SYDE 162 Human Factors in Design
System Design Engineering,
University of Waterloo
Course Outline (Spring 2013)

COURSE OVERVIEW

SYDE 162, Human Factors in Design, is the second course in the SYDE Design course sequence. We will extend learning from SYDE 161 Introduction to Design and SYDE 101 Introduction to Systems Design Engineering by focusing on user/workplace requirements as they apply to the design of human-machine systems. In Human Factors in Design we will introduce students to the discipline of human factors engineering and how it informs design decisions to improve design outcomes from the perspective of overall safety and performance.

MEETING TIMES & INSTRUCTIONAL METHODS

In-Class Sessions
Participation Lectures/Workshops: Mondays & Fridays 12:30 pm – 2:20 pm (E5 6008)
Case Studies & Q/A: Wednesdays 1:30 pm – 2:20 pm (E5 6008)

REQUIRED MATERIALS

Textbooks (for Open-Book Exams)

Design Materials: Students will be expected to come to class with paper, pens, and sticky notes for completing in-class activities. Instructors may also specify the use of mobile phones, digital cameras, and laptops for some activities.

Supplemental Materials to be posted on UW LEARN: UW LEARN is the official site for posting of materials related to SYDE 162. Prof MacGregor does not authorize the posting of SYDE 162 materials on other sites. Each student is responsible for his/her own learning which includes staying current with postings on LEARN.

INSTRUCTIONAL TEAM

Professor: Prof. C. MacGregor, Ph.D, CCPE
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j56yan@uwaterloo.ca

SYDE 162 Spring 2013/CGM (06/05/13)
INSTRUCTIONAL AND ASSESSMENT METHODS
Students will be exposed to human factors engineering concepts and analytical techniques relating to user experience/usability design, physical workplace design, and complex system design through in-class lectures, workshop-style skill development, case studies, class discussion, and assignments done by individuals and teams.

Intended Learning Objectives & Assessments:
Expand design skill sets for identifying user requirements in human-machine systems by incorporating learning from areas of research & development, cognitive ergonomics, physical ergonomics, and user experience.

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<th>Team Projects</th>
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<tr>
<td>Weekly</td>
<td>1) Product Usability</td>
<td>1) Weeks 1-5</td>
<td>Week of June 10-14</td>
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<td>2) Workstation</td>
<td>1) Redesigns: June 4-8</td>
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<td>2) Weeks 7-10</td>
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<td>2) Redesigns: July 22-26</td>
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Intended Learning Objectives

1. Define and describe key HFE concepts that are fundamental to HFE design principles and guidelines

   On-line & In-class activities (submitted) [F]

   Part A (multiple choice/short answer) [F/S]

   Part A (multiple choice/short answer) [S]

2. Evaluate user requirements in the context of user and workplace characteristics

   On-line & In-class activities (submitted) [F]

   Project 1 (Usability); Lab 1-5 (Workstation) [F/S]

   Part C Design scenario [F/S]

   Part C & D Design scenario(s) [S]

3. Apply HFE concepts to case studies and real-world design problems

   On-line & In-class activities (submitted) [F]

   Part B Case Study analysis [F/S]

   Part B Case Study/News Article analysis [S]

4. Propose and critique redesign solutions for case studies and real-world problems based on HFE methods

   On-line & In-class activities [F]

   Project 1 (Usability); Lab 1-5 (Workstation) [F/S]

   Part C Design scenario [F/S]

   Part C & D Design scenario(s) [S]

5. Propose basic user testing protocols

   TCPS-2CORE [S]

   Lab 5 – User Requirements & Ethics (w Project 1 Team) [S]

Course Grade Weighting

10% 35% 25% 30%
P1 (15%) Lab 1-5 (20%) (If FE>MT re-weight 15%) (If FE>MT re-weight 40%)

[F = Formative Feedback; S = Summative Feedback]

Individual Participation Submissions:
- TCPS-2 CORE Tutorial
  - 4% = 4/4 if done by end of Week 2; 3/4 if after Week 2 but before midterm; 2/4 if after midterm but before Week 10; 1/4 if after Week 10 but before Final Exam.
- Individual Submissions
  - 6% (each opportunity worth 0.5) = 8 opportunities before midterm; 8 opportunities after midterm.
EXPECTATIONS AND TIPS FOR SUCCESS:

Academic Standards and Workload: Appropriate professional tone and academic referencing are expected on all student submissions and examinations (open-book). This is to maintain academic integrity, as well as to help build strong professional practice skills. SYDE students should be aware that to create design course grading rubrics, we apply the general grading rubric principles that appear in SYDE 000 Style Manual (students should have had exposure to the SYDE Style Manual in SYDE 161 and SYDE 101). A typical SYDE course should require 8-10 hours per week. In SYDE 162 that means 5 hours in-class time plus 3-5 hours of out-of-class to work on readings, pair assignments, and team projects. This time may vary depending on how quickly you read and comprehend assigned course materials.

