

Western University - Faculty of Engineering

ES 1050 – Introductory Design and Innovation Studio Course Outline 2015-2016

This course is an introduction to the principles and practices of professional engineering design. The design-studio approach fosters innovative thinking, improves problem solving, and provides context. This course includes elements of the design process including need recognition, conceptualization, analysis and prototyping to satisfy specifications. Emphasis will be placed on creativity, innovation, teamwork, problem solving, communication, engineering ethics, safety, self-reflection and the skills necessary to practice engineering in any discipline.

Calendar Description:

Introduction to the principles and practices of professional engineering. The design studio fosters innovative thinking, improves problem solving, and provides context. Includes elements of need recognition, conceptualization, prototyping, and engineering design to satisfy commercial specifications. Emphasis on creativity, teamwork, communication and engineering skills necessary to practice in any engineering discipline.

Prerequisites:

None.

Co-requisites:

None.

Anti-requisites:

None.

Note: It is the student's responsibility to ensure that all Prerequisite and Corequisite conditions are met or that special permission to waive these requirements has been granted by the Faculty. It is also the student's responsibility to ensure that they have not taken a course listed as an Antirequisite. The student may be dropped from the course or not given credit for the course towards their degree if they violate the Prerequisite, Corequisite or Antirequisite conditions.

Contact Hours:

3 lecture hours and 4 laboratory/tutorial hours (2 hours studio and 2 hours team/tutorial) per week.

Course Instructors:

Instructor	Studio	Email	Office
Dr. Jon Southen (coordinator)	Studios 005 and 007	jsouthen@uwo.ca	SEB 3116
Dr. Shazad Barghi, P.Eng.	Studio 003 and 008 [Winter]	sbarghi2@uwo.ca	TEB 447
Dr. Franco Berruti, P.Eng.	Studio 003 and 008 [Fall]	fberruti@uwo.ca	CMLP 2331
Dr. Paul Kurowski, P.Eng.	Studio 009 [Fall]	pkurowski@eng.uwo.ca	SEB 3077
Dr. Konstantin Kreyman	Studio 012, 013, 017 and 018	kkreyman@uwo.ca	CMLP 1331
Dr. Abbas Samani, P.Eng.	Studio 004 [Fall]	asamani@uwo.ca	MSB 402
Dr. Duane Jacques	Studio 006, 004 [Winter]	djacque4@uwo.ca	
Dr. Roger Khayat, P.Eng.	Studio 010, Studio 009 [Winter]	rkhayat@uwo.ca	SEB 3086
Dr. Mohammad Hossain	Studio 011 and 016	mhossa7@uwo.ca	SEB 3055
Chris Vandelaar	Manufacturing and CAD support	cvandela@uwo.ca	CMLP 1301
Dr. Michael Bartlett, P.Eng.	Lecture Support	f.m.bartlett@uwo.ca	SEB 2097

Individual Studio Instructors will advise as to additional office hours.

Text:

No required text. Course information will be posted to Owl.

Reference Material:

Suggested readings may be posted to Owl.

Units:

Both SI and FPS unit systems may be used in lectures, tutorials and examinations.

General Learning Objectives:

The overall objectives of this course are to enable the student to acquire specific attributes and competencies listed below (1-11) towards the Profession of Engineering. It is understood that this is an entry level course which focuses on the design process and approaches and will start you on this path to acquire these skills and attributes in your chosen engineering field.

Required Attributes in the Engineering Profession:

1. **A knowledge base for engineering:** Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.
2. **Problem analysis: An ability to use appropriate** knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.
3. **Investigation: An ability to conduct investigations** of complex problems by methods that include appropriate experiments, analysis and interpretation of data, and synthesis of information in order to reach valid conclusions.
4. **Design: An ability to design solutions for complex,** open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
5. **Use of engineering tools: An ability to create,** select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.
6. **Individual and team work: An ability to work** effectively as a member and leader in teams, preferably in a multi-disciplinary setting.
7. **Communication skills: An ability to communicate** complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.
8. **Ethics and equity: An ability to apply professional** ethics, accountability, and equity.
9. **Economics and project management: An ability** to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations.
10. **Professionalism:** An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.
11. **Life-long learning: An ability to identify and to** address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.

