



**Course Outline (W2017)**

COE 800: Engineering Design

<b>Faculty Lab Coordinators (FLCs)</b>	Drs. V. Geurkov (C), A. Anpalagan, R. Cheung, M. Jaseemuddin, S. Karim, M. Kassam, N. Mekhiel, F. Mohammadi, K. Raahemifar, B. Venkatesh (M. Awadallah), D. Xu, T. Yang, F. Yuan																																																
<b>Calendar Description</b>	This course provides the student with a significant experience in self-directed learning. Project topics are provided from which the students select a topic. The topic selection information search, designs and component sourcing are completed as part of the Fall term course COE 700 Engineering Design. The students in a group will research the topic, design, implement, and make operational a design of currency in the fields of Electrical and Computer Engineering. Professional guidance is provided by faculty on a weekly basis. The completed project must be demonstrated operational by the last week of the term. A final project report that conforms to professional guidelines is required. The students must demonstrate their working project at an Open House.																																																
<b>Prerequisites</b>	<a href="#">COE 700</a>																																																
<b>Important Dates</b>	<p>COE800 important dates and deadlines are given below.</p> <table border="1"> <thead> <tr> <th>Week</th> <th>Dates</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Jan 9 - Jan 13</td> <td>Establishment of project management</td> </tr> <tr> <td>2</td> <td>Jan 16 - Jan 20</td> <td>Period 1 milestones &amp; deliverables submission</td> </tr> <tr> <td>3</td> <td>Jan 23 - Jan 27</td> <td>Lab work</td> </tr> <tr> <td>4</td> <td>Jan 30 - Feb 3</td> <td>Period 1 deliverables demonstration and evaluation</td> </tr> <tr> <td>5</td> <td>Feb 6 - Feb 10</td> <td>Period 2 milestones &amp; deliverables submission</td> </tr> <tr> <td>6</td> <td>Feb 13 - Feb 17</td> <td>Theory and design sections of report submission / Seminar 1</td> </tr> <tr> <td>7</td> <td>Feb 27 - Mar 3</td> <td>Period 2 deliverables demonstration and evaluation</td> </tr> <tr> <td>8</td> <td>Mar 6 - Mar 10</td> <td>Period 3 milestones &amp; deliverables submission</td> </tr> <tr> <td>9</td> <td>Mar 13 - Mar 17</td> <td>Lab work / Seminar 2</td> </tr> <tr> <td>10</td> <td>Mar 20 - Mar 24</td> <td>Period 3 deliverables demonstration and evaluation</td> </tr> <tr> <td>11</td> <td>Mar 27 - Mar 31</td> <td>Individual project contribution summary submission prior to oral exam</td> </tr> <tr> <td>12</td> <td>Apr 3 - Apr 7</td> <td>Individual Oral exam / Project demo &amp; Open House Poster submission</td> </tr> <tr> <td>13</td> <td>Apr 10 - Apr 14</td> <td>Individual Oral exam / Project demo &amp; Open House Poster submission Group Final EDP report (softcopy) submitted to FLC</td> </tr> <tr> <td></td> <td>Apr 28</td> <td>Open House Exhibition</td> </tr> <tr> <td></td> <td>May 5</td> <td>Final report uploaded to EDP web site</td> </tr> </tbody> </table> <p>A project manager is required to submit a weekly progress report at the end of every week. The report template is available at <a href="http://www.ee.ryerson.ca/capstone/weekly_report_template.docx">http://www.ee.ryerson.ca/capstone/weekly_report_template.docx</a>.</p>	Week	Dates	Description	1	Jan 9 - Jan 13	Establishment of project management	2	Jan 16 - Jan 20	Period 1 milestones & deliverables submission	3	Jan 23 - Jan 27	Lab work	4	Jan 30 - Feb 3	Period 1 deliverables demonstration and evaluation	5	Feb 6 - Feb 10	Period 2 milestones & deliverables submission	6	Feb 13 - Feb 17	Theory and design sections of report submission / Seminar 1	7	Feb 27 - Mar 3	Period 2 deliverables demonstration and evaluation	8	Mar 6 - Mar 10	Period 3 milestones & deliverables submission	9	Mar 13 - Mar 17	Lab work / Seminar 2	10	Mar 20 - Mar 24	Period 3 deliverables demonstration and evaluation	11	Mar 27 - Mar 31	Individual project contribution summary submission prior to oral exam	12	Apr 3 - Apr 7	Individual Oral exam / Project demo & Open House Poster submission	13	Apr 10 - Apr 14	Individual Oral exam / Project demo & Open House Poster submission Group Final EDP report (softcopy) submitted to FLC		Apr 28	Open House Exhibition		May 5	Final report uploaded to EDP web site
Week	Dates	Description																																															
1	Jan 9 - Jan 13	Establishment of project management																																															
2	Jan 16 - Jan 20	Period 1 milestones & deliverables submission																																															
3	Jan 23 - Jan 27	Lab work																																															
4	Jan 30 - Feb 3	Period 1 deliverables demonstration and evaluation																																															
5	Feb 6 - Feb 10	Period 2 milestones & deliverables submission																																															
6	Feb 13 - Feb 17	Theory and design sections of report submission / Seminar 1																																															
7	Feb 27 - Mar 3	Period 2 deliverables demonstration and evaluation																																															
8	Mar 6 - Mar 10	Period 3 milestones & deliverables submission																																															
9	Mar 13 - Mar 17	Lab work / Seminar 2																																															
10	Mar 20 - Mar 24	Period 3 deliverables demonstration and evaluation																																															
11	Mar 27 - Mar 31	Individual project contribution summary submission prior to oral exam																																															
12	Apr 3 - Apr 7	Individual Oral exam / Project demo & Open House Poster submission																																															
13	Apr 10 - Apr 14	Individual Oral exam / Project demo & Open House Poster submission Group Final EDP report (softcopy) submitted to FLC																																															
	Apr 28	Open House Exhibition																																															
	May 5	Final report uploaded to EDP web site																																															
<b>Learning Objectives (Indicators)</b>	<p>At the end of this course, the successful student will be able to:</p> <ol style="list-style-type: none"> <li>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. (GA3/4)</li> </ol>																																																

