



## **APS1502H: Leading Engineering Design Projects**

Syllabus subject to change.

### **Instructor**

Prof. Alison Olechowski [a.olechowski@utoronto.ca](mailto:a.olechowski@utoronto.ca) MC 308

### **Description**

The objective of this course is to prepare students for the type of teams, processes and decisions they will be a part of on 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 three hybrid team-individual assignments. The course readings will be sourced from real industry cases and experiences.

### **Schedule**

Meets September 14 – December 14 on Thursday evenings, 6-9pm, in WB219.

### **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 why technical leadership is needed 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 (45%)  
Midterm Exam (15%)  
Final Exam (30%)

### **Expectations for Participation**

Participation is included in your final grade to encourage your active participation in class activities and discussion. Attendance, punctuality, engagement and meaningful contribution to discussion 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.

### **Assignments**

1. This is How I Work (10%)  
A reflection on your professional routine, process and work style, with an action plan for change.
2. Creativity+DSM (20%)  
A small team exercise to generate an insightful architecture map using the Design Structure Matrix.
3. Engineering Change Case (15%)  
Based on a described design engineering project scenario, explain how you would use what you have learned in class to overcome the obstacle.

### **Exams**

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

### **Readings**

Excerpts from: *Everyone a Leader, A Guide to Leading High-Performance Organizations for Engineers and Scientists* by David Colcleugh, 2013.

Excerpts from: *Rocket Men, The Epic Story of the First Men on the Moon* by Craig Nelson, 2010.

Excerpts from: *Creativity, Inc., Overcoming the Unseen Forces That Stand in the Way of True Inspiration* by Ed Catmull, 2014.

Excerpts from: *The Machine That Changed the World: The Story of Lean Production-- Toyota's Secret Weapon in the Global Car Wars That Is Now Revolutionizing World Industry* by Womack, Jones and Roos, 2007.

Excerpts from: *Thinking Fast and Slow* by Daniel Kahneman, 2013.

Excerpts from: *Product Design and Development* by Ulrich and Eppinger, 2015.

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.

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

T. Brown, "Design thinking," *Harvard Business Review*, vol. 86, no. June, pp. 84–92, 2008.

*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.

## Preliminary Course Schedule and Key Dates

Date	Topic
Sep 14	The Challenge Leaders Face
Sep 21	Processes and Projects
Sep 28	Creativity
Oct 5	System Architectures
Oct 12	Organizations and Teams
Oct 19	<b>MIDTERM (1 hour)</b> Building Models
Oct 26	Influence and Change
Nov 2	Measurement and Data
Nov 9	Structured Communication
Nov 16	Decisions
Nov 23	Integrating Idea: Design of Services
Nov 30	Integrating Idea: Lean Engineering
Dec 7	Integrating Idea: The Future of Design
Dec 14	<b>FINAL EXAM</b>

### Classroom Policies<sup>1</sup>

*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.

*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 Institute so that the rigor and integrity of the Institute'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.

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

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, Teaching Stream  
Institute for Leadership Education in Engineering (ILead)  
Department of Mechanical & Industrial Engineering (MIE)

Alison Olechowski is an Assistant Professor, Teaching Stream, in the Department of Mechanical & Industrial Engineering and the Institute for Leadership Education in Engineering (ILead). She completed her PhD at the Massachusetts Institute of Technology (MIT) studying product development decision-making during complex industry projects. Dr. Olechowski completed her BSc (Engineering) at Queen's University and her MS at MIT, both in Mechanical Engineering. Dr. Olechowski studies 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.

### **Welcome to ILead**

This course will transform the way you think about engineering leadership. It is part of a suite of programs offered by the Institute for Leadership Education in Engineering (ILead). Learn about other opportunities such as our certificate programs and special events at [ilead.engineering.utoronto.ca](http://ilead.engineering.utoronto.ca). Our vision: *Engineers leading change to build a better world.*