APS1502H: Leading Engineering Design Projects

Syllabus subject to change.
Current as of Aug 14, 2019.

Instructor

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Description

The objective of this course is to prepare students for the teams, processes and decisions encountered during complex socio-technical engineering design projects. The course will equip students with tools and strategies for leading and following other leaders in this context. Students will have the opportunity to apply their learning on a term-long project. The course readings will be sourced from real industry cases and experiences.

Schedule

Meets September 3 – December 3 on Tuesday mornings, 9am-12pm, in MY370.

Office Hours
See Quercus site.

Learning Outcomes

On completing the course the student will be able to:

- Recognize and explain the challenges facing leaders in engineering design projects
- Recognize and explain the need for leadership on engineering design projects
- Anticipate and identify their role in the leadership, design and management processes followed during engineering design projects
- Identify and explain the motivation for various industry product development processes
- Analyze a system's organization and process architectures
- Create, interpret, and draw conclusions from a design structure matrix
- Generate ideas by applying the principles of creativity to a design problem
- Explain desirable traits of successful technical teams
- Apply tools for concept and project selection
- Identify, describe and mitigate cognitive biases that affect leaders' engineering decisions

Evaluation

Participation (10%)
Assignments (15%: 7.5% x 2)
Project (55%)
- 10% for project management plan
- 15% for mock-up prototype/risk management plan
- 30% for final presentation
Midterm Exam (10%)
Final Assignment (10%)

Expectations for Participation

Participation is included in your final grade to encourage your active participation in class activities and discussion. Meaningful contribution to discussion, engagement and punctuality will result in high participation grades.

Class attendance is critical given that class meets only once a week. Please email the professor in advance if you have an unavoidable conflict with class.

Term-Long Project

Teams of students will work together to conceive, plan and implement a project. Teams will submit project plans throughout the semester and present their final work at the end of the semester.

Assignments

Assignments will be due for submission on the online course portal. Late assignments will receive a 50% penalty. No assignments will be accepted beyond a week after the due date.

Exams

We will have one in-class midterm (1 hour). The exam will cover key content from lectures and readings, and require the application of the tools introduced in the class.

Course Plan

Date	Topic	Readings	Project
Week1: Sep 3	The Challenge Leaders Face Intro to Course Processes	**Pre-read:** Better All The Time	• Introduce project
Week 2: Sep 10	Identifying Opportunities • Creativity and brainstorming • User observation • Research	**Pre-read:** Creativity Inc (chapter "Fear and Failure")	• Individual observation exercise
Week 3: Sep 17	Project Selection • Tools for project selection Design of Services • Steps in design of service cycle	**Pre-read:** TBD	• Individual idea generation
Week 4: Sep 24	Teams • Psychological safety Structured Communication	**Pre-read:** *What Google Learned From Its Quest to Build the Perfect Team*	• Team formation
Week 5: Oct 1	Building models Visual communication	**Pre-read:** TBD	
Week 6: Oct 8	**MIDTERM (1 hour)** Project selection	**Pre-work:** Study for midterm	• In-class time for project selection
Week 7: Oct 15	Project management and planning	**Pre-read:** TBD	• Project management plan
Week 8: Oct 22	Influence and Change Emotional Design	**Pre-read:** *The network secrets of great change agents.*	• In-class project work

Date	Topic	Readings	Project
Week 9: Oct 29	Testing and Risk	**Pre-read:** TBD	• Risk management plan for project
Week 10: Nov 5	Decisions and Biases Having Tough Conversations	**Pre-read:** Thinking Fast and Slow	• Project prototype due (mock-up)
Week 11: Nov 12	Managing Complexity	**Pre-read:** Sosa and Eppinger	
Week 12: Nov 19	Final Presentations		• Project due
Week 13: Nov 26	Advanced Concepts	**Pre-read:** TBD	
Week 14: Dec 3	Course wrap-up		

Readings

Magazine article: *Better All The Time*, James Surowiecki, The New Yorker, Nov 10 2014.

