



Philadelphia University
Faculty of Engineering
Department of Communications & Electronics

Course Syllabus

Course Title: Probability and Random Variables and Random Signals	Course code: (650302)
Course Level: 3 rd year	Course prerequisite (s) and/or corequisite (s): Signal Analysis & Processing - (650331)
Lecture Time:	Credit hours: 3 Tutorial: 1 hour/Week

Academic Staff Specifics

Name	Rank	Office Location	Office Hours	E-mail Address

Course module description:

In almost all engineering problems we have to deal with measurements, their variability and interpretation. We also have to deal with uncertainty. Models are constructed to interpret these measurements and to provide solutions to a diverse set of problems ranging from target detection and tracking in radar systems, design and analysis of communication systems, performance evaluation of communication networks, design and evaluation of automatic control systems, design of optical systems, understanding the behavior of the Internet, detection and defense of security attacks on networks, advanced multimedia sensors, speech and image understanding systems. Fortunately through the years a rich set of models and analytical methods have been developed that has proven to be very useful for designing appropriate engineering systems and for solving these problems. They go under the generic name “probabilistic models and methods”.

Course module objectives:

The purpose of this course is to introduce undergraduate students to a set of systematic methodologies and modeling tools for handling uncertainty and variability in engineering problems. Probabilistic models and methods are introduced and emphasized. Primary emphasis is placed on problem solving examples, from which the need for the models and methods emanate. Careful attention is given to tying back models and methods to real measurements and data, thus providing immediate utility to students working in engineering problems, as well as a clear path for testing and validation of the methods and results. A balanced approach and coverage is provided for problems and applications on the one hand and mathematical and analytical models and methods on the other.

Course/ module components:

- **Books (title , author (s), publisher, year of publication)**
 - “Probability, Random Variables, and Random Signal Principles“, Peyton Z. Peebles, 4th edition, McGraw-Hill, Inc, 2001.
- **Support material (s) (vcs, acs, etc).**
- **Study guide (s) (if applicable)**
- **Homework and laboratory guide (s) if (applicable).**

Teaching methods:

Lectures & Course Project..

Learning Outcomes:

A) Knowledge and understanding Skills:

Students will obtain knowledge and understanding of:

- 1) Mathematical tools relevant to communications and electronics systems.
- 2) The methods of developing the communication systems.

B) Intellectual Skills:

The students will acquire and develop the thinking skills that should enable them to:

- 1) Understanding, designing and developing different communication and electronic systems for processing signals and data.
- 2) Analyze and identify the specifications and tools to design typical process control applications, applicable to data communications and its related electronics systems.

C) Practical Skills:

Students will acquire and develop the practical skills that should allow them to:

- 1) Use appropriate numerical and mathematical skills to describe, analyze and solve a problem in electronics or/and communication system.
- 2) Analyze, design, evaluate, system behavior and test electronic or/and communication system using simulation or computer-based tool (engineering software tool).
- 3) Undertake ongoing learning in order to keep up to date in the field on electronics and communication technologies.

D) Practical and subject specific skills (Transferable Skills):

Students will acquire and develop the key transferable skills that will enable them to:

- 1) Manage tasks, and solve problems.
- 2) Think logically and critically.

Assessment instruments:

- Short reports and/ or presentations, and/ or Short research projects
- Quizzes.
- Home works
- Final examination: 50 marks

<u>Allocation of Marks</u>	
Assessment Instruments	Mark
First examination	15%
Second examination	15%

Final examination: 50 marks	50%
Reports, research projects, Quizzes, Home works, Projects	20%
Total	100%

Documentation and Academic Honesty

Submit your home work covered with a sheet containing your name, number, course title and number, and type and number of the home work (e.g. tutorial, assignment, and project).

Any completed homework must be handed in to classroom. After the deadline “zero” will be awarded. You must keep a duplicate copy of your work because it may be needed while the original is being marked.

You should hand in with your assignments:

- 1- A printed listing of your test programs (if any).
- 2- A brief report to explain your findings.
- 3- Your solution of questions.