Class Room Protocol: We are all expected to know and follow the University of Waterloo’s policies relating to Academic Integrity and Inclusive Classroom Environments. Students are expected to be courteous and respectful of others, and mindful that a classroom is a shared working space with the primary goal of learning course material. Unnecessary distractions are too be minimized – that includes turning off cell phones and other distracters during lectures and design activities. If for some reason you arrive late then enter through the back door of the classroom and move quietly to the nearest vacant seat when it is appropriate to do so. Laptops can be distracting to those around you. To minimize distractions, laptops are permitted in the back row of the classroom only, unless the instructor has specifically requested use of laptops for an in-class activity.

Course Assignments & Deliverables (Posting, Submissions, and Feedback): Instructions for course assignments and deliverables will be posted in UW-Learn (SYDE 162). Students will upload relevant documents to appropriate electronic dropboxes. As appropriate, feedback to individuals and teams will be provided electronically.

Deadlines and Late Penalties: Course deliverables submitted after the due date will be assigned a grade of zero (0). This penalty may be waived at the discretion of the instructor in the event of extraordinary or special circumstances (with supporting verification/documentation).

Individual Participation Submissions: These are short activities that you submit for participation credit. Each is graded as “1” (reasonable attempt) or “0” (not reasonable or missing). Each participation activity is worth 0.5%. Students may earn up to a maximum of 10% for Participation Activities. Most individual participation activities will be done at random times during in-class sessions. Once the participation activity is asked to be handed in, then that participation opportunity is over.

Team Projects: Team Projects are mandatory in SYDE 162 (2013). For course assignments involving teamwork, the instructor reserves the right to modify team project requirements, and/or remove a student from a team project should circumstances be warranted.

Team Project Participation:
As with any SYDE design course, students are expected to participate and contribute equitably to teamwork/project components. Students with unauthorized absence, lateness, or lack of participation at specified team workshop sessions may have penalties imposed by way of differential grading on marks relating to team-based assignments/projects (up to 45% of the final grade).

Absence Due to Special Circumstances or Illness: Let Dr. MacGregor know in advance if you need to be away due to special circumstances. If the event conflicts with scheduled design activities, then verification of the reason for absence is needed. In the event of illness that prevents attendance or participation in mandatory course activities, a Health Services Verification of Illness form must be completed by an authorized medical practitioner. See http://www.healthservices.uwaterloo.ca/Health_Services/verification.html.

Communication Methods: Most communications regarding SYDE 162 will be done during class sessions. Special announcements will be posted in the “NEWS Update” section on LEARN. Emails sent to students will be done through LEARN, and sent to UW student accounts. In keeping with SYDE practices, students emailing SYDE 162 Instructional team must use their UW email account and include full student name, and student ID number.
Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check www.uwaterloo.ca/academicintegrity/ for more information.]

Discipline: A student is expected to know what constitutes academic integrity (see link above) to avoid committing an academic offence, and to take responsibility for their actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g. plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline www.adm.uwaterloo.ca/infosec/Policies/policy71.htm. For typical penalties check Guidelines for the Assessment of Penalties, www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm.

Grievance: A student who believes that a decision affecting some aspect of their university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4 www.adm.uwaterloo.ca/infosec/Policies/policy70.htm. When in doubt please be certain to contact the department’s administration who will provide further assistance. Useful website: http://arts.uwaterloo.ca/arts/ugrad/academic_responsibility.html

Appeals: A decision made or penalty imposed under Policy 70 (Student Petitions and Grievances) (other than a petition) or Policy 71 (Student Discipline) may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to Policy 72 (Student Appeals) www.adm.uwaterloo.ca/infosec/Policies/policy72.htm.

