

Department of Electrical and Computer Engineering
North South University (NSU)

Course Outline

EEE 520: Stochastic signals and systems

Instructor: Md. Shahriar Karim, Assistant Professor, ECE Department, NSU

Course Description:

The course introduces probability, stochastic variables (random variables), and random signals with a reasonably rigorous approach. The first few lectures concentrate on probability and random variables, which are later used to study conditional probabilities, expectations, characteristic functions, moment-generating functions, etc. Later, a few classes will focus on critical topics for stochastic applications, such as the Central Limit Theorem, Laws of Large Numbers, and convergence concepts. Finally, the course includes the theory and application of wide-sense stationary process (WSS) and concentrates further on the Linear Time-Invariant (LTI) system with random inputs. Overall, the course aims to provide students a fundamental understanding of the topics required to analyze stochastic phenomena in many engineering applications.

Course Credit: 3 credits

Text Book:

A. Papoulis; Probability, Random Variables and Stochastic Processes, Mc Graw Hill, 3rd Edition

References:

- S. M. Ross: Introduction to Probability Models, 4th Edition, Academic Press, 1989
- Albert Leon-Garcia, Probability and Random Processes for Electrical Engineers, 3rd Edition

Lecture Plan:

| Topic | Time |
|---|-------------------|
| random experiments, probability spaces, conditional probability, statistical independence of events, compound and repeated random experiments, random variables | 3 Lectures |
| probability distributions and density functions of random variables, Expectations, characteristic functions and moment generating functions, multiple random variables defined on a random experiment | 3 Lectures |

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|--|-------------------|
| statistical independence of random variables, correlation, sequences of random variables and stochastic convergence | 2 Lectures |
| the weak law of large numbers, the central limit theorem, Tail bounds of probability | 2 Lectures |
| stochastic processes, stationarity, correlation and covariance functions, power spectral density, Gaussian random processes through linear systems | 2 Lectures |

Assessment Scheme:

| Assessment Tools | Weightage |
|----------------------------------|------------------|
| Attendance and Class Performance | 10% |
| Homework | 10-15% |
| Midterm 1 | 20% |
| Midterm 2 | 20% |
| Final | 30-35% |

Grading Scheme: The class will follow the existing NSU grading policies with 93 and above as **A** grade (excellent). Any score less than 60 would be equivalent to **F** grade.

Course Policies:

This course will strictly follow the "NSU Code of Conduct, Revised- 2018". However, a few important points you all should always remember, and follow, are as below:

- Students should attend class lectures and take necessary notes. Unless specified otherwise, homeworks are generally due at the beginning of the class.
- Failure to attend an exam or failure to submit an assignment on time receives zero except when it is unavoidable because of some genuine emergency (requires proofs). In case of emergency, students should contact the instructor before the exam or before the stipulated date of assignment.
- Copying assignments are strictly prohibited; instead, discussion among students are encouraged. Please note down names of your peer classmates who you discussed during homework assignments. However, as the exams will largely follow the pattern of questions being asked in HW, solving those problems alone would help you during exams.
- Regarding requests for quiz, midterms should be conveyed within the 6 hours of the papers being returned in class.
- Unless the final grade is incorrectly computed, grade will NOT be changed once it is posted. There are no scopes of assigning additional works to improve your final grade.
- No electronic device during exams; if needed, calculator is allowed.