# Praxis I Syllabus

## 1. Course Overview

As the first course in the Praxis Design Sequence, Praxis I lays the foundation for future design courses in Engineering Science. This foundation includes common terminology, models and processes, necessary skills, and most importantly the Praxis Approach to Engineering Design. Key features of this Approach include:

- Synthesizing multiple conceptions of "engineering" and "design" to **develop an individualized understanding of, and approach to the practice of "engineering design"**;
- E**xploring, questioning, and developing alternative perspectives on** the theory and practice of "engineering design";
- Taking responsibility for **integrating engineering design theory and practice**;
- Using **multiple modes** to represent and defend design decisions and concepts; and,
- **Demonstrating integrity** between engineering design as understood and as practiced.

The Praxis Approach has as core theoretical underpinnings the Perry Model of Intellectual and Ethical Development and the Kolb Learning Cycle. Students are encouraged to explore these models to better understand the philosophy of the Praxis Sequence and how to succeed in the various Praxis courses.

Praxis I is divided into two sections, each of which is based on a single, multi-week project: Device Design and Product Design (see section 3 for details). The projects in Praxis I model and lay the foundation for the major term-long project in ESC102, Praxis II.

Students engage in engineering design and practice engineering communication in other Engineering Science 1F term courses, most notably CIV102, CSC180, and PHY180. Praxis I provides students with concepts, models, and tools that they can use both to practice engineering design and to reflect on their other design and problem solving experiences.

# 2. Teaching Team

The Teaching Team in Praxis I integrates members from the Division of Engineering Science and the Engineering Communication Program (ECP). Lectures will be given primarily by the Course Instructors, while teams of Studio Instructors and Teaching Assistants will facilitate the studios.

## Course Instructors

Jason Foster (Course Coordinator)
jason.foster@utoronto.ca

Rob Irish
r.irish@utoronto.ca

## Studio Instructors

Arthur Imperial
arthur.imperial@utoronto.ca

James McMahon
james.mcmahon@utoronto.ca

Ted Nolan
emartin.nolan@utoronto.ca

Farzan Sasangohar
f.sasangohar@mail.utoronto.ca

Matthew Strohack
m.strohack@utoronto.ca

Kasia van Schaik
kasia.vanschaik@utoronto.ca

## Teaching Assistants

James Bateman (1T3 NΨ Physics)
james.bateman@mail.utoronto.ca

Andrew Flood (0T7 + PEY NΨ Physics)
andrew.flood@mail.utoronto.ca

Peter Goshulak (1T1 + PEY Mechanical Engineering)
p.goshulak@mail.utoronto.ca

Vicki Komisar (0T9 NΨ Biomedical)
v.komisar@utoronto.ca

Ante Lausic (1T0 NΨ Nanoengineering)
ante.lausic@utoronto.ca

Patricia Sheridan (0T9 Mechanical Engineering)
patricia.sheridan@utoronto.ca

## Professional Language Resource Person

Penny Kinnear
penny.kinnear@utoronto.ca

Office hours with members of the Teaching Team are by appointment on a “first-contact, first-scheduled” basis. Although the teaching team tries to be available and accessible, appointments should be scheduled at least one business day prior to the desired time.

At key points during the term members of the Teaching Team will make themselves available for “Praxis Cafés”. These Cafés will provide opportunities for informal one-on-one or small group discussions that support course activities. Note that no coffee, tea, or other hot beverages will be served by the Teaching Team at the Cafés, although you are free to bring your own.

# 3. Assignments and Distribution of Grades

The studio activities and assignments are designed to support and document work on the two course projects. In addition to assignments that relate directly to each of these projects, students are expected to continue to develop their independent learning and reflective skills throughout the term.

| Project | Due Date | Deliverable | Weight | Submitter |
|---|---|---|---|---|
| Device Design | 2014-10-06 @ 0900 | Device Design Report | 10% | Individual |
| Product Design | **Design Brief** | **15%** | | **Mixed** |
| | Studio 06 | Design Brief Pitch<br>In Studio and submitted electronically 24 hours prior to Studio | 5% | Individual |
| | 2014-10-25 @ 2400 | Design Brief<br>Submitted electronically | 10% | Team |
| | **Conceptual Design** | **25%** | | **Team** |
| | 2014-11-08 @ 2400 | Conceptual Design and Detailed Design Statements of Work<br>Submitted electronically | 15% | Team |
| | Studio 12 | Design Critique<br>In Studio | 10% | Team |
| | **Detailed Design** | **10%** | | Individual |
| | Studio 10 day @ 2400 | Detailed Design Report<br>Submitted electronically | 10% | Individual |
| Individual Growth | 2014-12-01 @ 1200 | Record of Praxis Experience<br>Submitted electronically | 20% | Individual |
| | TBD<br>(Likely 2014-12-05 or 2014-12-08) | Final Examination | 20% | Individual |

Students should be adding to, or revising, their Record of Praxis Experience (RoPE) regularly throughout Praxis I. Throughout the term the Teaching Team will offer suggestions, in both Lecture and Studio, of content appropriate for the RoPE.