Specific Learning Objectives:

- 1. Engineering design and the design process (as applied to different engineering disciplines)**
 - a. Recognize a need and develop a problem definition.
 - b. Develop design specifications, requirements and constraints.
 - c. Conduct research and gather background information on existing and emerging technologies relevant to a problem.
 - d. Be aware of emerging technologies and how they can be applied to generate innovative design solutions.
 - e. Use creativity and brainstorming techniques to generate many alternative design ideas and concepts, including both obvious and innovative ideas.
 - f. Use sound methods to evaluate alternatives and select the best one.
 - g. Predict and validate the function and performance of design concepts using:
 - i. Mathematical models and simple engineering calculations
 - ii. CAD models and computer analysis (CAE)
 - iii. Experiments and testing using physical prototypes
 - h. Prepare a project budget, and perform basic cost analysis.
 - i. Become familiar with different manufacturing methods.
 - j. Produce comprehensive design documentation including
 - i. Final design report
 - ii. Analysis and test results
 - iii. Engineering drawings
 - k. Understand the concept of intellectual property, and its protection

- 2. Engineering Graphics and CAD (as applied to different engineering disciplines)**
 - a. Be able to produce engineering drawings and diagrams using freehand sketching and CAD
 - b. Appreciate the forms of graphical communication used in different engineering disciplines, including:
 - i. Piping and instrumentation diagrams
 - ii. Process flow diagrams
 - iii. Electrical schematics
 - iv. Pneumatic and hydraulic schematics
 - v. Floor plans and site layouts
 - vi. Flow charts and diagrams
 - c. Be able to read and produce correct detail drawings incorporating the following elements:
 - i. Multi views
 - ii. Pictorial views
 - iii. Section views
 - iv. Auxiliary views
 - v. Dimensions and tolerances
 - d. Be able to read and produce assembly drawings including:
 - i. Exploded assemblies
 - ii. Multi view assemblies
 - iii. Bills of material
 - e. Be familiar with the concepts and application of 3D CAD software to produce:
 - i. Solid parametric, feature-based models of single parts
 - ii. Assembly models of multiple parts
 - iii. Drawings of parts and assemblies
 - iv. Pictorial renderings and animations

3. Mathematical modelling and engineering validation in design

- a. Predict and validate the function and performance of design concepts using:
 - i. Mathematical models and simple engineering calculations
 - ii. Experiments and testing using physical prototypes
 - iii. CAD models and computer analysis (CAE)
- b. Define various steps in mathematical modeling
- c. Describe different type of models
- d. Differentiate between under and over-constrained systems
- e. Create simple models (making assumptions and approximations)
- f. Develop a proper testing method within the constraints of available resources
- g. Apply mathematical tools to analyze and express experimental data
- h. Validate a model
- i. Study and optimize the behaviour and performance of a design

4. Teamwork, leadership and personal skills.

- a. Negotiate with others and resolve conflicts
- b. Conduct effective team meetings
- c. Develop project management skills including setting goals, assigning and prioritizing tasks, and meeting deadlines
- d. Reflect on experience, and learn from failures.

5. Technical communication.

- a. Prepare and deliver effective oral presentations.
- b. Communicate effectively both orally and in writing.
- c. Prepare effective and properly formatted technical reports.

6. Professional engineering (ethics, social responsibility)

- a. Understand the role of engineering within society
- b. Understand and practice ethical and professional engineering conduct.
- c. Understand issues of health and safety.
- d. Understand the importance of equity in the professional engineering context.
- e. Properly consider environmental, legal, ethical and social implications of an engineering design project.

