

**INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DESIGN AND MANUFACTURING (IIITDM) KANCHEEPURAM**

Course Title	Topics in Stochastic Processes	Course No	To be filled by the office		
Specialization	Electronics Engg	Structure (IPC)	3	0	3
Offered for	B. Tech. (EDM, COE) DD (ESD) M. Des. (CDS)	Status	Core <input type="checkbox"/>	Elective <input checked="" type="checkbox"/>	
Course Objectives	The primary goal of this course is to introduce advanced Stochastic processes that are used to model various systems in engineering. The focus is on rigorous analytical modelling of various problems arising in engineering (e.g. networks).				
Course Outcomes	At the end of the course, the students are expected to 1 Understand various stochastic models 2 Formulate an engineering problem using stochastic modelling 3 Analyze the performance of various systems 4 Design various protocols in networks using the theory of stochastic processes (and networks)				
Contents of the course	<ul style="list-style-type: none"> • Probability review (5) Kolmogorov's axiomatic probability, continuity of probability, random variables, stochastic processes, convergence of random sequences, law of large numbers • Discrete Time Markov Chains (DTMC) (10) Conditional independence, Markov property, strong Markov property, hitting times and recurrence, communicating classes and class properties, positive recurrence and invariant distribution, transience, discrete-time M/M/1 queue, mean drift criteria • Renewal Theory (10) Elementary renewal theorem (ERT), renewal reward processes, Poisson process, regenerative processes, renewal equation • Continuous Time Markov Chains (CTMC) (10) Pure jump CTMC, regular CTMC, communicating classes, recurrence and positivity, birth-death process • Markov Renewal Theory (7) Markov-renewal sequences, semi-Markov processes, Markov regenerative processes 				
Textbook	1. Anurag Kumar, "Discrete Event Stochastic Processes," online book, available at http://www.ece.iisc.ernet.in/~anurag/books/anurag/spqt.pdf				
References	2 E. Cinlar, "Introduction to Stochastic Processes," Prentice-Hall, 1975. 3. M. Loeve, "Probability Theory I," Springer-Verlag, 4 th edition, 1977. 4. M. Loeve, "Probability Theory II," Springer-Verlag, 4 th edition, 1978. 5. S. M. Ross, "Stochastic Processes," Wiley, 2 nd edition, 1996.				