APSC 101 – Introduction to Engineering II

Course Syllabus 2015W

Course Overview

APSC 101 is a continuation of APSC 100. It builds on the concepts you have already seen, further developing your proficiency in design, sustainability, professionalism, communication, teamwork, and more. In addition, you will continue to expand your engineering toolbox with new skills in working with hand tools, microcontrollers, and engineering drawings, new tools and perspectives in sustainability, and challenging problems in design and decision making. Most importantly, you will further develop your ability to think like and act like an engineer.

Calendar Description

An introduction to the engineering profession including: the engineering design process, sustainability, prototype testing, introduction and application of the relevant foundational scientific principles, team functioning, engineering graphics, and technical communication.

Learning Outcomes

By the end of this course, you should be able to:

- Apply the engineering design process to open-ended engineering design problems
- Develop and use prototypes as part of the engineering design process
- Apply scientific principles to the understanding and analysis of engineering problems, and to the design of potential solutions
- Apply considerations of sustainability in engineering design and decision making
- Prepare and deliver effective technical reports and oral presentations
- Prepare engineering drawings on paper and by using CAD tools
- Apply engineering tools, including hand tools, prototyping tools, and software tools to create, test, and analyze physical embodiments of an engineering design
- Articulate the responsibilities of a member of a regulated profession to the profession and to society
- Demonstrate ethical behavior and describe the importance of engineering codes of ethics, both at the student and professional level
- Describe the contributions that an engineer can make to society as well as the impact (both positive and negative) that an engineering project can have on society
- Demonstrate effective practices in teamwork
- Value the need to adapt to different teaching and learning styles, and recognize the expectation of life-long learning and continuing professional development

Teaching Team

APSC 101 is taught by a large, committed team of teachers from across programs and departments of Applied Science and the Engineering industry. The sections below list the class teaching team, the engineering studio instructor and teaching assistant teams, and the course coordination team.

Class Teaching Team

Naoko Ellis, Professor, Chemical and Biological Engineering, P.Eng.
Goran Fernlund, Associate Professor, Materials Engineering, P.Eng.
Carol Jaeger, Senior Instructor, Electrical and Computer Engineering & Associate Dean, P.Eng.
Jon Nakane, Lab Director, Engineering Physics, P.Eng.
Yahya Nazhat, Instructor, Civil Engineering (background as a Geotechnical Engineer), C.P.Eng.
Susan Nesbit, Professor of Teaching, Civil Engineering, P.Eng.
Pete Ostafichuk, Professor of Teaching, Mechanical Engineering & Chair First Year Engineering, P.Eng.
Sheryl Staub-French, Associate Professor, Civil Engineering, P.Eng.
Vikram Yadav, Assistant Professor, Chemical and Biological Engineering, P.Eng.
Joseph Yan, Senior Instructor, Electrical and Computer Engineering, P.Eng.
Nobo Yonemitsu, Senior Instructor, Civil and Integrated Engineering, P.Eng.

Engineering Studio Teaching Team

Patricia Keen, Senior Environmental Health, Risk and Impact Assessment Consultant
Florence Luo, Design director, Twinklebelle Design Inc., P.Eng.
Chris McLean, Co-founder, VP Product Development, and General Manager, Espro Inc., P.Eng.
Bill Rawlings, Director of Operations, Mavi Innovations, P.Eng.
Pamela Rogalski, Co-founder and CEO, Engineering Leadership Council, P.Eng.
Bernhard Zender, Staff Instructor, Engineering Physics

Teaching Assistant Team

Hoda Ahmadi, MASc Candidate, Mechanical Engineering
Arian Amirkeyvan, PhD Candidate, Mechanical Engineering
Alice Lam, MASc Candidate, Mechanical Engineering
Darrick Lee, BASc Candidate, Engineering Physics
Badrun Naher Liya, MASc Candidate, Electrical and Computer Engineering
Ivan Lobachev, MASc Candidate, Electrical and Computer Engineering
Amir Shoolestani, PhD Candidate, Civil Engineering
Behzad Shoolestani, PhD Candidate, Civil Engineering
Nicolas Unick, BASc Candidate, Engineering Physics

Course Coordination

Course coordinator, Peter Ostafichuk (ostafichuk@mech.ubc.ca)
Assistant course coordinator, Ara Beittoei (ara.beittoei@ubc.ca)
Module 5 Leader: Nobo Yonemitsu
Module 6 Leader: Susan Nesbit
Module 7 Leader: Joseph Yan

Course Structure

Modules

The course is divided into three interwoven modules:

- Module 5: Technical Skills in Design – Arduino and Hand Tools Project (Jan 4 to Feb 5)
- Module 6: Sustainability – Water Scarcity (Feb 1 to Mar 4)
- Module 7: Cornerstone Design Project – Rainwater Treatment System (Mar 7 to Apr 8)

Each week in a module follows a regular pattern of online preparation – large class A – engineering studio – large class B. A description of what is expected of you in each class element is described below, followed by a summary of course topics.

