Basic Instructional School on Stochastic Processes 2023

Speakers and Syllabus

Name of the Speaker with affiliation	Detailed Syllabus
Kumarjit Saha (K.S.), Ashoka University, Delhi	Basic Probability Theory I: Orientation, Elementary concepts: experiments, outcomes, sample space, events. Discrete sample spaces and probability models. Combinatorial probability and urn models; Conditional probability and independence;
Kaushik Majumder (K.M.), NISER, Bhubaneswar & Dinesh Keshri (D.K), NISER, Bhubaneswar	Linear Algebra: Matrices, Matrix Operations, Determinants, Matrix Representation of system of linear Equations, Vector Spaces and Subspaces, Basis of a Vector Space, Linear transformations, matrix representation, Inner product spaces and orthogonality, Cauchy-Schwarz Inequality for finite sum Eigenvalues, Classification and Transformation of Quadratic Forms, Diagonalisation of real symmetric matrices Analysis: Sequences, limits, limsup and liminf; infinte series, convergence and absolute convergence Limit of a function at a point, continuity, intermediate value theorem, differentiation, Rolle's theorem, Taylor's theorem Power series – radius of convergence, term by term differentiation and integration, Abel's theorem, Cauchy-Schwarz Inequality for infinte series and integrals
Moumanti Poddar (M.P.), IISER, Pune	Basic Probability Theory II: Random variables – discrete and continuous; Expectations, variance and moments of random variables; Markov inequality, Chebycheff inequality, First and second moment method (in tutorial with applications), Transformations of univariate random variables;
Rishideep Roy (R.R.), IIM, Bengaluru	Stochastic Processes I: Simple symmetric Random Walk – reflection princliple, return to origin, Arc-sine law, Discrete Markov chains with countable state space, example of two state Markov chain, Recurrence, transience, criterion for recurrence, positive and null recurrence
Nabin Kumar Jana (N.K.J.), NISER, Bhubaneswar	Basic Probability Theory III: Jointly distributed random variables; joint density and change of variables formula, independence and conditional distribution; probability transforms (if time permits)
Arijit Chakrabarty (A.C.), ISI, Kolkata	Stochastic Processes II: Irreducibility and decomposition of state space, class property, stationary distributions, ratio limit theorem, periodicity, limit theorems, reversible chains. Generating functions; Several illustrations including the Gambler's ruin problem, queuing chains, birth and death chains etc., Branching process, Stochastic Processes III: Poisson process, continuous time Markov chain with countable state space, continuous time birth and death chains.

B. V. Rao (B.V.R.), CMI, Chennai	Basic Probability Theory IV: Modes of convergence, Borel-Cantelli lemma, WLLN under 2nd moment assumption and SLLN under 4th moment assumption, CLT (statement with applications)

References:

1. A. Ramachandra Rao and P. Bhimasankaram: Linear Algebra.
2. G. F. Simmons: Introduction to Topology and Modern Analysis
3. S. M. Ross: A first course in Probability
4. Jacod & Protter: Probability Essentials
5. W. Feller: Introduction to the Theory of Probability and its Applications, Vol. 1.
6. P.G. Hoel, S.C. Port and C.J. Stone: Introduction to Stochastic Processes.

(Lecture notes from the speakers, if available)

Time-Table

Day	Date	Lecture 1 (9.00–11.00)	Tea (11.05 –11.25)	Tutorial (11.30–12.30)	Lunch (12.30–2.25)	Lecture 2 (2.30–4.30)	Tea (4.35-4.55)	Tutorial (5.00-6.00)	Snacks 6.05-6.30
Mon	June 26 - July 01	K.S.		K.S.+ Tutor		K.M.		K.M.+ Tutor	
Tues		K.S.		K.S.+ Tutor		K.M.		K.S.+ Tutor	
Wed		K.S.		K.S.+ Tutor		K.M.		K.S.+ Tutor	
Thu		K.S.		K.S.+ Tutor		D.K.		K.S.+ Tutor	
Fri		K.S.		K.S.+ Tutor		D.K.		K.S.+ Tutor	
Sat		Tutorial		Tutorial		D.K.		D.K. + Tutor	
SUNDAY : OFF									
Mon	July 03 - 08	M.P.		M.P. + Tutor		R.R.		R.R. + Tutor	
Tues		M.P.		M.P. + Tutor		R.R.		R.R. + Tutor	
Wed		M.P.		M.P. + Tutor		R.R.		R.R. + Tutor	
Thu		M.P.		M.P. + Tutor		R.R.		R.R. + Tutor	
Fri		M.P.		M.P. + Tutor		R.R.		R.R. + Tutor	
Sat	Tutorial								
SUNDAY : OFF									
Mon	July 10-15	A.C.		A.C. +Tutor		N.K.J.		N.K.J. + Tutor	
Tues		A.C.		A.C. +Tutor		N.K.J.		N.K.J. + Tutor	
Wed		A.C.		A.C. +Tutor		N.K.J.		N.K.J. + Tutor	
Thu		A.C.		A.C. +Tutor		N.K.J.		N.K.J. + Tutor	

Fri		A.C.		A.C. +Tutor		N.K.J.		N.K.J. + Tutor	
Sat		Tutorial		Tutorial		Tutorial		Tutorial	
SUNDAY : OFF									
Mon	July 17-21	A.C.		A.C. + Tutor		B.V.R.		B.V.R. + Tutor	
Tues		A.C.		A.C. + Tutor		B.V.R.		B.V.R. + Tutor	
Wed		A.C.		A.C. + Tutor		B.V.R.		B.V.R. + Tutor	
Thu		A.C.		A.C. + Tutor		B.V.R.		B.V.R. + Tutor	
Fri		A.C.		A.C. + Tutor		B.V.R.		B.V.R. + Tutor	