## 3.1. Device Design

Students work in pairs to explore and analyze the concept of "engineering design" by investigating the key design decisions embodied in existing household electro-mechanical devices. This project comprises two components: device analysis and research. In small teams, students will engage in teardown activities for two electromechanical devices (in Studios 02 and 04). In addition, students will learn to use research resources related to device design (in Studio 03). The device design project culminates in a report written as a midterm test on October 6$^{th}$, 2014.

## 3.2. Product Design

Students engage in an engineering design sequence that spans framing, conceptual design, detailed design, and design critique. Students take on the roles of entrepreneur-client and, in multiple forms, design engineer through three components: the design brief, the conceptual design, and the detailed design. Teams

of four students will develop a product through a set of deliverables that represent a simplified engineering design process. Students should try to become aware not only of their actions, but how the deliverables and simplified process influences, positively or negatively, their engineering design practice.

| | |
|---|---|
| **Design Brief:** | Teams will frame an engineering opportunity that invites products as possible outcomes |
| **Conceptual Design:** | Teams will develop concepts for products which address the Design Brief |
| **Detailed Design:** | Individuals will generate a single, rigorously developed and substantiated, detailed design decision in support of the Conceptual Design |

### 3.3. Record of Praxis Experience

The Record of Praxis Experience (RoPE) is a document that helps students to articulate their understanding of engineering design and to demonstrate their design experiences, values, skills, and thinking. The RoPE is a record of both your engineering design theory and practice, and includes reflection on both. As such it contains not only artifacts of design, but artifacts of thinking or reflecting about design. As students develop this thinking, they will be able to advance their design practice, illustrate their value to a team, and build the resources to apply for engineering or research positions.

### 3.4. Final Examination

The Final Examination for ESC101 will likely take place on either Friday, December 5th, 2014 or on Monday, December 8th, 2014. The exam will be written online and will have three questions, weighted unequally, that focus on:

- Framing and Requirements
- Implementing "Design for X"
- Critical Self-Reflection

Student will have access to their Record of Praxis Experience (see below) during the Final Examination.

## 4. Resources

### 4.1. Hardcopy Resources

Irish, R. and Weiss, P., *Engineering Communication From Principles to Practice*, 2nd Edition, Oxford University Press, 2013.

This textbook is organized around 18 principles for effective engineering communication. In Praxis I the focus will be on principles 1,3-8, and 10. Other principles will be covered in Praxis II and beyond.

### 4.2. Electronic Resources

| | |
|---|---|
| **Blackboard:** | available through `https://portal.utoronto.ca` |
| **Course Downloads:** | `https://design.engsci.utoronto.ca/courses/esc101/20149/` |
| **Tickets:** | `https://design.engsci.utoronto.ca/tickets` |
| **Surveys:** | `https://design.engsci.utoronto.ca/surveys` |

# 5. Activities and Workload

## 5.1. Lectures (3 scheduled hours per week)

Monday 1400-1500 • Tuesday 1300-1400 • Friday 1300-1400

Lectures take place in MC102 and introduce the concepts required to successfully complete the course, examples of how those concepts can be and have been applied, and connections among materials sourced from both within and outside of Praxis I.

## 5.2. Design Studios ("Tutorial"; 2 scheduled hours per week)

Studios provide weekly, focused, and incremental activities that support the Praxis I projects. Students work both individually and in teams to meet Studio-specific learning objectives and have Studio-specific experiences. Active participation in Studio is essential to student success in the Praxis Sequence.

| Week | No. | Major Studio Activities |
|---|---|---|
| 2014-09-08 | 01 | Reflecting and Defining |
| 2014-09-15 | 02 | Destroying and Understanding I |
| 2014-09-22 | 03 | Researching and Exploring I |
| 2014-09-29 | 04 | Destroying and Understanding II |
| 2014-10-06 | 05 | Teaming and Valuing |
| 2014-10-13 | 06 | Pitching and Picking |
| 2014-10-20 | 07 | Investigating and Framing |
| 2014-10-27 | 08 | Reframing and Diverging |
| 2014-11-03 | 09 | Converging, Selecting, and Representing |
| 2014-11-10 | 10 | Researching and Exploring II |
| 2014-11-17 | 11 | Refining and Representing |
| 2014-11-24 | 12 | Defending and Critiquing |
| 2014-12-01 | | *No studios are scheduled so that you have more time to prepare for Final Exams* |

## 5.3. Workload

Students are expected to spend on average one hour outside of class for every one hour of classroom time (e.g. 5 hours per week per student). This workload may not be distributed evenly across the term.

