

UNIVERSITY OF WATERLOO
 Department of Systems Design Engineering
SYDE 642: Cognitive Engineering Methods
Course Syllabus, Winter 2021

1. Course Instructor

Instructor: Dr. Siby Samuel
 Email: siby.samuel@uwaterloo.ca

Online: Thursday 3:00 PM to 4:00 PM or By appointment

2. Course Schedule

Class Hours: Wednesday 2:00 PM – 2:50 PM
 Friday 2:00 PM – 3:50 PM.

Class Venue: All classes will take place Online.

3. Course Outline

This course examines the fundamentals of modern perspectives on design for complex, distributed cognitive and socio-technical systems using current methods in cognitive engineering. We discuss Cognitive Task Analysis, Brunswick’s Lens Model, Naturalistic Decision Making, Contextual Inquiry, Macro-cognitive Methods, Ethnographic methods, Concept Mapping, Cognitive Modeling and their application to different types of human engineering problems. Examples of topic areas may include models and designs for systems with embedded control and for automated systems, design for situation awareness, and the empirical investigation of theoretical predictions for design. Finally, this course discusses aspects of the current research environment in cognitive engineering, with the objective of developing successful future researchers in this area.

Note: The topic schedule may be rearranged as seen fit by the instructor.

4. Tentative Weekly Schedule

<i>Week 1 : Lecture 1</i>	<i>Wed, Jan 13, 2021</i>	Introduction
<i>Week 1 : Lecture 2</i>	<i>Fri, Jan 15, 2021</i>	Situational Awareness Oriented Analysis and Design (ref: Endsley Situation Awareness papers)
<i>Week 2 : Lecture 3</i>	<i>Wed, Jan 20, 2021</i>	Situational Awareness Measurement
<i>Week 2 : Discussion 1</i>	<i>Fri, Jan 22, 2021</i>	Discussion 1

<i>Week 3 : Lecture 4</i>	<i>Wed, Jan 27, 2021</i>	Cognitive Task Analysis
<i>Week 3 : Discussion 2</i>	<i>Fri, Jan 29, 2021</i>	Discussion 2
<i>Week 4 : Lecture 5</i>	<i>Wed, Feb 3, 2021</i>	Naturalistic Decision Making and the Critical Incident Method (book: Klein's Sources of Power)
<i>Week 4 : Discussion 3</i>	<i>Fri, Feb 5, 2021</i>	Discussion 3
<i>Week 5 : Lecture 6</i>	<i>Wed, Feb 10, 2021</i>	Concept Mapping and Macro-cognitive methods (ref: Hoffman papers, Fiore)
<i>Week 5 : Discussion 4</i>	<i>Fri, Feb 12, 2021</i>	Discussion 4
<i>Week 6 :</i>	<i>Wed, Feb 17, 2021</i>	Reading Week
<i>Week 6 :</i>	<i>Fri, Feb 19, 2021</i>	Reading Week
<i>Week 7 : Lecture 7</i>	<i>Wed, Feb 24, 2021</i>	Contextual Inquiry (ref. Holtzblatt)
<i>Week 7 : Midterm Exam 1</i>	<i>Fri, Feb 26, 2021</i>	Exam 1
<i>Week 8 : Term Paper proposal</i>	<i>Wed, Mar 3, 2021</i>	Term paper proposals need to be presented. 10 mins per student followed by Q/A
<i>Week 8: Discussion 5</i>	<i>Fri, Mar 5, 2021</i>	Discussion 5
<i>Week 9: Lecture 8</i>	<i>Wed, Mar 10, 2021</i>	Ecological Psychology and Situated Cognition (reading: Gibson, papers on situated cognition)
<i>Week 9: Discussion 6</i>	<i>Fri, Mar 12, 2021</i>	Discussion 6
<i>Week 10: Lecture 9</i>	<i>Wed, Mar 17, 2021</i>	Distributed Cognition, field work, and ethnographic methods (ref:

