

# ECE316 Probability and Random Processes Winter 2011

**Course website:** <http://www.ece.uwaterloo.ca/~mazum/ECE316-2011>

**Instructor:** Prof. R. Mazumdar, e-mail: mazum@ece.uwaterloo.ca, phone: Ext 37444 Office: EIT 4011

Office hours: Wed-Th 3.30-4.30 pm. I will hold help sessions before the midterm and final exams with times agreed upon by consent.

**TA:** There are two TAs associated with the course:

Zhang, Haotian M e-mail: h223zhan@uwaterloo.ca

Zhou, Yuhang M e-mail: y14zhou@engmail.uwaterloo.ca

**Schedule:** Classes:

Normal lectures : Time 9:30-10:20 TWF Room RCH 307

There will be no regular lectures during the week of Jan 17-21 and during Reading Week : Feb. 21-25. To make up the lectures all additional lectures will be used on the following days and times:

Additional lecture times:

Jan 6 9.30-10.20 in RCH 307

Jan. 20 9.30-10.20 in RCH 307

Feb. 3 9.30-10.20 in RCH 307

Feb. 17 9.30-10.20 in RCH 307

Mar. 10 9.30-10.20 in RCH 307

Mar. 24 9.30-10.20 in RCH 307

Tutorials:

TUT 101 Time 15:30-16:20 T Room DWE 3522A

TUT 102 Time 14:30-15:20 T Room DWE 3517

TUT 103 Time 14:30-15:20 Th Room DWE 3517

**Pre-requisites:** Algebra and Calculus

## Course outline

- Review of basic combinatorial analysis: Counting, permutations, combinations, identities. Introduction and overview of course.
- Introduction to probability: Axioms, sample spaces, events, and set operations. Sample spaces and probabilities. (2 lectures).

- Independence and conditioning: Independence, conditional probabilities, law of total probability, Bayes' formula. (3 lectures)
- Random variables and distributions: Expectation, moments, common distributions (4 lectures)
- Joint distributions and jointly distributed random variables: Sums of independent random variables, conditional distributions (4 lectures)
- Expectations and their properties: Moments, moment generating functions, characteristic functions, conditional expectation and its properties, jointly Gaussian (Normal) random variables. (4 lectures).
- Sums of random variables. Limit theorems: Probability inequalities, Central Limit Theorem (CLT), Laws of Large Numbers, simple convergence ideas. (6 lectures)
- Introduction to random processes: Classification. Examples: Bernoulli, Poisson process, wide-sense stationary process. Spectral density. (6 lectures)

**Course text:** There is a required course text. It is a well written book and well worth your investing in it.

A. H. Haddad, *Probabilistic Systems and Random Signals*, Pearson Prentice Hall, 2006, ISBN 0-13-009455-2

You can also use the old text for the course except it is not very good for the last part of the course related to random processes. It is a book that is more detailed and more suited for discrete probability.

S. Ross, *A first course in probability*, 8th Edition, Pearson Prentice Hall 2010.

There are many other good books that deal with the material. Another book that I think is well written and covers the material is:

*Introduction to probability*, D. P. Bertsekas and J. N. Tsitsiklis, Athena Scientific , 2002. ISBN 1-886529-40-X. This is an excellent book for further reading and understanding some of the material.

**Note:** I will indicate the relevant chapters in the first two books as the lectures progress.

## Course evaluation

- Weekly problem sets will be given out. They will be posted on the web at the beginning of the week. It will be your own interest to try to work on the problem sets yourselves. Solutions to selected problems will be discussed in the tutorials and posted on the website. **For this reason it is in your interest to attend your tutorial section. There will be a midterm examination on:**

Feb. 16, 2011 08:30-09:50 in RCH-211/307

- **Marks break-up:** Midterm 40%, Final Exam 60%.

## Additional notes

- **Be sure to check the website for up-to-date course information and announcements.**
- All exams will be closed book. No calculators or summary sheets will be allowed. The relevant formulae will be provided on the exam paper.
- If you miss a midterm without a verifiable and valid reason there will be no make-up exam offered.
- It is important to attend the tutorial sections.

## Academic Dishonesty

The ECE faculty expect every student to practice honourable and ethical behavior both inside and outside the classroom. Any actions that might unfairly improve a student's score on graded work or examinations will be considered cheating and will not be tolerated. Examples of cheating include (but are not limited to):

- Sharing results or other information during an examination.
- Bringing forbidden material or devices to an examination.
- Working on an exam before or after the official time allowed.
- Requesting a re-grade of answers or work that has been altered.
- Representing as your own work anything that is the result of the work of someone else or material taken from elsewhere (the web) without proper attribution.

**Cheating on an exam will result in a failing grade for the entire course.** Please note that after the exam papers are graded, they will be copied; therefore, requesting a re-grade of an exam which has been altered will automatically result in a failing grade for the course. All occurrences of academic dishonesty will be reported to the Associate Chair for Undergraduate Studies of ECE and the Faculty. I will be the final arbitrator as to whether a case will be referred to the Associate Chair.

If there is any question as to whether a given action might be construed as cheating, please see the professor or the TA before you engage in any such action.