Weekly Online Preparation

The primary source of the course content will come from required online experiences completed at your own pace. Most weeks, the content will be delivered through a set of curated videos, but it could also come from readings or other sources. As part of the online preparation, you will be required to complete a self-test quiz, questionnaire, or other learning activity. Together, these elements will prepare you for the classes and studio exercises, and in most cases you will receive immediate feedback to ensure you have a good understanding of the materials. Completing the online preparation is essential for the subsequent course activities, and as such, a portion of the course grade is dedicated to completing the online prep.

Class A

The first class of the week (for most sections this is on Monday, but for some this is on Wednesday) will start with a team quiz. This is a multiple choice quiz based on the online preparation materials and completed in your class teams. The quiz will have six multiple choice questions answered on scratch cards. With these cards, your team will discuss each question and scratch what you believe is the correct answer. If you reveal a ★, you get full marks for that question; if you do not reveal a ★, you know you did not get the question correct and you can discuss and retry for partial marks. Following the team quiz, you will have 30 minutes of class that involves activities, discussions, and mini-lectures.

Engineering Studio[1]

In the studio period, you will work in your studio teams to apply the concepts from the online preparation and Class A. In most cases, you will work directly on a portion of a project or case study for the current module. The studio periods will also be used to showcase design creations and to deliver a team oral presentation. To receive credit for team work, you must attend the studios (see also page 6).

Class B

The second class of the week (for most sections this is Friday, but for some this is Wednesday) is divided into two parts. You will continue to explore the ideas from Class A and the studio through discussions

[1] In APSC 100 we referred to this activity as either "tutorial" or "lab," but neither one quite describes the character of what you were doing. For APSC 101, we have decided to rename this time "engineering studio," since during these sessions you get to practice and develop various engineering skills while getting guidance from instructors and TAs.

and other activities, and you will prepare for the week that follows. Unlike APSC 100, there are no more presentations from the different engineering disciplines.

Class and Studio Teams

You will be working in two different teams throughout the course. Each team nominally has 6 members (some teams have 5) and you will remain in these same teams for the duration of the term. You can find your teams on Connect in the "Schedule, Syllabus, and Team Roster" folder. Your class team starts with a number (e.g. 1-23) and will be the group you will work with during the lecture times. You will complete the weekly team quizzes in this team and work on simple exercises. Your studio team starts with a letter (e.g. A-12) and will be a completely different group of people from your class team. In your studio team, you will complete studio exercises and projects associated with each module. We will deliberately use the two different teams in the course to allow you to bring conversations from class to the studio; in a sense, this means 36 different perspectives will be represented in your studio team discussions. This also means that you will get to know 10 other students really well by the end of the term.

Course Topics

A tentative list of the course topics is provided below. These are subject to change. Any significant changes will be reported on Connect.

Mod.	Week Start	Online	Class A	Studio	Class B
5	Jan 4	Intro. to hand tools	Project introduction	Hand tools workshop	Design refresher and project concept generation
	Jan 11	Intro. to microcontrollers	Analysis & prototyping I	Arduino workshop and project work time	Analysis & prototyping II
	Jan 18	Engineering drawings	Isometric drawings	Project work time	Orthographic drawings
	Jan 25	Communication	Conveying technical information	Project work time	Effective posters
6	Feb 1	Sustainability and waves of innovation	Engineering achievements	Module 5 Showcase	Introduction to water scarcity
	Feb 8	Sustainability and engineering design	None (Family Day)	Sustainability case studies	Sustainability and systems thinking
	Feb 15	Reading Week – No Class			
	Feb 22	Assessing sustainability	Life Cycle Assessment	Life Cycle Assessment case study	Midterm
	Feb 29	Appropriate technology	Introduction to Project 2	Stakeholder assessment and LCA for Project 2	Module 6 summary and Module 7 outlook
7	Mar 7	Context of Project	Project Intro – needs and specifications	Project 2 worktime	Sustainability and design
	Mar 14	Prototype testing	Conducting experiments using prototypes	Project 2 worktime	Verification and validation
	Mar 21	Data and information	Turning test data into information	Project 2 worktime	None (Good Friday)
	Mar 28	Working with others	None (Easter Monday)	Project 2 worktime	Acting like an engineer
	Apr 4	Course reflection activity		Project 2 Demonstration and oral presentations	Course wrap-up

Course Grading and Pass Requirements

Your course grade will be determined according to the following components.