		Hutchins, Cognition in the Wild)
Week 10: Discussion 7	<i>Fri, Mar 19, 2021</i>	Discussion 7
Week 11: Lecture 10	<i>Wed, Mar 24, 2021</i>	Embodied Cognition
Week 11: Discussion 8	<i>Fri, Mar 26, 2021</i>	Discussion 8
Week 12: Lecture 11	<i>Wed, Mar 31, 2021</i>	Computational Cognition
Week 12: Midterm Exam 2	<i>Fri, Apr 2, 2021</i>	Exam 2
Week 13: Seminars	<i>Wed, Apr 7; Fri, Apr 9; Wed, Apr 14 2021</i>	Student Seminars

4.1. Text(s) used:

Each week has a specific reading assignment. In some weeks you will be expected to cover the material in a different book each week. A list of readings will be provided to you on a weekly basis.

4.2. Assessment Components:

There are three key grading components in this course – midterm exams, discussions, and term project. There will be 2 midterm exams, 8 discussion components and 1 term project which will be evaluated at three stages (proposal, presentation and report)

- **Midterm Exams 36% (18% each)**

There will be two midterm exams (one on **Fri, Feb 26th, 2021** and the second on **Fri, Apr 2nd, 2021**). Exam content will include material covered in lectures up to the week prior to the exam. Content will also include the weekly readings and discussion material.

- **Term paper Proposal 10%**

Students should identify a decision making or cognitive engineering problem that they would like to address in their project. Further, preliminary details should be included on importance of the problem, potential methods that can be used to solve the problem, and likely limitations with approach. 10-minute project proposal presentation is due **Wed, Mar 3rd, 2021**.

- **Term Paper 15%**

In your chosen topic area, apply any two methods you have studied in this course. Be prepared to justify your choice of methods. You will be evaluated based on this choice, your competency in demonstrating the use of the method, and your ability to interpret the results from your analysis. Final paper is **due on April 15th (End of day)**. Final paper should be no longer than 10 pages, single spaced, Time New Roman, font size 11. References are not included in the page count.

- **Term Paper presentation 15%**

Students are expected to present their application of methods learnt in the course to real world problems. The presentation should cover the relevant background, methods, protocol (any props, script, etc.), basic descriptive statistics. Term paper presentations will be conducted during the last week of classes.

- **Discussion 24% (8 sessions of Discussion, each worth 3%)**

All students have to participate in the discussion components for this course. Few papers will be allotted for every discussion. Marks are allotted for each discussion section on the basis of participation, preparation, and quality of insights.

COURSE AND DEPARTMENTAL EXPECTATIONS

Guiding Principles for our SYDE-BME Community (faculty, staff, and students):

1) Be compassionate. 2) Be accountable. 3) Be patient. 4) Be safe and healthy.

Compassionate and respectful communication: Most online communication between the Department and students will be done through LEARN and/or email. Students are reminded that they should now use their email account name@uwaterloo.ca. Include an academic signature with your full name, program, student ID. We encourage you to include your preferred pronouns (he/him; she/her; they/them).

Scheduling of Synchronous (live) online course events: Due to the COVID-19 pandemic, all University of Waterloo courses components will be delivered online, until further notice. To maintain build supportive teaching environments, instructors may use the time slots (EDT) scheduled “in-class” hours to hold “live-stream” events such as lectures, tutorial help sessions, group activities, and open office hours. To accommodate different time zones, different working/studying conditions and limitations in internet access, all critical course components, including lectures and student support must be made available in asynchronous formats. Any timed component (for example: a test or quiz) must take time zone and internet availability into account.

Course Assignments & Deliverables (Posting, Submissions, and Feedback): Instructions for course assignments and deliverables will be posted in UW-Learn (SYDE 642). Students will upload relevant documents to appropriate electronic drop boxes. As appropriate, feedback to individuals and teams will be provided electronically. Late submissions will receive a grade of 0; however, feedback will still be provided to help with student learning.

Attendance and Participation Submissions: Students may earn up to a maximum of 24% for Participation Activities.

