Faculty of Engineering, Architecture and Science

Department of Electrical and Computer Engineering

BME802: Human Computer Interface

**Compulsory Texts:**

**Reference Text:**


[www.biopsychology.org/norwich/ispt.htm](http://www.biopsychology.org/norwich/ispt.htm)

**Calendar Description:**
Principles underlying the design, evaluation and implementation of interactive computing systems as well as the major research topics associated with such systems. Technical breakdown of interfaces that are multi-media based front-ends to complex networks. Graphical user interfaces will be introduced along with the related physiological and human factors issues. Design of interfaces using virtual reality, the WorldWideWeb, and other advanced development tools. Commonly integrated media such as video, graphics, and audio capabilities will be examined. User-centered technology will be a primary theme using the design of web pages and medical device design as hands-on applications.

**Learning Objectives:**
At the end of this course, the successful student will be able to:
1. Evaluate progress and modify designs (4a: Design Process Overview)
2. Analyze data to make decisions (5b: Interpreting and analyzing data)
3. Make concise technical presentations to a peer group (7b: Oral)
4. Application of Public Interest in Decision Making (8a: Public Interest)
5. Obtain and use literature in the field (12b: Professional development)

Note: Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board. For more information, see: [http://www.feas.ryerson.ca/quality_assurance/accreditation.pdf](http://www.feas.ryerson.ca/quality_assurance/accreditation.pdf)

**Course Organization:**
- 3 hours of lecture per week for 13 weeks
- 2 hours of lab/tutorial per week for 12 weeks
- 3 Lab/tutorial sections of maximum 20 students
- 1 Teaching Assistant

**Course Evaluation:**
- Midterm exam: 20%
- Design project: 10%
- Lab reports: 20%
- Research Project: 10%
- Final exam: 40%
- Total: 100%
Course Project  In the project, the students are expected to research a human-computer interaction technology of their choice, and produce a Formal Report and give a Presentation to the class. The project consists of a field study in a retail or entertainment venue, technology description, and explanation of methodology and underlying principles. Scientific references are required. An original design component is required such as quantitative evaluation of alternative designs, an experiment, user satisfaction surveys, or improved designs.

Course Content

<table>
<thead>
<tr>
<th>Chap.</th>
<th>hours</th>
<th>Topic, description</th>
</tr>
</thead>
</table>
| 1     | 3     | Introduction to Course and Outline  
Human-in-the-loop Systems  
Definitions, Design process  
Field work: Technology evaluation |
| 2     | 3     | Technology history and evolution  
Introduction to Psychophysics  
Signal Detection Theory  
Stimulus-Response Matrix  
Criteria, Sensitivity, Decision Strategy |
| Norwich, Chau and Fairley | 3 | Eye Movement applications  
Human Perception: Entropy Theory  
Shannon, Norwich  
Information, Channel Capacity  
Experimental paradigms |
| 3     | 3     | Hearing and Sound Cues  
Attention, Detection, Display Design  
Focused, Divided, Selective Attention  
Target Search, Vigilance  
Field of View, Proximity, Features Review |
| 4,5   | 3     | Analog vs. Digital Displays  
Colour, Dimensions  
Data Displays  
Mental Models  
Emergent Features  
Review  
Design Project Assignment |
| 3     | **MIDTERM** |
| Chau and Fairley | 3 | Depth Perception  
2D vs. 3D Displays  
Virtual and Augmented Reality  
Cross-Modality Displays  
Orientation and Motion  
Advanced Displays and Navigation |
| 6     | 3     | Written and Spoken Language  
Icons, Codes  
Processing: Memory, Learning, Training  
Working vs. Long Term Memory  
Encoding, Storage, Retrieval  
Verbal vs. Spatial Mapping  
Chunking |
| 7     | 3     | Running Memory  
Capacity, Time Sharing, Interference  
Training Strategies, Mental Model |
| 8     | 3     | Processing: Decision Making |
Human Statistical Analysis Capability  
Design Guidelines and Aids  

<table>
<thead>
<tr>
<th>Week</th>
<th>Title</th>
</tr>
</thead>
</table>
| 11,12 | Processing: Attention, Stress, Human Error  
Resource Allocation Theories  
Performance Operating Characteristic  
Prediction of Performance  
Workload Measurement |
| 9,10 | Choice of Action: Uncertainty  
Reaction Times; Speed vs. Accuracy  
Experimental Techniques  
Shared Supervisory Control  
Applications |
| 3 | Review |

Laboratory/Tutorials

<table>
<thead>
<tr>
<th>Week</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-4</td>
<td>Multimedia Instructions</td>
</tr>
<tr>
<td>5-7</td>
<td>Game Evaluation</td>
</tr>
<tr>
<td>8-10</td>
<td>Website Evaluation</td>
</tr>
<tr>
<td>11-13</td>
<td>User Interface Development</td>
</tr>
</tbody>
</table>

Important Notes

1. All of the required course-specific written reports will be assessed not only on their technical/academic merit, but also on the communication skills exhibited through these reports.

2. Should a student miss a mid-term test or equivalent (e.g. studio or presentation), with appropriate documentation, a make-up will be scheduled as soon as possible in the same semester. Make-ups should cover the same material as the original assessment but need not be of an identical format. Only if it is not possible to schedule such a make-up may the weight of the missed work be placed on the final exam, or another single assessment. This may not cause that exam or assessment to be worth more than 70% of the student’s final grade. If a student misses a scheduled make-up test or exam, the grade may be distributed over other course assessments even if that makes the grade on the final exam worth more than 70% of the final grade in the course.

3. Students who miss a final exam for a verifiable reason and who cannot be given a make-up exam prior to the submission of final course grades, must be given a grade of INC (as outlined in the Grading Promotion and Academic Standing Policy) and a make-up exam (normally within 2 weeks of the beginning of the next semester) that carries the same weight and measures the same knowledge, must be scheduled.

4. Medical or Compassionate documents for the missing of an exam must be submitted within 3 working days of the exam. Students are responsible for notifying the instructor that they will be missing an exam as soon as possible.

5. Requests for accommodation of specific religious or spiritual observance must be presented to the instructor no later than two weeks prior to the conflict in question (in the case of final examinations within two weeks of the release of the examination schedule). In extenuating circumstances this deadline may be extended. If the dates are not known well in advance because they are linked to other conditions, requests should be submitted as soon as possible in advance of the required observance. Given that timely requests will prevent difficulties with arranging constructive accommodations, students are strongly encouraged to notify the instructor of an observance accommodation issue within the first two weeks of classes.

6. The results of the first test of mid-term test will be returned to students before the deadline to drop an undergraduate course in good Academic Standing.

7. Students are required to adhere to all relevant University policies including the Student Code of Academic Conduct (www.ryerson.ca/senate/policies/pol60.pdf) and Non-Academic Conduct (www.ryerson.ca/senate/policies/pol61.pdf)

9. Students are required to obtain and maintain a Ryerson Matrix e-mail account for timely communications between the instructor and the students.

10. Any changes in the course outline, test dates, marking or evaluation will be discussed in class prior to being implemented.