Item	Number	Total Weight	Indiv. / Team*	Notes
Online individual quizzes and questionnaires	~18	5%	I	Done as part of weekly online preparatory material. Marks are for completion.
Team quizzes	10	5%	T	Done as a team in class based on online material.
Studio worksheets	11	10%	T	Completed during weekly studio.
Professional development reflections, memos, and critiques	2-3	5%	I/T	These include self-assessments of professional development, peer-assessments of other teams' work (e.g. evaluations of other teams' posters), and in-class memos.
Project deliverables	2	25%	T	One deliverable per project (e.g. poster or presentation)
Midterm exam	1	15%	I	See note below
Final exam	1	35%	I	

* a peer evaluation process will be used in the course to determine individual grades from team work – see below for details.

Note: to pass the course, you must achieve a weighted average of at least 50% on the combination of the midterm and the final exam, otherwise the grade will be capped at 49%.

If you have any questions or concerns about the course grading or your performance, speak to the course coordinator (see above) as soon as you are able. The course instructors reserve the right to adjust or modify the graded items and grade weighting in the course.

Peer Evaluation

Each student will evaluate their teammates' contributions and performance, and they themselves will likewise be evaluated. The evaluation scores each individual gives will be normalized to 100% - if they tend to give low or high evaluations on average, it will not matter. The peer evaluation scores within a team will therefore also average 100% – some individuals will have higher and some lower. The team contribution to each individual's course grade will be determined by multiplying the team grade by the individual's peer evaluation score. In total, there will be four peer evaluation events, roughly evenly-spaced in the course. The first and third evaluations will be done for class teams and the second and fourth evaluations will be for studio teams.

Each peer evaluation event will be open for one week. Late evaluations will be accepted up to one week late, but submitting a late evaluation will reduce your evaluation score by 2% per day late.

Following the close of each peer evaluation event, you will receive anonymous and randomly-ordered scores and comments from your teammates.

Texts and References

There are no required texts for the course. Content will be delivered through online videos and in-class presentations. Materials will be available on Connect for you to access. If you are interested in an additional reference for the course that should be helpful for future years, we recommend:

> *Designing Engineers: An Introductory Text*, by Susan McCahan, Phil Anderson, Mark Kortschot, Peter E. Weiss, and Kimberly A. Woodhouse, published by Wiley, 2015.

Limited copies of this text will be available in the UBC Bookstore, and the Bookstore will order more if there is demand (so if they are out of stock and you would like it, let them know).

Professional Expectations

Attendance

Attendance is mandatory for APSC 101. The course is designed to include team-based activities and continual assessment in both the classes and the studios. Attendance will be tracked through the submission of team based quizzes and deliverables from in-class and in-studio activities. It is understood that in any 13-week term a student is likely to miss one or two classes due to illness or other unexpected circumstances. For such rare unavoidable cases, medical documentation is not required for absence from a class or studio with the following exceptions:

- **Project Demonstrations or Showcases:** If, due to medical reasons, you will be missing a class or studio during which your team will be making a presentation, valid medical documentation will be required. Other justifiable absences may be considered at the discretion of the course coordinator on a case-by-case basis with appropriate documentation. Submit documents to apsc101@apsc.ubc.ca.
- **Midterm Examination:** If it becomes clear that you will miss the midterm examination due to medical reasons, the weight of the midterm may be moved to the final exam upon approval of submitted documentation (i.e. a doctor's note). There will not be a makeup or alternate midterm exam. Other justifiable absences may be considered at the discretion of the course coordinator on a case-by-case basis with appropriate documentation. Submit documents to apsc101@apsc.ubc.ca.
- **Final Examination:** Students seeking academic concession due to absence from the final exam for any reason must apply to Engineering Student Services (ESS) within 72 hours of the missed exam. This is a standard practice for all final examinations at UBC. For more information please review the following webpage: http://students.engineering.ubc.ca/faqs.