Note for Students with Disabilities: The Office for Persons with Disabilities (OPD), located in Needles Hall Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require accommodation to lessen the impact of your disability, please register with OPD at the beginning of each academic term.
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<th>MAIN THEMES</th>
<th>Required Readings</th>
<th>MONDAY In-Class Sessions (Activities/Deliverables)</th>
<th>WEDNESDAY (Case Studies/Q&amp;A)</th>
<th>FRIDAY In-Class Sessions (Activities/Deliverables)</th>
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<td>1.</td>
<td>Human Factors &amp; User Requirements</td>
<td>Wickens: Chp 1, 2, 3, Chp 14 (366-369)</td>
<td>MAY 6 Project 1 Launch Project 1 Team Membership</td>
<td>MAY 8 Case Study Section</td>
<td>MAY 10 Project#1 Components Due: 1) Situation of Concern 2) Picture (s) of Current Design 3) Personas 4) User Requirements Participation #3 (in-class)</td>
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<td>Usability Basics (1)</td>
<td>Casey: Set Phasers on Stun</td>
<td>Participation #1 (in-class)</td>
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<td>Cognitive Ergonomics (1)</td>
<td>Casey: Wizard of Wall Street Never Cry Wolf</td>
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<td>Signal Detection &amp; Information Models</td>
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<td>Hazard Analysis (1)</td>
<td>Wickens Chp 14</td>
<td>May 20 VICTORIA DAY – HOLIDAY (NO CLASS)</td>
<td>MAY 22 Case Study Section Business in Bhopal Participation #5 (in-class)</td>
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<td>Casey: Business in Bhopal</td>
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<td>4.</td>
<td>Cognitive Ergonomics (2)</td>
<td>Wickens Chp 7, 8, 9</td>
<td>MAY 27 Project#1 Components Due: 1) Compliance with Principles of Controls &amp; Displays</td>
<td>MAY 29 Case Study Section Rental Car Double Vision Participation #6 (in-class)</td>
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<td>Stimulus to Response; Decision-Making</td>
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<td>5.</td>
<td>Project 1 Presentations &amp; Retrospective</td>
<td>All assigned readings, methods, and concepts</td>
<td>JUNE 3 Project #1 Redesign Presentations</td>
<td>JUNE 7 Project#1 Retrospective</td>
<td>JUNE 8 MIDTERM REVIEW Participation #8 (in-class)</td>
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<td>Midterm Review</td>
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<td>6.</td>
<td>Midterm Week</td>
<td>All assigned readings, methods, and concepts</td>
<td>JUNE 10 MIDTERM WEEK - NO CLASS</td>
<td>JUNE 12 MIDTERM</td>
<td>JUNE 14 MIDTERM WEEK - NO CLASS</td>
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<td>MAIN THEMES</td>
<td>Required Readings</td>
<td>MONDAY In-Class Sessions</td>
<td>WEDNESDAY (Case Studies)</td>
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| 7. June 17+, 19 & 21 | Physical Ergonomics (1) Anthropometrics | Wickens: Chp 10  
Casey: Tigershark! Return for Salyut | **JUNE 17+ (EXTRA CLASS)**  
Lecture:  
- Explanation for Lab-Approach (Weeks 7-13)  
- Meet Lab Group Members  
- Anthropometric Basics  
**Participation # 9 (in-class)** | **JUNE 19**  
Case Study  
- Tigershark!  
- Return for Salyut  
**Participation #10 (in-class)** | **JUNE 21**  
LAB 1 – DUE BY 5:00 PM  
**ANTHROPOMETRICS (4%)**  
- Use measurements and anthropometric tables to establish user requirement specifications for a design scenario |
| 8. June 24, 26 & 28 | Physical Ergonomics (2) Biomechanics | Wickens: Chp 11 | **JUNE 24**  
LECTURE:  
- Biomechanics Basics  
- NIOSH Lifting Equation  
**Participation #11 (in-class)** | **JUNE 26**  
Midterm Exams Returned (tentative) | **JUNE 28**  
CANCELLED (LONG WEEKEND) |
Casey: Leap of Faith; New Fangled Technology | **JULY 1**  
CANADA DAY – HOLIDAY (NO CLASS) | **JULY 3**  
LECTURE:  
- Humans & Automation  
- New Fangled Technology  
- Leap of Faith  
**Participation #12 (in-class)** | **JULY 5**  
LAB 2 – DUE BY 5:00 PM  
**WORK FLOW ANALYSIS (4%)**  
- Use Hierarchical Tasks Analysis and Link Analysis to redesign a workspace |
| 10. July 8, 10 & 12 | Physical Ergonomics (4) Work Demands Analysis | Wickens: Chp 12 & 13 (See Final Exam Concept list for focused readings)  
Casey: Act of God | **JULY 8**  
LECTURE:  
- Physical and Mental Demands  
- Stress & Mental Workload  
- Fatigue & Vigilance  
**Participation #13 (in-class)** | **JULY 10**  
Case Study:  
- Act of God  
**Participations #14 (in-class)** | **JULY 12**  
LAB 3 – DUE BY 5:00 PM  
**WORK DEMANDS ANALYSIS (4%)**  
- Use Ergonomic Checklists to do preliminary assessments of different jobs to identify risks. |
| 11. July 15, 17 & 19 | Macro-Ergonomics (1) Personnel Selection & Training | Wickens: Chp 18 Gamification Reading | **JULY 15**  
LECTURE:  
- Selection & Training Basics  
- Questionnaire Development  
**Participation #15 (in-class)** | **JULY 17**  
LECTURE:  
- Gamification & Training (for Lab 4) | **JULY 19**  
LAB 4 – DUE BY 5:00 PM  
**ETHICS REVIEWS (4%)**  
- Use basic UW ORE forms to describe human factors study. |
| 12. July 22, 24 & 26 | Macro-Ergonomics (2) Organizational Factors & Teams | Wickens: Chp 19  
Casey: Chutes & Ladders  
Silent Warning  
Peppermint Twist | **JULY 22**  
LECTURE:  
- Organizational Basics  
- Collaborative Work  
**Participation #16 (in-class)** | **JULY 24**  
Case Studies:  
- Chutes & Ladders  
- Silent Warning  
- Peppermint Twist | **JULY 26**  
LAB 5 – DUE BY 5:00 PM  
**USER REQUIREMENTS (4%)**  
- Revisiting User Requirements from Project 1. |
| 13. July 29, 30 | Course Wrap-Up | Review assigned readings | **JULY 29**  
LECTURE:  
- Emerging trends in human factors engineering | **JULY 30**  
(Monday schedule to replace holidays)  
FINAL EXAM REVIEW | LAB REVISIONS – Due Monday, July 29 by 11:45 pm |