ECE 7250 INFORMATION THEORY AND APPLICATIONS

COURSE OUTLINE – WINTER 2015

COURSE DESCRIPTION: This course covers the basic concepts in information theory, including entropy and related measures of information, lossless data compression, channel capacity, differential entropy, and rate-distortion theory.

COURSE OBJECTIVE: Information theory deals with the “laws of nature” governing the transmission, storage, and processing of information. It establishes fundamental limits of communication and provides clues on how to design systems which can approach these limits. The objective of this course is to understand such fundamental results and their implications in designing optimal communication systems (also applicable to any information processing system).

PRE-REQUISITES: Basic probability theory, random variables and random processes, undergraduate level signal processing background.

CONTACT HOURS: 3 lecture hours/week.

COURSE CONTENT: Various measures of information for discrete sources, lossless source coding and source coding theorem, capacity of noisy channels and channel coding theorem, generalization to continuous sources, Gaussian channel, fading channel, rate-distortion theory (lossy source coding), and (time permitting) an overview of network information theory.

HOMEWORK: Assignments to be handed-in for marking and grading.


EVALUATION: Your final course grade is determined by your performance in assignments, term test, and a final examination. The weighting of each of these components is as follows:

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<tr>
<th>COMPONENT</th>
<th>VALUE</th>
<th>TOTAL</th>
<th>DETAILS / ADDITIONAL INFO</th>
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<tbody>
<tr>
<td>Homework/Assignments</td>
<td>30%</td>
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<tr>
<td>Project</td>
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<td>In class presentation and a written report</td>
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<td>Final Examination</td>
<td>50%</td>
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<td>In-class, closed-book, 3 hours</td>
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<td>TOTAL</td>
<td>100</td>
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INSTRUCTOR INFO:
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Office Hours: By appointment.
REQUIREMENTS/REGULATIONS

- **Student Responsibilities**: It is the responsibility of each student to contact the instructor if he/she is uncertain about his/her standing in the course and about his or her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with incomplete term work, deferred examinations, and attendance and withdrawal.
  - **Lectures**: Attendance at lectures is essential for successful completion of this course. Students must satisfy each evaluation component in the course.

**ACADEMIC INTEGRITY**:

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations and Requirements of the University of Manitoba, Section 7.1, students are reminded that plagiarism* or any other form of cheating is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university) regardless of media

- examinations
- assignments
- laboratory reports
- term exams

A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty

* **Plagiarism**: to steal and pass off (the ideas or words of another) as one's own; use (another's production) without crediting the source