Policies for Work Submitted

In general, submissions for individual activities should be your own work. It may be appropriate to discuss assignments with your classmates and help each other to work through problems, but any submission (hand written, typed, or in response to electronic interactive quizzes and questions) must be your own work and not copied from others. In this class we have the following typical activities:

- **Weekly Online Preparation:** As part of the online preparation, you will be required to complete a self-test quiz, questionnaire, or other learning activity. These are to be completed individually as the goal of these activities is to ensure that you are prepared for the week ahead and to let the instructional team assess whether there are any difficult concepts that we should further address

in the class. Deadlines for these activities will be posted on Connect. There are no extensions for these activities.

- **Classes and Studios:** The classes and studios will contain a number of team-based activities and assessments. It is expected that students work together and actively participate in completing quizzes, worksheets, and general discussions. On team quizzes and studio worksheets, you will write the names of all team members who were present and contributed to the work. At the instructors' discretion, marks for quizzes, studio worksheets, and project deliverables will be withheld for students who are absent without appropriate reason from multiple activities during the term. Note that recording the names of any teammates who weren't present is an act of academic misconduct by the entire team and will be reported if identified. See the section titled "Academic Integrity" below for more details. In-class and in-studio activities are submitted in the class in which they are held. There are no extensions for these activities, other than those granted by the instructor in exceptional circumstances.
- **Critiques and Professional Development Reflections:** Except where specifically identified otherwise, these are individual activities and must be your own work. Deadlines for each of the reflections will be posted on Connect. For full marks, submit your work before the published deadline; if you would like a bit more time, you may still submit up to 3 days after the deadline, but your maximum possible mark will decrease by 20% per calendar day.

Professional Conduct

This is a very dynamic course and demonstrating professional conduct in the class will allow all students to get the best experience possible from the class. Examples of good professional conduct include:

- Being prepared for class, specifically by having completed the weekly online preparation or by having completed any action items agreed upon by your studio team during project modules.
- Being on time for classes and studios so that you are present for any instructions and are ready to work with your team as soon as each activity begins.
- Including all team members in discussions, and being respectful of each team member and their contributions to the team. Encourage every team member to put forward ideas and be open to solutions that incorporate the best ideas from all team members. Each of you will have different backgrounds and life experiences from which to draw ideas – learn from each other.
- Taking credit only for your own work, and giving credit to others for their contributions.
- Focussing only on the task at hand and ensuring that your team finishes in-class or in-studio activities in a timely manner.
- Being honest and fair when conducting peer assessments. Complements, encouragement, and constructive criticism are all welcome, but rude or inflammatory comments are not. Remember that peer assessment should focus on elements such as participation, cooperation, effort, and quantity and quality of contributions to a group effort.

Academic Integrity

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious

consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.

For more information, see: http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,286,0,0

Support and Getting Help

Who to Contact

- Questions about course content: usually, one of the best time to ask simple questions about course content is immediately before or after the class. For more detailed questions, usually meeting an instructor during office hours is best; instructor office hours will be posted to Connect. There are two additional resources that you should be aware of: Peer Assisted Study Sessions (PASS) and AMS Tutoring. These are primarily intended to assist with first year science and math, but you may be able to get some help on APSC 101 topics there too. See below for further information on PASS and AMS Tutoring.
- Feedback and suggestions about Arduino and hand tool videos (Module 5): Bernhard Zender, bzender@physics.ubc.ca.
- General inquiries (e.g. registration questions, submitting medical notes, etc.): email apsc101@apsc.ubc.ca and include your student number and UBC registered name somewhere in the email body. You can also visit Engineering Student Services (ESS) in KAIS 1100. Their hours are Mon, Tues, Wed, and Fri 9:00-4:00, and Thurs 11:00-4:00.
- Issues with Connect and online materials: please email cis-dev2@apsc.ubc.ca
- Personal emergencies and concerns about the course: Ara Beittoei (Ara.Beittoei@ubc.ca) or any member of the teaching team.

Peer Assisted Study Sessions (PASS)

From the UBC PASS website,

> *Peer-Assisted Study Sessions are informal study sessions led by a senior student who specialises in your area of study. Multiple sessions are held every week, and the content is directly related to what you're learning in your course at the time. You will learn techniques on how to effectively learn your course content and will also receive targeted support on areas you find particularly challenging. You are invited to drop into as many of these sessions as you would find helpful.*[2]

For first year engineering, PASS Sessions will generally be held in either EDC 320 (usual room) or EDC 301 (room during periods of high demand). PASS will have the official list of rooms. The two rooms are connected, so if you're expecting a session in one room but cannot find it, look next door.

PASS session times will be announced early in the start of term.

