Praxis II Syllabus

Praxis II builds on the skills and attitudes developed in Praxis I by having students complete a single, more in-depth design cycle that spans problem finding and framing through to concept development and realization (through prototyping and other means). As such the course provides a forum for students to continue to develop their skills, attitudes and aptitudes as engineering designers. Praxis II follows from Praxis I and reinforces the key tenets of the Praxis Approach to Engineering Design:

- Focusing on the quality and credibility of engineering designs;
- Using research to make and defend design decisions;
- Developing individualized conceptions of "engineering design" that guide action and exploration; and,
- Integrating theory and practice.

1. Course Overview

In Praxis II, students are exposed to more advanced engineering design and communication concepts and apply this knowledge to more complex situations. Praxis II asks students to take on leadership, entrepreneurial, and consulting roles within the context of engineering design by first identifying a suitable design challenge and then designing a solution to that challenge.

Students in Praxis II are presented with following design challenge which guides the entire course:

> Effect a real and measurable improvement in the lived experience of a community located in the Greater Toronto Area.

The Praxis II schedule is divided into two phases: framing and solving.

1.1. Framing Phase

In the framing phase, students seek out and develop an understanding of a particular community in the greater Toronto area. This involves identifying the community, understanding its nature, consulting with its members or representatives, and identifying problems that negatively impact that community's quality of life. This understanding must incorporate both technical and nontechnical (e.g. social, political, ethical, etc.) perspectives.

This phase culminates in each team authoring a Request for Proposal (RFP) that codifies the need for improvement that has been identified and frames the situation such that a successful engineering design solution is possible. A subset of the RFPs developed in the framing phase is selected to proceed to the solution phase.

1.2. Solving Phase

During the solving phase, students develop candidate engineering designs that meet the requirements outlined in the RFPs. As they develop their solutions, students will explore the uses, advantages and limitations of formal engineering design tools and processes. The focus of the solution phase is on developing quality, credible, engineering design concepts.

Praxis II culminates in an open Showcase during which proposed student designs, supported by prototype(s), will be reviewed and evaluated on both their technical and nontechnical merits. Students will concurrently be evaluated on their communication abilities through the media of written abstracts, posters, and oral presentations.

2. Teaching Team

The Teaching Team in Praxis II integrates Engineering Communication instructors and Engineering Design instructors, as both are significant stakeholders in the Praxis II learning experience.

Course Instructors

Jason Foster
jason.foster@utoronto.ca

Rob Irish
r.irish@utoronto.ca

Studio Teaching Team

Jenny Lofgreen
j.lofgreen@utoronto.ca

Neil Shyminsky
n.shyminsky@utoronto.ca

Ted Nolan
emartin.nolan@utoronto.ca

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

Andrew Flood (0T8 NΨ Physics)
andrew.flood@mail.utoronto.ca

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

Giorgio Proestos (1T2 NΨ Infrastructure)
giorgio.proestos@mail.utoronto.ca

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

Office hours with the Teaching Team are by appointment on a first-contact, first-scheduled basis.

3. Assignments and Distribution of Grades

Due Date	Deliverable	Weight	Submitter
Studio week of 2014-01-13	Community Pitch	5%	Individual
2014-01-17 @ 2400	ESEC Feedback	1%	Individual
2014-02-17 @1800	Request for Proposal (RFP)	20%	Team
2014-03-02 @ 2400	RFP Revision	10%	Team
Studio week of 2014-03-24	Design Critique	10%	Team
TBD (Likely 2014-04-11or 2014-04-14)	Design Showcase •Prototype(s) •Poster •Presentation •One-Pager	25%	Team
At various points during the term corresponding to key Team experiences	Praxis II Course Surveys	4%	Individual
7 days after the Design Showcase at 2400	Design Handbook	15%	Individual
7 days after the Design Showcase at 2400	Design Portfolio	10%	Individual

3.1. Design Handbook

The Praxis II Design Handbook is a process- and tools-focused complement to the Praxis I and Praxis II Design Portfolios. While the Portfolios focus on deliverables and public presentation, the Design Handbook focuses on the design tools and processes that informed those deliverables. Unlike the public audience of the Portfolio, the primary audience for the Design Handbook is the designer (as they engage in future design activities).

