NATIONAL INSTITUTE OF TECHNOLOGY: TIRUCHIRAPPALLI- 620 015

DEPARTMENT OF MATHEMATICS

COURSE OUTLINE TEMPLATE		
Course Title	**Probability Theory and Random Process**	
Course Code	**MAIR 45**	**No. of Credits : 3** **Learning hours : 3**
Department	**ECE**	Section: **B**
Pre-requisites Course Code		**MAIR 21, MAIR 34**
Course Teacher		**Dr. R.Pandiya Raj** **panrajmaths@gmail.com** **rpraj@nitt.edu** **9344764070** **8870782541**

Course type - General Institute requirements

COURSE OVERVIEW

Studying Probability, Conditional probability, indepent events, Bayes' Theorem, Random variables, distributions and density function, independent random variable, moments, characteristic function, Chebyshev and Schwartz inequalities with many examples and problems.

Studying Random process, stationarity and ergodicity, Strict sense, wide sense stationary process, spectral representation, Wiener Khinchine theorem with many examples and problems.

Studying Gaussian process, Poisson Process, and low pass and Band pass noise representations with many examples and problems.

COURSE OBJECTIVES

Studying major theorems and inequalities strongly and acquiring cut edge knowledge in Probability through solving problems with many combinatorial, algebraic and geometrical techniques.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes(PO)
completion of the course, students are able to 1. **solve almost all type of problem in probability.** 2. **understand the axiomatic formulation of modern Probability Theory and think of random variables as an intrinsic need for the analysis of random phenomena.** 3. **characterize probability models and function of random variables based on single and multiple random variables.** 4. **evaluate and apply moments and characteristic functions and understand the concept of inequalities and probabilistic limits.** 5. **understand the concept of random processes and determine covariance and spectral density of stationary random processes.** 6. **demonstrate the specific applications to Poisson and Gaussian processes and representation of low pass and band pas noise model** 7. **approximate the real problems using stochastic process and deduce results.**	

COURSE TEACHING AND LEARNING ACTIVITIES

Week	Topic	Mode of Delivery
Week- 1	1. Introduction to Probability and problems. 2. Basic theorems and related problems. 3. Solving more problems on probability.	Chalk and Talk/ Slide presentation.
Week-2	1. Probability spaces and problems. 2. Joint and conditional probabilities. 3. Problems.	
Week -3	1. Independent events. 2. Bayes' theorem. 3. Examples and problems.	Chalk and Talk/ Slide presentation.
Week – 4	1. Introduction to Random variables and random vectors. 2. Distributions and density function. 3. Related Problems.	

Week -5	1. Independent random variables. 2. Related Theorems and examples. 3. Problems.	
Week -6	1. Functions of two random variables. 2. Related Theorems and examples. 3. Problems.	
Week -7	1. Mean and expectation of a random variable. 2. Moments and characteristic functions. 3. Related theorems and examples.	
Week -8	1. Problems related characteristic function. 2. Chebyshev and Schwartz inequalities. 3. Related concepts and theorems and Problems.	
Week -9	1. Introduction to random process. 2. Stationarity and ergodicity. 3. Problems.	
Week -10	1. Strict sense and wide sense stationary processes. 2. Covariance functions and their properties. 3. Problems.	
Week -11	1. Spectral representation. 2. Wiener Khinchine theorem. 3. Problems.	Chalk and Talk/ Slide presentation
Week -12	1. Gaussian Processes. 2. Processes with independent increments. 3. Problems.	
Week -13	1. Poisson Processes. 2. Low pass and Band pass noise representations. 3. Problems.	

COURSE ASSESSMENT METHODS

S.No.		Week/Date	Duration	% Weightage
1.	**First Assessment (Descriptive-**from first two units)	7th week	1 Hour	20%
2.	**Second Assessment (Descriptive-** from third and fourth units)	13th week	1 Hour	20%
3.	**Reassessment for the absentist. (Descriptive-** from first four units)	14th week	1 Hour	20%
4.	**Third assessment (objective type questions)**	14th week	1 Hour	10%
5.	**Final Assessment (Descriptive-**from all the units)		3 Hours	50%
	Total : 100 Marks			

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

Reference Books

1. Davenport, Probability and Random Processes for Scientist and Engineers, McGraw-Hill.
2. Papoulis,A, Probability, Random variables and Stochastic Processes, McGraw Hill, 2006.
3. E. Wong, Introduction to Random Processes, Springer Science & Business Media, 2013
4. W.A.Gardner, Introduction to Random Processes, (2/e), McGraw Hill,1990.
5. H.Stark& J.W. Woods, Probability, Random Processes and Estimations Theory For Engineers, (2/e), Prentice Hall,1994.
6. Shard S. Sane, Combinatorial Techniques, Hindustan Book Agency, 2013.
7. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Sons, Eleventh Revised Edition, June 2002.

http://math.stackexchange.com/ website to discuss and learn more mathematics.

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

1. Feedback from students during class committee meeting.
2. Anonymous feedback through questionnaire (as followed previously).

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

1. Absentees of the first assessment or the second assessment can only write the reassessment test.
2. To appear the final assessment exam, students should have at least 75% of class attendance.
3. In case, the students who have 65% to 74% attendance, with the genuine reasons can be allowed to appear the final assessment exam prior to providing the proof within the stipulated time.
4. Those students who have less than 65% of class attendance are not allowed to appear the final assessment examination.
5. Failure students with more than 64% class attendance(excluding OD, medical leave) have to undergo formative assessment.
6. Students with less than 65% class attendance(excluding OD, medical leave) have to redo the course.
7. $Minimum\left\{\frac{class\ average}{2}, \frac{Maximum\ mark}{3}\right\}$ **is the pass mark.**

ADDITIONAL COURSE INFORMATION

Faculty is available for discussion after the class hours at the Department on the first floor of Lyceum. Room No. 218. Faculty can also be contacted over phone: 88707 82541.

FOR SENATE'S CONSIDERATION

Course Faculty _____ 04/01/17 **CC-Chairperson** _____ 4/1/2017 **HOD** _____ 4/1/2018