We encourage you to take advantage of PASS, and to attend sessions starting early in the term. While PASS will help with exam study and writing skills, it is not a "cram session" for midterms or finals. No

[2] http://students.ubc.ca/success/student-supports/peer-assisted-study-sessions

matter how well you are doing in your courses, you stand to benefit from PASS. Watch Connect for further information about PASS.

AMS Tutoring

In addition to PASS, the Alma Mater Society (AMS) will also be holding tutoring sessions for first year engineering students. Again, the subjects will focus on science and math courses. These tutoring session are led by undergraduate students who excelled in these same courses. Sessions are run on a drop-in basis and space is limited.

AMS tutoring session times will be announced early in the start of term.

Tips for Success

The tips presented in this section apply not just to this course, but to your entire program. University is a very different system as compared to high school. You have significantly more independence, and you must take responsibility for your own actions. Many of you may be living away from home for the first time, you are all making new friends, and there are a seemingly endless array of social activities to participate in. Using good time management and finding the right balance of school work and social time can be difficult. Here are some tips for a successful transition:

Classes and Assignments

- Go to class (even if the instructor doesn't take attendance). For those of you living away from home for the first time, this may also mean investing in a reliable alarm clock. Notes may be published on Connect for some courses, but nothing can replace the live lecture and the ability to ask questions when something is not clear. Even the best lecture notes posted by an instructor cannot replace the full conversation that goes on in the classroom.
- Take notes in class, or annotate notes provided by the instructor. Taking an active role in the classroom helps with retention and allows you to identify difficult concepts that you will want to review and practice after class.
- Ask questions. If you don't understand something, odds are several others in the class don't either. Asking questions during the lecture helps everyone. Many instructors will also take questions directly after the lecture while they are packing up, and all instructors hold office hours either pre-set or by appointment. Don't be afraid to ask for help or clarification.
- Do assigned homework, even if it is not for credit. Keeping up with practice problems is the best way to tell if you have a good understanding of the material. If you get stuck, try taking a problem that you have worked on but haven't successfully solved to your instructor during office hours (or to drop-in tutoring if available). Often your instructor can help you much more effectively if they can spot the types of errors that you are making.
- Try problems yourself before looking at solutions or answers. The solution to a problem may make perfect sense when you see it, but your job is to arrive at that solution on your own. There will be no solution set to turn to on the midterm or final, after all, so establishing how confident you are in your abilities to solve problems in each of your courses is a key element for success.

Study Tips

- Find an effective study location – if your dorm room is noisy, check out the various libraries on campus. Create dedicated study time and space, removing all distractions.
- Take breaks – try focussing for 45 minutes followed by a 15 minute break, then repeat as necessary. Save your web browsing, texting, Facebook updates, etc. for the breaks. Over an evening of studying, this will be more effective than either trying to push through without taking breaks, or trying to study with distractions.
- Practice 'active recall'. This means that instead of highlighting text passages, reading, and re-reading (which are all passive activities), practice recalling the information that you need to solve a problem, and practice solving the types of problems that you are likely to encounter on a test. Being able to explain concepts to others is also a good way to test your knowledge.
- Try not to cram. If you can revisit material on multiple occasions before a test you will retain the material for longer and are more likely to be able to recall it during the test.
- Find the right mix of working independently and in groups. Studying with friends can be helpful if you are all focussed, but make sure that you walk away from the study session having accomplished what you needed to for the day.

Extracurricular Activities

- "Choose well, not all" – you will hear constant messages about getting involved in clubs, sports, student teams, student government, and other interesting activities. Having some extracurricular involvement is a great thing, but resist the urge to sign up to anything and everything. Make sure that you leave sufficient time to get your work done to your satisfaction. Don't be afraid to start slow and add or remove activities as you gauge the impact that they have on your coursework.
- Take some time to reflect on what each activity contributes to the big picture. Some may be purely for enjoyment and self-fulfilment, and others may be deliberately chosen professional development opportunities. Make sure to balance these activities, and if you find yourself overwhelmed, think about the purpose and priority of each in your personal and career goals when trimming back.

Stay Healthy – Body and Mind

- Keep a regular schedule and make sure you are getting enough rest, eating healthy meals, staying hydrated, and getting some regular exercise. Falling behind in your coursework is stressful, so try your best to keep up to date with assignments and general studying.
- Get medical help where needed for illness, and get a doctor's note if you will be missing tests or multiple lectures.
- Visit an ESS advisor if you are feeling worried or troubled. They can give help and suggestions, and can refer you to other on-campus resources that may be helpful. Talking helps.