Note that in Praxis, and in all of their courses, students should strive to work both efficiently and effectively. All assignments, in Praxis and elsewhere, are designed so that the time and effort required to complete the assignment reflects the learning outcomes for the assignment. Students who find themselves investing an inordinate amount of time or effort in a Praxis assignment should contact the Teaching Team immediately to explore different approaches that may increase both their efficiency and effectiveness.

# 6. Graduate Attributes and Learning Objectives

Having completed Praxis I, all students are expected to have started on the path to possessing the abilities and understandings linked to the following Canadian Engineering Accreditation Board graduate attributes[1]:

- 3.1.3 Investigation
- 3.1.4 Design
- 3.1.5 Engineering tools
- 3.1.6 Teamwork
- 3.1.7 Communication skills
- 3.1.8 Professionalism
- 3.1.10 Ethics and equity
- 3.1.11 Economics and project management
- 3.1.12 Lifelong Learning

Having completed Praxis I, all students are expected to be able to:

1. **Develop a personal theory of engineering design that is congruent to that of the Engineering profession**
   a. Locate and explore accepted definitions of, approaches to, and theories of "engineering design";
   b. Synthesize a personal theory of engineering design congruent with the Engineering profession based on experience, exploration, and research; and,
   c. Refine their personal theory of engineering design by reflecting on their engineering design practice.
2. **Practice engineering design, as an individual and as part of a team, with integrity between your actions and your theory**
   a. Critique existing engineering designs from the perspective of design decisions and consequences;
   b. Characterize problems and appropriately frame them as engineering problems;
   c. Structure and analyze a team design activity using a variety of formal models;
   d. Use multiple, formal methods to generate design alternatives and select among candidate designs;
   e. Transition a design between different scales and types of refinement; and,
   f. Reflect upon and learn from both their and other's successful and failed designs.
3. **Represent and express engineering designs and ideas**
   a. Select appropriate modes of communication (oral, written, graphical) to best express an idea for an audience;
   b. Structure information to credibly communicate engineering knowledge; and,
   c. Support design ideas with research, analysis, and prior design.
4. **Make engineering arguments**
   a. Analyze an audience and tailor an argument accordingly;
   b. Make appropriate claims from evidence, recognizing possible weaknesses or bias in evidence;
   c. Frame an argument in a manner accepted by the engineering community; and,
   d. Adapt modes of argument to meet a need.

[1] Further information on the CEAB Graduate Attributes can be found at:
http://www.engineerscanada.ca/e/files/Accreditation_Criteria_Procedures_2010.pdf

# 7. Grading Policies

## 7.1. Grade Expectations

Obtaining an "A" grade in Praxis requires demonstrating strong evidence of original thinking. Students who submit work that delivers no more than what is required, regardless of the depth to which those requirements are satisfied, are in essence showing only "evidence of grasp of subject matter". Accordingly they can expect a maximum grade of a "B". **Obtaining an "A" requires that students demonstrate that they have engaged in original thought and have explored aspects of the material and assignment that were not explicitly required, but that are relevant to the objectives of the assignment and the course.**

Note that an "A" grade will not be awarded to a submission where the required elements are either missing or accomplished at an unsatisfactory level, regardless of whether additional work or original thought has been demonstrated.

## 7.2. Grade Discussions

Students are encouraged to discuss their work, both before and after it has been graded, with their Studio Instructors and, if necessary, with the Course Instructors. **In any conversation involving grades, students must be prepared to present a cogent argument supported by evidence.** Should an assignment be regraded, the new grade may be lower, the same, or higher than the initial grade.

