ECE 4850-T01: Stochastic Processes for Engineers
Course Outline – Fall Term 2014

Course Objectives
1. Understand stochastic process as relates to statistics
2. Understand different situations in ECE where stochastic processes appear
3. Learn to mathematically represent basic real life stochastic processes
4. Learn the mathematical and applied probability tools for analyzing stochastic processes
5. Learn to use statistics in estimation and their applications in ECE

Prerequisites
STAT 2220 Statistics for Engineers

Course Content
The following topics will be covered:
1. Getting started with probability: A very quick review (1 hour)
2. Review of Random Variables (4 hours)
3. Random vectors (N>=2 random variables) (4 hours)
4. Sums of random variables (2 hours)
5. Parameter estimation using sample mean (2 hours)
6. Hypothesis testing (3 hours)
7. Estimation of random variables (4 hours)
8. Stochastic processes (6 hours)
9. Markov chains (9 hours)
10. Random signal processing (4 hours)(To be covered only if time permits)

Accreditation Units
Mathematics: 80%
Natural Science: 0%
Complementary Studies: 0%
Engineering Science: 20%
Engineering Design: 0%

Web Page
Course material will be posted on JUMP: https://jump.umanitoba.ca/cp/login/

Textbook

Other References
None

Evaluation Details
The final course grade is determined by the student’s performance and to be determined later.

Mid-Term
Thursday, October 23, 2014 (in class)
Instructor
Prof. A. S. Alfa
Room: E3-504A EITC
Telephone: (204) 474-8789
Email: attahiru.alfa@umanitoba.ca

Office Hours
Tuesdays and Thursdays: 3:00-4:00 PM

Teaching Assistants
TBA

Voluntary Withdrawal Date
Wednesday, November 12, 2014

Requirements/Regulations
- Attendance at lectures and laboratories is essential for successful completion of this course. Students must satisfy each evaluation component in the course to receive a final grade.
- It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or 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, attendance and withdrawal.
- No programmable devices or systems (such as calculators, PDAs, iPods, iPads, cell phones, wireless communication or data storage devices) are allowed in examinations unless approved by the course instructor.

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 in examinations, assignments, laboratory reports or term tests is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty.

Learning Outcomes
1. Understand stochastic process as relates to statistics
2. Understand different situations in ECE where stochastic processes appear
3. Learn to mathematically represent basic real life stochastic processes
4. Learn the mathematical and applied probability tools for analyzing stochastic processes
5. Learn to use statistics in estimation and their applications in ECE
## Expected Competency Level **

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Attribute*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

*Attributes:
- A1 A knowledge base for engineering
- A2 Problem analysis
- A3 Investigation
- A4 Design
- A5 Use of engineering tools
- A6 Individual and team work
- A7 Communication skills
- A8 Professionalism
- A9 Impact of engineering on society/environment
- A10 Ethics and equity
- A11 Economics and project management
- A12 Life-long learning

**Competency Levels:**
- 1 - Knowledge (Able to recall information)
- 2 - Comprehension (Able to rephrase information)
- 3 - Application (Able to apply knowledge in a new situation)
- 4 - Analysis (Able to break problem into its components and establish relationships)
- 5 - Synthesis (Able to combine separate elements into whole)
- 6 - Evaluation (Able to judge of the worth of something)

### Student Contact Time (Hrs)

- **Lectures:** 3 hrs lecture/week × 13 weeks/term = 39 hrs
- **Laboratories:** 1.5 hrs laboratory × 5 weeks = 7.5 hrs
- **Tutorials:** 1.5 hrs tutorial × 5 weeks = 7.5 hrs

We have a total of five 2hours and 55mins slots allocated for labs and tutorials.

### Evaluation

<table>
<thead>
<tr>
<th>Component</th>
<th>Value (%)</th>
<th>Methods of Feedback *</th>
<th>Learning Outcomes Evaluated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes</td>
<td>15</td>
<td>S,F</td>
<td>1,2,3,4</td>
</tr>
<tr>
<td>Laboratories</td>
<td>10</td>
<td>S,F</td>
<td>3,4,5</td>
</tr>
<tr>
<td>Mid-Term Tests</td>
<td>25</td>
<td>S,F</td>
<td>1,2,3</td>
</tr>
<tr>
<td>Final Examination</td>
<td>50</td>
<td>S</td>
<td>1,2,3,4,5</td>
</tr>
</tbody>
</table>

*Methods of Feedback: F - formative (written comments and/or oral discussion), S - summative (number grades)