to introduce distribution theory, and its importace in solving for the theory of partial differential equations.

Course Outcome(s)	The students get familiarize with foundations of distribution theory: test functions, the concept of a distribution, distributions with compact support, operations on distributions, convolution, homogeneous distributions and the Fourier transform. Application of distribution theory with examples

Syllabus:

Test Function and Distributions: Introduction, Test Functions, Convergence in test function, Distribution, Operations on Distributions, Multiplication and Division of Distributions, Local properties of Distributions , A Boundedness property.

Convergence of Distributions: Introduction, Convergence of a sequence of Distributions, Convergence of a series of Distributions. Differentiation of Distributions, Introduction, Distributional Derivative, Derivative of the product, Derivative of a locally Integrable f unction. Convolution of Distributions: Introduction, Distribution of Compact Support, Direct Product of Distributions, Some Properties of the Direct product, Convolution , Properties of Convolution, Regularization of Distributions, Fundamental Solutions of Linear Differential Operators. Tempered Distribution and Fourier transforms: Introduction, The Space of Rapidly Decreasing Functions, The Space of Tempered Distributions, Multipliers in $S'(R^n)$, The Fourier Transform on L^1(Rn),The Fourier Transform on $S(R^n)$, The Fourier Transform on S0(Rn) , Properties of the Fourier Transform on S'(Rn) , Convolution Theorem in S'(Rn) , The Fourier Transform on E'(Rn), Applications

Sobolev Spaces: Introduction, Hilbert Space, The Sobolev Sapace $H^{m,p}$(Omega), The Sobolev Space $H^s(R^n)$ Product and Convolution in $H^s(R^n)$, The Space $H^{-s}(R^n)$, The Sobolev Space H^1, Sobolev Space of Order s. Extension theorem, Imbedding and completeness theorem, trace theory. Fundamental solution and Application to Elliptic Problems: Weak solution of elliptic boundary value problem (BVP),regularity of weak solutions, maximum principle, eigenvalue problems.

Text books:

1. F.G. Friedlander, Introduction to the theory of distributions,Cambridge University Press, Cambridge, (1998).
2. Robert A. Adams, John J. F. Fournier, Sobolev spaces, Elsevier,2003.
3. J.J. Duistermaat, Johan A.C. Kolk, Distributions: Theory and Applications, Springer Science & Business Media (2010).
4. Ram P. Kanwal,Generalized Functions: Theory and Applications, Springer Science & Business Media, (2004)
5. Svetlin G. Georgiev,Theory of Distributions, Springer (2010)

References:

1 L.C. Evans, Partial Di_erential Equations, AMS,(2010)

2. W. Rudin, Functional Analysis, Mc Graw Hill, New York, (1973).
3. E. DiBenedetto, Real Analysis, Birkhauser, Boston, (2002)
4. S. Kesavan, Topics in Functional Analysis and Applications
5. S. Salsa, Partial Di_erential Equations in Action. From Modelling to Theory, 2nd Edition, Springer- Verlag Italia, (2015).
6. A.H.Zemanian, Distribution Theory and Transform Analysis

Code:MAT5051: Probability Theory Prerequisites:	L	T	P	Credit
	3	2	0	**4**

Course Category	Elective
Course Type	Theory
Course Objective	This course will lay the foundation to probability theory and statistical modelling of outcomes of real life random experiments through various statistical distributions.
Course Outcome(s)	To know different ways to describe the distribution of a random variable; to know methods for treating and describing limits of sequences of random variables; to be familiar with how filtrations and conditional expectations are used to represent information and can work with discrete time martingales; know the construction of Brownian motions and some of their most important properties.