For the research report, you are required to write a report similar to a research paper. It should include:

- **Abstract:** It describes the main synopsis of your paper.
- **Introduction:** It provides background information necessary to understand the research and getting readers interested in your subject. The introduction is where you put your problem in context and is likely where the bulk of your sources will appear.
- **Methods (Algorithms and Implementation):** Describe your methods here. Summarize the algorithms generally, highlight features relevant to your project, and refer readers to your references for further details.
- **Results and Discussion (Benchmarking and Analysis):** This section is the most important part of your paper. It is here that you demonstrate the work you have accomplished on this project and explain its significance. The quality of your analysis will impact your final grade more than any other component on the paper. You should therefore plan to spend the bulk of your project time not just gathering data, but determining what it ultimately means and deciding how best to showcase these findings.
- **Conclusion:** The conclusion should give your reader the points to “take home” from your paper. It should state clearly what your results demonstrate about the problem you were tackling in the paper. It should also generalize your findings, putting them into a useful context that can be built upon. All generalizations should be supported by your data, however; the discussion should prove these points, so that when the reader gets to the conclusion, the statements are logical and seem self-evident.
- **Bibliography:** Refer to any reference that you used in your assignment. Citations in the body of the paper should refer to a bibliography at the end of the paper.

• Protection by Copyright

1. Coursework, laboratory exercises, reports, and essays submitted for assessment must be your own work, unless in the case of group projects a joint effort is expected and is indicated as such.
2. Use of quotations or data from the work of others is entirely acceptable, and is often very valuable provided that the source of the quotation or data is given. Failure to provide a source or put quotation marks around material that is taken from elsewhere gives the appearance that the comments are ostensibly your own. When quoting word-for-word

from the work of another person quotation marks or indenting (setting the quotation in from the margin) must be used and the source of the quoted material must be acknowledged.

3. Sources of quotations used should be listed in full in a bibliography at the end of your piece of work.

• **Avoiding Plagiarism.**

1. Unacknowledged direct copying from the work of another person, or the close paraphrasing of somebody else's work, is called plagiarism and is a serious offence, equated with cheating in examinations. This applies to copying both from other students' work and from published sources such as books, reports or journal articles.
2. Paraphrasing, when the original statement is still identifiable and has no acknowledgement, is plagiarism. A close paraphrase of another person's work must have an acknowledgement to the source. It is not acceptable for you to put together unacknowledged passages from the same or from different sources linking these together with a few words or sentences of your own and changing a few words from the original text: this is regarded as over-dependence on other sources, which is a form of plagiarism.
3. Direct quotations from an earlier piece of your own work, if not attributed, suggest that your work is original, when in fact it is not. The direct copying of one's own writings qualifies as plagiarism if the fact that the work has been or is to be presented elsewhere is not acknowledged.
4. Plagiarism is a serious offence and will always result in imposition of a penalty. In deciding upon the penalty the Department will take into account factors such as the year of study, the extent and proportion of the work that has been plagiarized, and the apparent intent of the student. The penalties that can be imposed range from a minimum of a zero mark for the work (without allowing resubmission) through caution to disciplinary measures (such as suspension or expulsion).

Course/module academic calendar

week	Basic and support material to be covered	Homework/reports and their due dates
(1)	Sets	
(2)	Review of probability of sets	
(3)	Random variables	HW#1
(4)	Random variables and probability and distribution function	
(5)	Expectation	HW#2
(6) First examination	Moments and some problems solutions	
(7)	Multiple random variables	
(8)	Distribution and density of multiple random variables	HW#3
(9)	Operations on random variables	

(10)	Random process	
(11) Second Exam	Spectral analysis of random process	HW#4
(12)	Power density spectrum and Random noise	
(13)	Random process and linear systems	
(14)	Convolution	
(15) Specimen examination (Optional)	Course Project Discussion	
(16) Final Examination	-----	

Expected workload:

On average students need to spend 2 hours of study and preparation for each 50-minute lecture/tutorial.

Attendance policy:

Absence from lectures and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

Course references

Books:

- 1) "A First Course in Probability", Sheldon Ross, Prentice hall, 2001.
- 2) "Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers", R.D. Yates and D.J. Goodman, John Wiley & Sons, 2004.
- 3) "Fundamentals of Applied Probability Theory", A. Drake, McGraw Hill, 1967.