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 verifiable exceptional circumstances in keeping with UW policies.*

Fair Contingencies for Emergency Remote Teaching We are facing unusual and challenging times. To provide contingency for unforeseen circumstances, the instructor reserves the right to modify course topics and/or assessments and/or weight and/or deadlines with due notice to

students. In the event of further challenges, the instructor will work with the Department/Faculty to find reasonable and fair solutions that respect rights and workloads of students, staff, and faculty.

SYDE-BME COMMENT ON ACCOMMODATION: We respect that our SYDE-BME students are independent adult decision-makers, with many opportunities to partake in activities that might be in time conflict with academic deadlines and deliverables. Along with the right to make adult decisions comes the responsibility and accountability for those decisions and any outcomes.

The University of Waterloo's policy on accommodation for missed deliverables pertains to verifiable health matters, and highly unfortunate events (for example: family tragedies). The Department of Systems Design Engineering follows University of Waterloo's general policy: students who self-elect to forgo a deliverable receive a "0" for that deliverable. It is preferred practice so that fairness is maintained for members of the same class/course by avoiding preferential treatment, and so that instructors are not burdened with having to create extra quizzes, deliverables, etc. It also reflects professional practice, as failing to show up to work and missing deadlines can be very costly to the company and individual (for example: not submitting a contract proposal, or design review on time). Please read the policy here: [Link Accommodation due to illness]

Compassionate Accommodation: If you are facing challenges that are affecting more than one course contact the Associate Chair Undergraduate (A.C.U.G. email: sydeunde@uwaterloo.ca) or the Director of BME (email: sdbmedir@uwaterloo.ca). They will review your case and coordinate a reasonable and fair plan in consultation with appropriate others (for example: instructors, Department Undergraduate Studies Committee, Chair, AccessAbility Services, Engineering Counselling services, Registrar's Office).

Note: We are facing unusual and challenging times. The instructor reserves the right to modify course topics and/or assessments with due notice. In the event of further challenges, the instructor will work with the Department to find reasonable and fair solutions.

ACCESSABILITY:

Writing and Communication Centre.

The Writing and Communication Centre works with students in all Faculties to help you consider your audience, clarify your ideas, develop your voice, and write in the style appropriate to your discipline. We offer one-on-one support for writing papers, delivering presentations, integrating research, and revising for clarity and coherence. Group appointments for team-based projects, presentations, and papers are also available.

All of our services are available virtually: booked appointments, drop-ins, resources, and writing groups. Check out our website for other ways to interact with us, such as open online forums and online "Question and Answers". Visit us at www.uwaterloo.ca/wcc.

Please note that communication specialists guide you to see your work as readers would. We can teach you revising skills and strategies, but will not change or correct your work for you. Please bring your assignment instructions and any notes or drafts to your appointment.

[Link Writing and Communication Centre]

AccessAbility Services: AccessAbility Services (A.A.S.) is the University's centralized office for the provision of academic accommodations for students with a known or unknown disability, illness, or condition. Even if students are unsure of whether they qualify for A.A.S. support, an A.A.S. consultant can talk them through next steps, and refer them elsewhere if appropriate.

[Link AccessAbility Services].

FACULTY OF ENGINEERING – MORE FINE PRINT

Faculty of Engineering website: [Link Academic Support and Policies].

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 Academic Integrity website for more information. Link Office of Academic Integrity].

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 (for example: plagiarism, cheating) or about expectations for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. Relevant documents include:

- University of Waterloo Policy 71 [Link Policy 71 Student Discipline].
- Academic Penalty Guidelines [Link Policy 71 Penalty Guidelines].
- Assessment of Unauthorized Collaboration: [Link Assessment of Unauthorized Collaboration].

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. When in doubt please be certain to contact the **Associate Chair Undergraduate or Academic Advisor** who will provide further assistance.

[Link Policy 70 Petitions & Grievance.]

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)

[Link Policy 72 Student Appeals].