7. Exploration of engineering disciplines

- a. Understand and appreciate the different disciplines of engineering.
- b. Be familiar with the engineering programs offered at Western.
- c. Be exposed to engineering design as practiced in different disciplines.
- d. Appreciate the roles of different disciplines in a multi-disciplinary engineering project

Evaluation:

The course grade will be determined as follows:

Fall Term (total: 90):	
Design project I	27
Design project II	32
Assignments	16
Notebook	5
Midyear Exam	10
Winter Term (total: 110):	
Design project III	70
Tests and Assignments	15
Notebook	5
Final Exam	<u>20</u>
 TOTAL	 200

The final course mark includes all the components listed above, weighted as above. A number of individual assignments and three team projects will be associated with this course. To determine an individual student mark based on the assigned team mark, each team member will be asked to specify his/her own contribution and a formula will be used to calculate the individual mark. **Participation in team work is mandatory for all students.**

It is the student's responsibility to ensure that all assignments are submitted to the specified location on or before the specified due date. Late penalties of 10% of the total mark per day will be applied to late assignments.

To ensure consistency between studio sections, grades for projects and assignments may be normalized. The procedure for normalizing grades will be made available, if necessary.

Use of English:

In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests and examinations for the improper use of English. Additionally, poorly written work with the exception of final examinations may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

Cheating:

University policy states that cheating, including plagiarism, is a scholastic offence. The commission of a scholastic offence is attended by academic penalties that might include expulsion from the program. If you are caught cheating, there will be no second warning. The University of Western Ontario uses software for plagiarism checking. Students are required to submit certain reports in electronic form to Turnitin.com for plagiarism checking. For more information on scholastic offenses, please see:

http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf

Attendance:

Any student who, in the opinion of the Studio Instructor, is absent too frequently from lecture, laboratory, or tutorial periods (which includes all sessions in lecture-hall, workshop, studio, or team-meeting formats) will be reported to the Associate Dean (Undergraduate Studies) (after due warning has been given). On the recommendation of their Studio Instructor, and with the permission of the Associate Dean (Undergraduate Studies), the student will be debarred from sharing in the grade from the team project.

Accessibility:

Please contact the course coordinator if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

Notification:

Students are responsible for checking their university email account (@uwo.ca) regularly to receive notices posted by the Studio Instructors regarding the ES 1050 course.

Consultation:

Students are encouraged to discuss problems with their Tutorial Assistants and/or Studio Instructor during Studio or Team Meeting sessions. Office hours will be arranged for students to meet Studio Instructors and Tutorial Assistants. Additional consultation can be arranged by appointment.

Student Conduct:

Students are expected to arrive at lectures on time, and to conduct themselves during class in a professional and respectful manner that is not disruptive to others. Please turn off your cell phone before coming to a class, tutorial, quiz or exam. On the premises of the University or at a University-sponsored program, students must abide by the Student Code of Conduct:

<http://www.uwo.ca/univsec/board/code.pdf>

Sickness and Other Problems:

Students should immediately notify their Studio Instructor by electronic mail if they have any problems that could affect their performance in the course. Immediate notification is required to ensure teamwork components of the course are not adversely affected. If the Studio Instructor does not respond students should contact the Undergraduate Services Office, SEB 2097. Where appropriate, the problems should be documented. The student should seek advice from their Studio Instructor about how to deal with the problem as it relates to their performance and their team's performance in the course. For more information concerning medical accommodations, please see:

http://www.uwo.ca/univsec/handbook/appeals/accommodation_medical.pdf

Accreditation Units:

Engineering Design	50%
Engineering Science	25%
Complementary Studies	25%

The document “*INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED*” is part of this course outline.

INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED

IF, ON MEDICAL OR COMPASSIONATE GROUNDS, YOU ARE UNABLE TO WRITE TERM TESTS OR FINAL EXAMINATIONS OR COMPLETE COURSE WORK BY THE DUE DATE, YOU SHOULD FOLLOW THE INSTRUCTIONS LISTED BELOW. YOU SHOULD UNDERSTAND THAT ACADEMIC ACCOMMODATION WILL NOT BE GRANTED AUTOMATICALLY ON REQUEST. YOU MUST DEMONSTRATE TO YOUR DEPARTMENT (OR THE UNDERGRADUATE SERVICES OFFICE) THAT THERE ARE COMPELLING MEDICAL OR COMPASSIONATE GROUNDS THAT CAN BE DOCUMENTED BEFORE ACADEMIC ACCOMMODATION WILL BE CONSIDERED. DIFFERENT REGULATIONS APPLY TO TERM TESTS, FINAL EXAMINATIONS AND LATE ASSIGNMENTS. READ THE INSTRUCTIONS CAREFULLY. (SEE THE 2015 UWO ACADEMIC CALENDAR).

A. GENERAL REGULATIONS & PROCEDURES

1. All first year students will report to the Undergraduate Services Office, SEB 2097, for all instances.
2. If you are an upper year student and you are missing a test/assignment/lab or exam that is worth MORE THAN 10% of your final grade, you will report to the Undergraduate Services Office, SEB 2097. Otherwise, you will report to your department office to request accommodation.
3. Check the course outline to see if the instructor has a policy for missed tests, examinations, late assignments or attendance.
4. Documentation must be provided as soon as possible. If no one is available in your Department office or the Undergraduate Services Office, leave a message clearly stating your name & student number and reason for your call. The department telephone numbers are given at the end of these instructions.
5. If you decide to write a test or an examination you should be prepared to accept the mark you earn. Rewriting tests or examinations or having the value of a test or examination reweighted on a retroactive basis is not permitted.

B. TERM TESTS

1. If you are in first year and you are unable to write a term test, contact the Undergraduate Services Office, SEB 2097 PRIOR to the scheduled date of the test.
2. If you are an upper year student and you are unable to write a term test, inform your instructor PRIOR to the scheduled date of the test. If the instructor is not available, leave a message for him/her at the department office. If the test is worth MORE THAN 10% of your final grade you will report to the Undergraduate Services Office, SEB 2097 to request accommodation. Otherwise, you will report to your department office to request accommodation.
3. Be prepared to provide supporting documentation to the Department Chair and/or the Undergraduate Services Office (see next page for information on documentation).
4. Discuss with the instructor if and when the test can be rescheduled. **N.B.** The approval of the Chair or the Undergraduate Services Office is required when rescheduling term tests.

C. FINAL EXAMINATIONS

1. If you are unable to write a final examination, contact the Undergraduate Services Office PRIOR TO THE SCHEDULED EXAMINATION TIME to request permission to write a Special Final Examination. If no one is available in the Undergraduate Services Office, leave a message clearly stating your name & student number.
2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). The following circumstances are not considered grounds for missing a final examination or requesting special examinations: common cold, sleeping in, misreading timetable and travel arrangements.
3. In order to receive permission to write a special examination, you must obtain the approval of the Chair of the Department **and** the Associate Dean and in order to apply you must sign a "Recommendation for a Special Examination Form" available in the Undergraduate Services Office. The Undergraduate Services Office will then notify the course instructor(s) and reschedule the examination on your behalf.

N.B. It is the student's responsibility to check the date, time and location of the special examination.

D. LATE ASSIGNMENTS

1. Advise the instructor if you are having problems completing the assignment on time (**prior** to the due date of the assignment).
2. Be prepared to provide documentation if requested by the instructor (see reverse side for information on documentation).
3. If you are granted an extension, establish a due date. The approval of the Chair of your Department (or the Associate Dean if you are in first year) is not required if assignments will be completed prior to the last day of classes.
4.
 - i) Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean. Documentation is mandatory.
 - ii) A Recommendation of Incomplete Form must be filled out indicating the work to be completed and the date by which it is due. This form must be signed by the student, the instructor, the department Chair and the Associate Dean.

