Probability Theory & Random Processes
EE5817

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Outline

AI5002: 2 Credit

- Introduction to Probability, Definitions, Combinatorics
- Joint/conditional probabilities, independence, Bayes' rule
- Continuous and discrete random variables, CDF, PDF, PMF
- Moments, Joint/conditional distributions, Function of a random variable
- Function of two random variables, Joint moments
- Random vector, Vector-space representation
- Elements of detection and estimation theory, Moment-generating and characteristic functions
- Bounds and approximations, Sequence of random variables, convergence, Central limit theorem

AI5003: 1 Credit

- Random process, realizations, discrete and continuous time processes
- Mean, autocorrelation and autocovariance functions
- Stationarity, SSS, WSS, function of a process
- Ergodicity, Spectral representation of process, power spectral density
- Spectral factorization theorem

Course Codes, Conflicts, Prerequisite

- EE5817 (3 credits) = AI5002 (2 credit) +AI5003 (1 credit)
- AI5003 (1 credit) = SM5023 (1 credit)
- EE2310 (1 credit) = AI2003 (1 credit)
- EE2310 = AI5003 - 'Paper Presentation'
- Conflicts: EE1370, AI5002, AI1102, EE5817 significant overlap
- Conflicts: EE2310, AI2003, AI5003, SM5023 significant overlap
- Prerequisite: EE1370/AI1102 →EE2310/AI2003
- Prerequisite: AI5002→AI5003

Resources

- Google Classroom Code: x5jimbk
- Video Lectures:
  https://nptel.ac.in/courses/111/102/111102111/
  https://nptel.ac.in/courses/117/105/117105085/
- Online Courses:
  https://projects.iq.harvard.edu/stat110/youtube
  https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-151-probability-and-statistics-in-engineering-spring-2005/lecture-notes/
- Recorded Lectures
- Slides, Lecture notes, Practise Questions
- Contact Hours with TAs and Instructor

Class Timings

- Weekly Class 1, Monday: 16:00-17:30
- Weekly Class 2, Thursday: 14:30-16:00
- Weekly Contact Session: To be scheduled per group
- *Group size to be determined after registration deadline ends*

The Rubric

Evaluation Methodology	**Tentative %**
Google Form based Weekly Quiz (MCQ+Short Answer Type)	40-60%
Live-video based Viva-Voce	10-20%
In-class short exercises, Attendance, participation	10-20%
Programming assignments	10-20%
Paper Presentation (only for AI5003, SM5023, and EE5817)	10-20%

Questions