The Design Handbook is an informal document kept by an individual designer to improve their future performance as an engineering designer. The Design Handbook captures the designer's preferred design tools and processes in a format that the designer can use in future design activities (e.g. in AER201) as a personalized reference work. The Handbook captures both design theory, sourced primarily but not exclusively from engineering design literature (but also lectures, interviews, workshops, etc.), and design practice, in the form of worked examples from the designer's own experience (for example from ESC101 and ESC102).

Practically, students should have already developed a basis for the Design Handbook as part of the Praxis I Design Portfolio. Segments such as the design process and worked examples of process can be extracted from the Praxis I Design Portfolio to form the foundation of the Praxis II Design Handbook.

A Design Handbook differs from a Design Notebook[1], which is also used in professional practice. A Design Notebook is a realtime capture of the design activities undertaken during a single project to document what was done, when, and by whom, during that single project. A Handbook, on the other hand, draws from multiple design activities, and includes a subset of the design activities undertaken during each project. Its primary purpose is to collect the key design activities and tools across multiple projects to assist the designer in future projects as reference material (or design practice). As such a Design Handbook is usually structured around the different phases of an engineering design process.

3.2. Design Portfolio

The Praxis II Design Portfolio extends and builds on the Design Portfolio developed in Praxis I. Students received feedback on their Praxis I Portfolios, which offers a starting point for improvement. The Praxis II Design Portfolio should continue to demonstrate strengths, areas of progress, and areas for future development as an engineering designer. However, it should provide more depth and incorporate more experience than the Praxis I Portfolio.

3.3. ESEC Feedback

ESEC is a mandatory event taking place on Friday, January 17, 2014. To earn a "participation mark" for ESEC, each student must complete a brief survey that focuses on the talks they attended.

3.4. Community Pitch

The community pitch is a two-to-three minute presentation in which each student proposes a community of interest located within the Greater Toronto Area. This community must have the potential to develop into a "client" or "key stakeholder" for a design project. The critical points of the pitch are identifying a meaningful community, understanding its dynamics and key points for accessing that community, and demonstrating that a first-year EngSci team can effect a real and measurable improvement in their lived experience.

[1] Engineering Design Notebooks are considered to be legal documents, and can be used as evidence in contractual disputes, inquests, and intellectual property protection. Students in Praxis II **should** keep a Design Notebook as a record of their activities; students in Praxis II **must** develop a Design Handbook.

3.5. Request for Proposal (RFP) and RFP Revision

The Request for Proposal (RFP) builds on the Praxis I Product Design Brief assignment and challenges students to frame an engineering challenge to the levels expected by industry and government. Success in the RFP assignment requires that teams identify and frame an engineering design challenge, identify and directly engage with stakeholders, consult with relevant codes and standards, and develop comprehensive engineering requirements. The target audience for an RFP is the engineers who will submit proposed design concepts that meet the requirements and address the stakeholder needs codified within the RFP.

Because of not only the challenges of writing a quality RFP but also the importance of the RFP to the second phase of Praxis II, all teams will be required to revise their RFP based on feedback from the Teaching Team. As part of the revision, each team will include a summary of their changes to enable efficient and effective assessment of the revised RFPs.

3.6. Design Critique

The Design Critique provides an opportunity for teams to receive feedback before the final Design Showcase. Teams will present their design concepts formally to their Studio Teaching Team and informally to their peers. The Studio Teaching Team will critique the concepts, presentation, and discussion to help teams refine their design concepts and design thinking.