## 7.3. Team Grades

When working in teams, students are expected to divide workload equitably. The nature of the division is up to the team members, and does not require that all members work the same hours or produce identical volumes of work. By default all team members receive an identical grade on team assignments. **Students should report any difficulties in their teams to a member of the Teaching Team as early as possible** so that the difficulties can be addressed in a positive way. Students should also maintain as complete a record of team interactions as possible[2]. **Based on solicited, confidential feedback, the Course Instructors may adjust the grade distribution within a team.**

## 7.4. Late Penalties

Due dates have been selected such that course workload is spread out over the term and that sufficient time is available to provide formative feedback prior to the submission of summative assignments. Assignments that are submitted late will be subject to a cumulative penalty, as outlined in the respective assignment descriptions. Note that this practice deviates from the more common industry practice of not accepting late deliverables.

## 7.5. Support and Accommodation

Students with diverse learning styles and needs are welcome in this course. Students who have a disability or health consideration that may require accommodations are both encouraged and welcome to approach the Course Instructors as soon as possible. **Should accommodations be necessary, by University of Toronto policy students are required to contact the Accessibility Services Office**.

[2] This includes, but is not limited to, copies of emails, text messages, chat logs, phone calls, etc.

# 8. Other Policies

Engineering Science Students are expected to comport themselves professionally and to exercise common sense[3]. They are also expected to be familiar with, and act according to, University policies, guidelines, and interpretations. Of particular importance are those mentioned in the "Academic Regulation" section of the Faculty of Applied Science and Engineering Academic Calendar.

## 8.1. Plagiarism

The University of Toronto treats plagiarism as a violation of the Code of Behaviour on Academic Matters. Plagiarism is a serious form of cheating in which a student makes use of someone else's ideas or words without giving appropriate attribution. In your academic work, plagiarism usually occurs in one of three ways:

- You cut and paste a piece of someone else's text or code or figure but do not clearly show what the source is for that material.
- You hand in work done by others (e.g. teammates) without putting their names on the work.
- You rephrase someone else's idea into your own words, but do not give credit to the source of the idea.

The University takes cheating very seriously. Penalties can include zero on the assignment, zero in the course, annotations on your transcript (which would be seen by a potential graduate school or employer), or in extreme cases expulsion from the University. **If you are concerned about your use of sources, discuss your concerns with your Studio Instructor or a Course Instructor *before* submitting a document for assessment.**

## 8.2. Instructional Materials and Copyright

Students are prohibited from recording or otherwise reproducing any copyrighted materials associated with this course unless they obtain prior permission from the copyright holder. Note that all lectures are copyright of the lecturers.

## 8.3. English Proficiency Requirement

The Engineering Faculty's English Proficiency Requirement is as follows:

> The Faculty requires each student to show an ability to write English coherently and correctly in all written work submitted for evaluation. Consequently, the Faculty reserves the right to ask each student to write a post-admission English Proficiency Assessment at the beginning of his or her first year of studies. Every student will also take at least one course that includes a written communication component within their curriculum. Satisfactory completion of the course or courses is required for graduation.
> (*Calendar*, FASE, 2014-2015, Academic Regulations VI.3.)

In Engineering Science, successful completion of the written components of Praxis I should demonstrate such proficiency. All written components will be considered as contributing to demonstrating proficiency; however, most weight will be assigned to closely supervised writing activities. Students who fail to demonstrate English proficiency in Praxis I will be asked to take specific steps in Praxis II aimed to improve their English proficiency.

[3] Students are encouraged to consult with the Teaching Team if they are uncertain whether an activity or decision would be unprofessional or would indicate a lack of common sense.

## 8.4. Public Disclosure

Students agree that by taking this course all submitted deliverables may be used for teaching and learning purposes, in this or subsequent courses, or to support research into improving engineering education. Any such use will confirm to the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans. **Students who are concerned about the intellectual property ramifications of potential disclosure must notify the Course Instructors prior to the end of the 20149 academic session.** Students who have questions about the University of Toronto Inventions Policy should inquire with the Course Instructors

## 8.5. Turnitin

Students agree that by taking this course all required papers may be subject to submission for textual similarity review to Turnitin.com for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site. The intellectual property of all students submitting to Turnitin.com is protected by the licensing agreement between the University of Toronto and iParadigms. This agreement further ensures that student papers submitted to Turnitin.com will not be used for commercial purposes.

## 8.6. Course Feedback

Over the course of the term, students may be requested to provide feedback on the course. This feedback may be solicited by the Division of Engineering Science or the Course Instructors. Any such feedback will be used to improve the course, during both this and future sessions. While students are not required to respond to the requests for feedback, they are encouraged to do so as their feedback can significantly improve both their course experience and that of future students. Should feedback be requested, student anonymity will be preserved unless the student explicitly chooses to share their identity with the Course Instructors.