Book chapter: "Fear and Failure" (page 106- 128) in *Creativity, Inc., Overcoming the Unseen Forces That Stand in the Way of True Inspiration* by Ed Catmull, 2014.

Magazine article: *What Google Learned From Its Quest to Build the Perfect Team: New research reveals surprising truths about why some work groups thrive and others falter* by Charles Duhigg, The New York Times Magazine, Feb. 25, 2016.

Journal paper: Battilana, Julie, and Tiziana Casciaro. "The network secrets of great change agents." Harvard Business Review 91.7-8 (2013): 62-8.

Book chapter: "Introduction" (page 4-13) *Thinking Fast and Slow* by Daniel Kahneman, 2013.

Journal paper: M. E. Sosa, S. D. Eppinger, and C. M. Rowles, "The Misalignment of Product Architecture and Organizational Structure in Complex Product Development," Manage. Sci., vol. 50, no. 12, pp. 1674–1689, Dec. 2004.

Additional readings to be added.

Classroom Policies[1]

Policy on Electronics: In this course, we ask that you turn off your mobile device and close your laptop during class. We will take breaks, at which time you are welcome to check your devices. If you would like to take notes on your laptop, please inform the instructor.

Diversity: I value an inclusive environment. I hope to foster a sense of community in this classroom and consider this classroom to be a place where you will be treated with respect. I welcome individuals of all backgrounds, beliefs, ethnicities, national origins, gender identities, sexual orientations, religious and political affiliations – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming, and inclusive environment for every other member of the class. If this standard is not being upheld, please feel free to speak with me.

Special Accommodations: If you need disability-related accommodations, I encourage you to meet with me early in the semester.

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[1] In part from MIT Teaching and Learning Lab: http://tll.mit.edu/design/syllabus-statements

Mental Health and Wellness: As a university student, you may experience a range of health and/or mental health issues that may result in significant barriers to achieving your personal and academic goals. The University of Toronto offers a wide range of free and confidential services and programs that may be able to assist you. We encourage you to seek out these resources early and often.
Student Life Website: http://www.studentlife.utoronto.ca
Health and Wellness Website: http://studentlife.utoronto.ca/hwc

If, at some point during the year, you find yourself feeling distressed and in need of more immediate support, visit the **Feeling Distressed Webpage**: http://www.studentlife.utoronto.ca/feeling-distressed, for more campus resources.

Off campus, immediate help is available 24/7 through **Good2Talk**, a post-secondary student helpline at 1-866-925-5454.

Academic Integrity: In this course, I will hold you to the high standard of academic integrity expected of all students at the university. I do this for two reasons. First, it is essential to the learning process that you are the one doing the work. I have structured the assignments in this course to enable you to gain a mastery of the course material. Failing to do the work yourself will result in a lesser understanding of the content, and therefore a less meaningful education for you. Second, it is important that there be a level playing field for all students in this course and at the university so that the rigor and integrity of the university's educational program is maintained.

Violating the [Code of Behaviour on Academic Matters](#) in any way (e.g., plagiarism, unauthorized collaboration, cheating, etc.) will result in procedures as described in the Code. Possible sanctions include receiving a failing grade on the assignment or exam, being assigned a failing grade in the course, having a formal notation of disciplinary action placed on your record, and suspension.

Please review the [Code of Behaviour on Academic Matters](#) and related resources (e.g., working under pressure; how to paraphrase, summarize, and quote; etc.) and contact me if you have any questions about appropriate citation methods, the degree of collaboration that is permitted, or anything else related to the Academic Integrity of this course.

Instructor Biography

Alison Olechowski, PhD
Assistant Professor
Department of Mechanical & Industrial Engineering (MIE)
Institute for Leadership Education in Engineering (ILead)

Alison Olechowski is an Assistant Professor in the Department of Mechanical & Industrial Engineering and the Troost Institute for Leadership Education in Engineering (ILead) at the University of Toronto. Dr. Olechowski and her team study the processes and tools that teams of engineers use in industry as they design innovative new products. She has studied engineering products and projects in the automotive, electronics, aerospace, medical device and oil & gas industries.