UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN MATHEMATICS

SYLLABUS WITH EFFECT FROM 2023-2024

<table>
<tr><td colspan="2">TitleoftheCourse</td><td colspan="6">PROBABILITY THEORY</td></tr>
<tr><td colspan="2">PaperNumber</td><td colspan="6"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">428E2B</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">ProbabilityatUGlevel</td></tr>
<tr><td colspan="2">CourseOutline</td><td colspan="6">UNIT – I Random Events and Random Variables:
Random events – Probability axioms – Combinatorial formulae – Conditional probability – Bayes theorem – Independent events – Random variables – Distribution function – Joint distribution – Marginal distribution – Conditional distribution – Independent random variables – Functions of random variables .
Chapter 1 : Sections 1.1 to 1.7
Chapter 2: Sections 2.1 to 2.9

UNIT – II : Parameters of the Distribution : Expectation – Moments – The Chebyshev Inequality – Absolute moments – Order parameters – Moments of random vectors – Regression of the first and second types.
Chapter 3 : Sections 3.1 to 3.8

UNIT – III Characteristic Functions : Properties of characteristic functions - Characteristic functions and moments – Semi invariants – Characteristic function of the sum of the independent random variables – Determination of distribution function by the Characteristic function – Characteristic function of multidimensional random vectors – Probability generating functions
Chapter 4 : Sections 4.1 to 4.7

UNIT – IV Some Probability distribution : One point, two point, Binomial – Polya – Hypergeometric – Poisson (discrete) distributions – Uniform – Normal gamma – Beta – Cauchy and Laplace (continuous) distribution.

Chapter 5 : Section 5.1 to 5.10

UNIT – V Limit Theorems: Stochastic convergence – Bernaulli law of large numbers – Convergence of sequence of distribution functions – Levy – Cramer theorems – de Moivre – Laplace theorem – Poisson, Chebyshev, Khintchine weak law of large numbers – Lindberg theorem – lapunov theorem – Borel – Cantelli lemma - Kolmogorov inequality and Kolmogorov strong law of large numbers.</td></tr>
</table>

	Chapter 6 : Sections 6.1 to 6.4, 6.6 to 6.9, 6.11 and 6.12
RecommendedText	M.Fisz, Probability Theory and Mathematical Statistics, Third edition –John Wiley and Sons, New York ,1963.
ReferenceBooks	1. R.B.Ash,Real Analysisand Probability,AcademicPress, NewYork ,1972 2. R.Durrett, Probability: Theoryand Examples, [2nd Edition] , DuxpuryPress,NewYork, 1996 3. V.K.Rohatgi,AnIntroductiontoProbability:TheoryandMathematicalStatistics,WeileyEasternLtd.,NewDelhi, 1988[3rd Print]. 4. S.I.Resnick,AProbabilityPath,Birhauser,Berlin,1999. 5. B.R.Bhat , Modern Probability Theory ,[3rd Edition] , New Age International (P) Ltd, New Delhi ,1999. 6. M.Fisz,ProbabilityTheoryandMathematicalStatistics,JohnWileyandSons,NewYork,1963.