3.7. Design Showcase

The Design Showcase is a public event during which student designs, supported by prototype(s), will be reviewed and evaluated on both their technical and nontechnical merits. Students will concurrently be evaluated on their communication abilities through the media of written summary, posters, and oral presentations. For the Design Showcase, each team must produce four deliverables:

1. A full-colour, large-format, single-sheet poster; the costs of poster production are borne by the team
2. One or more prototypes of their design(s)
3. A flexible presentation that can be tailored to the needs of a variety of audiences ranging from curious public guests to assessing members of the Teaching Team
4. A one-page project summary or “pitch” suitable for a general audience. This summary is analogous to the written portion of the Praxis I Kickstarter Package.

3.8. Course Surveys

At various points during the term students will be asked to complete surveys that will inform them, their teammates, the Teaching Team and other course stakeholders of their performance. These surveys will be timed to coincide with key Team experiences and may be used as evidence regarding the fairness of intra-team workload allocation.

4. Resources

4.1. Recommended Text

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

This textbook (also used in Praxis I) explains the principles for effective engineering communication in detail and is useful reference for both future academic and professional engineering communication activities.

4.2. Design Critique and Showcase

As there are no textbook costs associated with Praxis II, students should expect to spend approximately the same amount in this course as they would for textbooks in their other courses on their poster and prototype(s) and may engage in additional exploration, experimentation, or construction; the costs of these activities are to be borne by the students. Grade and level of expenditure will not be causally linked.

4.3. Electronic Resources

Blackboard:	available through `https://portal.utoronto.ca`
Downloads:	`https://design.engsci.utoronto.ca/courses/esc102/20141/`
Wiki:	`https://design.engsci.utoronto.ca/wikis/1t7`
Twitter Feed:	follow username `EngSciPraxis` and hashtag `#esc102`
Surveys:	`https://design.engsci.utoronto.ca/surveys`
Tickets:	`https://design.engsci.utoronto.ca/tickets`
Realtime Communication:	`ircs://design.engsci.utoronto.ca:6667`
Team-effectiveness Learning System:	`https://teamlearning.ilead.utoronto.ca/team-app`

5. Activities and Workload

5.1. Lectures (3 scheduled hours per week)

Lectures introduce both the concepts required to successfully complete the course and examples of how those concepts can be and have been applied. Students are encouraged to ask questions in lecture to help clarify their understanding and that of the class.

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

Studios are designed as weekly focused activities and opportunities for group work and consultation with the teaching team. The activities of the studio are cumulative, that is one builds on the next and students will work both individually and in teams to meet course objectives. Studios have unique deliverables that often inform or are prerequisites for further activities in Praxis II; active participation in Studio is essential to student success.

5.3. Workload

The nominal expectation is that students spend a minimum of one hour outside of class for every one hour of classroom time. On a weekly basis this translates to a minimum of five hours per student per week.

6. Graduate Attributes and Learning Objectives

Having completed Praxis II, all students are expected to have continued on the path to possessing the abilities and understandings linked to the following CEAB graduate attributes:

- 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
- 3.1.9 Impact of engineering on society and the environment
- 3.1.10 Ethics and equity
- 3.1.11 Economics and project management
- 3.1.12 Lifelong Learning

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

1. Engage in quality, credible engineering design praxis
   a. Describe personal, credible, and professionally acceptable definitions of "engineering design", "engineering credibility", and "engineering quality";
   b. Enact their engineering definitions
   (for example through defining a process or processes, identifying specific tools that suit their definition and personal abilities, through developing suitable metrics, etc.); and,
   c. Frame a challenge in engineering terms such that it can be addressed using engineering design methods; and,
   d. Develop credible concept designs in response to a Request for Proposal, using the tools of engineering design.
2. Incorporate rigorous engineering design principles, tools, and techniques into their design practice
   a. Locate, analyze, and synthesize credible engineering design resources including experts, research papers, textbooks, handbooks, manuals, etc.;
   b. Demonstrate that their design activities were informed by such resources; and,
   c. Apply the same rigorous practice to the communication of their engineering design.
3. Express engineering designs and ideas
   a. Select appropriate modes of communication, working within established design related genres such as the RFP, poster, and abstract;
   b. Structure the information being expressed;
   c. Adapt established expressive processes; and
   d. Apply established models of expression in both textual and visual domains.
4. Make engineering arguments
   a. Analyze the audience of an argument and tailor the argument accordingly;
   b. Frame an argument in a manner accepted by the engineering community;
   c. Ground an argument in an established theory of argumentation; and
   d. Apply rhetorical principles to the design of text and visuals.