E. SHORT ABSENCES

If you miss a class due to a minor illness or other problems, check your course outlines for information regarding attendance requirements and make sure you are not missing a test or assignment. Cover any readings and arrange to borrow notes from a classmate.

F. EXTENDED ABSENCES

If you are absent more than one week or if you get too far behind to catch up, you should consider reducing your workload by dropping one or more courses. (Note drop deadlines listed below). You may want to seek advice from the academic counsellor in your Department or Ms. Karen Murray in the Undergraduate Services Office, if you are in first year.

G. DOCUMENTATION

If you consulted an off-campus doctor or Student Health Services regarding your illness or personal problem, **you must provide the doctor with a Student Medical Certificate** to complete at the time of your visit and then bring it to the Department (or the Undergraduate Services Office). **This note must contain the following information: severity of illness, effect on academic studies and duration of absence. Regular doctors notes will not be accepted; only the Student Medical Certificate will be accepted.**

In Case of Serious Illness of a Family Member: Provide a Student Medical Certificate to your family member's physician to complete and bring it to the Department (or the Undergraduate Services Office if you are in first year).

In Case of a Death: Obtain a copy of the death certificate or the notice provided by the funeral director's office. You must include your relationship to the deceased and bring it to the Department (or the Undergraduate Services Office if you are in first year).

For Other Extenuating Circumstances: If you are not sure what documentation to provide, ask the Departmental Office (or the Undergraduate Services Office if you are in first year) for direction.

Note: Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).

H. ACADEMIC CONCERNS

1. You need to know if your instructors have a policy on late penalties, missed tests, etc. This information may be included on the course outlines. If not, ask your instructor(s).
2. **You should also be aware of attendance requirements in some courses. You can be debarred from writing the final examination if your attendance is not satisfactory.**
3. If you are in academic difficulty, check out the minimum requirements for progression in the calendar. If in doubt, see your academic counsellor.

Calendar References: Check these regulations in your 2015 Western Academic Calendar available at www.westerncalendar.uwo.ca.

Absences Due to Illness: <http://www.westerncalendar.uwo.ca/2015/pg117.html>
Academic Accommodations for Students with Disabilities: <http://www.westerncalendar.uwo.ca/2015/pg118.html>
Academic Accommodations for Religious or Holy Days: <http://www.westerncalendar.uwo.ca/2015/pg118.html>
Course Withdrawals: <http://www.westerncalendar.uwo.ca/2015/pg157.html>
Examinations: <http://www.westerncalendar.uwo.ca/2015/pg129.html>
Scheduling of Term Assignments: <http://www.westerncalendar.uwo.ca/2015/pg97.html>
Scholastic Offences: <http://www.westerncalendar.uwo.ca/2015/pg113.html>
Student Medical Certificate: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf
Engineering Academic Regulations: <http://www.westerncalendar.uwo.ca/2015/pg1442.html>

Note: These instructions apply to all students registered in the Faculty of Engineering regardless of whether the courses are offered by the Faculty of Engineering or other faculties in the University.

Drop Deadlines:

First term half course (i.e. "A" or "F"):	November 5, 2015
Full courses and full-year half courses (i.e. "E", "Y" or no suffix):	November 30, 2015
Second term half or second term full course (i.e. "B" or "G"):	March 7, 2016

Contact Information:

Undergraduate Services Office:	SEB 2097	Telephone: (519) 661-2130	Fax: (519) 661-3757
Dept. of Chemical and Biochemical Engineering & Green Process Engineering:	TEB 477	Telephone: (519) 661-2131	Fax: (519) 661-3498
Dept. of Civil and Environmental Engineering:	SEB 3005	Telephone: (519) 661-2139	Fax: (519) 661-3779
Dept. of Electrical and Computer Engineering, Software Engineering & Mechatronics Engineering:	TEB 279	Telephone: (519) 661-3758	Fax: (519) 850-2436
Dept. of Mechanical and Materials Engineering:	SEB 3002	Telephone: (519) 661-4122	Fax: (519) 661-3020