7. Assessment

The Praxis Assessment Process allows – and encourages – students to discuss the feedback they receive on their assignments and activities openly with the Teaching Team as part of an ongoing learning cycle. If questions or concerns exist about assessment, students should provide evidence that they have read and understood assessor's comments, and can provide credible justification for reassessment. If differences in opinion regarding assessment continue after such discussion, students may request that their work be assessed by a Course Instructor. If that occurs, **the new assessment will supersede the original regardless of whether the resulting grade is higher, lower, or the same**.

7.1. Grading Expectations

Obtaining an "A" grade in Praxis requires not only that students demonstrate strong evidence of original thinking that goes beyond what is required, but also that they communicate clearly using all appropriate media.

7.2. Team Grades

Teams are expected to divide work fairly. Determining "fairness" is up to the team, but may involve equal time or equal value of work. Students should report any team difficulties to a member of the Teaching Team as early as possible. By default, members of a team receive an identical grade on team assignments. However, based on interactions with the Teaching Team and Team Survey feedback, the Course Instructors

may adjust the grades within a team. Students may be asked for documentation of team interactions as evidence of team function.

7.3. Late Penalties

Assignments that are submitted late will be subject to a cumulative penalty of no less than 5% per calendar day or part thereof. Note that this practice deviates from the more common industry practice of not accepting late deliverables.

7.4. 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 a member of the Teaching Team as soon as possible. **Should accommodations be necessary, by University of Toronto policy students are required to contact the Accessibility Services Office**. The Accessibility Services staff are available by appointment to assess specific needs, provide referrals, and arrange appropriate accommodations.

8. Policies

Engineering Science Students are expected to comport themselves professionally and to exercise common sense. 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 forms of cheating in which a student makes use of someone else's ideas or words without giving appropriate attribution. In academic work, plagiarism usually occurs in one of three ways:

1. You cut and paste a piece of someone else's text, code, or figure but do not clearly show the source both in a citation and in a list of references.
2. You hand in work done by others (e.g. teammates) without putting their names on the work
3. 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. All lectures are copyright of the lecturers.

8.3. Intellectual Property

Design work undertaken in this course falls under the auspices of the "University of Toronto Inventions Policy", available online at:

`http://www.governingcouncil.utoronto.ca/policies/invent.htm`

This policy stipulates that "… the University shall solely own all rights" to such works. Students who believe that their design work should be protected must inform the Teaching Team prior to the submission of that work.

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. Should such use take place the deliverables will be modified to be FIPPA-compliant. Students who are concerned about the intellectual property ramifications of potential disclosure must notify the Course Instructors prior to the end of the academic session.

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.

8.4. English Proficiency Requirement

In Engineering Science, successful completion of the written components of Praxis I demonstrated such proficiency.

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. Illness

While the Teaching Team will work with students to ensure that they are not disadvantaged should they become ill, **students have a responsibility to work in good faith with the Teaching Team to make appropriate accommodations**. Students who become ill and are unable to complete their Praxis and Design assignment(s), or whose performance is compromised, have the option of petitioning their circumstances by following the information available in the Academic Calendar or online at:

`http://www.undergrad.engineering.utoronto.ca/Office_of_the_Registrar/Petitions.htm`

Note that should you choose to pursue this path, you will need to acquire appropriate medical documentation **at the time of your illness**; documentation acquired after the fact will not be accepted.

Because much of the student work in Praxis takes place within teams, students should be careful to make arrangements with their teammates in order to mitigate the effects of a potential absence. The Teaching Team will work with student teams to help them make these arrangements.