2. 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. (GA5c)
3. Work effectively as a member and leader in teams, preferably in a multi-disciplinary setting. (GA6)
4. Communicate complex engineering concepts within the profession and with society at large, including reading, writing, speaking and listening, and the ability to comprehend and write effective reports / design documentation, and to give / effectively respond to clear instructions. (GA7)
5. Understand the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest. (GA8a/c)
6. Appropriately incorporate economics and business practices including project, risk and change management into the practice of engineering, and to understand their limitations. (GA11)
7. Identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and contribute to advancement of knowledge. (GA12)

**NOTE:** Numbers in parentheses refer to the graduate attributes (GAs) required by the Canadian Engineering Accreditation Board (CEAB).

Course evaluation will be based on students' laboratory performance and design report.

Project Management, teamwork and weekly progress	15%
Seminars Attendance	5%
Milestones Demonstration	15%
Oral Examination	20%
Final Demonstration	10 %
Open-House Presentation	5%
Final Engineering Design Report	30%

**Course Evaluation**

- a) *Project Management:* The semester is divided into three periods of three weeks each. One student will act as a manager/team leader within a period, thus each student will have a chance to play the role of manager/team leader. The team will select their manager/team leader for each period at the beginning of the semester and provide the names to their assigned Faculty Laboratory Coordinator (FLC). The FLC will mark each student in each period in his/her role as a Manager/Team Leader (Leadership, Conductor of meetings, Organizer/planner/motivator, Conflict resolution) or as a Team Member (Co-operation, Contribution, Conflict resolution). More details on project management are given at the end of this course outline.
- b) *Oral Examination:* Students are required to demonstrate a working prototype and "individually" show a thorough knowledge of their EDP through an oral examination by the FLC. Failure to do so will automatically result in a FAIL grade. *Students who do not keep their FLC advised of their progress on a weekly basis may be refused an oral examination because authorship and contribution to the project is questionable.*
- c) *Open House Presentation & Poster Preparation:* Students are required to participate in an "Open House" exhibition and prepare posters for the exhibition. The Open House is scheduled on April 28, 2017 and the opening time will be announced and will facilitate visitors and prospective employers. At the Open House, students will demonstrate and discuss their project with visitors from the academic community, their peers, and visitors from industry. Participation in this exhibit may result in a grade revision for enhancements or improvements to the project. Students absent from the Open House will have their grade reflect this.
- d) *Final Engineering Design Report:* The main body of the report is limited to **40 pages**, including text, analysis equations/algorithms diagrams, schematics, tables and references list. Additional material (e.g. source code, datasheets, etc.), not subjected to grading, can be inserted in the APPENDIX. Mark reduction will be applied for report exceeding the 40-page limit. A softcopy of your group final Engineering Design report must be submitted to your FLC by April 16<sup>th</sup>, 23:59 pm. A report submitted without prior satisfactory demonstration of your

	<p>group project will automatically be given a <i>FAIL</i> grade. The format of the report should conform to professional standards and adequately document the design activities undertaken by the student. If the project includes software, the source code must be included with the report. The final version of the Engineering Design report must be uploaded to the EDP web site by May 5<sup>th</sup>, 2017.</p>
<p><b>Engineering Design Project Grading Considerations</b></p>	<p>The EDP grade awarded to a student who has completed all the requirements, including a successful and timely project demonstration and oral examination, is based on an assessment made by their FLC. Though the wide variation in EDP topic, approach, and challenges encountered by the student does not allow a precise marking scheme to be uniformly applied, the factors described below will be weighted by the FLC to determine the student grade.</p> <p>a.        <i>Laboratory Work</i></p> <p>All EDPs require that a concept, an idea, bounded by design specifications in the EDP topic description be researched to provide sufficient knowledge to enable a realistic design be fleshed out. This design is implemented in the laboratory.</p> <p>The foundations for the EDP grade rest on the design and implementation process. Unless the design is sound and based on solid engineering, the laboratory time will be inefficiently used and the effort frustrating to all involved including the FLC.</p> <p>Even with a good design, the student will be challenged with implementation and bringing the design to life. The key aspect is the process by which the student tackles the challenges encountered. Is a problem analysed to thoroughly understand its root and a logical decision made as to what options are viable and a strategy devised to confirm the diagnosis and attempt a solution, or is a trial and error quick-fix method employed? How systematic and skilled are the troubleshooting procedures employed; for instance, are results studied carefully or program flow examined, or does the investigator simply "stab in the dark" in the hope of success, with little or no understanding?</p> <p>Other factors used in evaluating lab performance include time and project management skills. How well did the student meet milestones and GANTT chart schedules, and the consistency with which the project was tackled and ongoing technical documentation?</p> <p>The variations in project topic and approach, student creativity, ingenuity, novelty and complexity of implementation or success in meeting practical implementation challenges are all factors in grading decisions.</p> <p>Although a project that has been demonstrated as meeting or exceeding the initial requirements is fundamental for a good grade, the FLC will consider all the aspects in establishing the final grade.</p> <p>b.        <i>EDP Report</i></p> <p>The EDP report, an essential course component, is the document on which anyone not intimately involved with the laboratory work assesses the project. In addition, the project value to future investigators is contained within the final report. The report should adequately describe the design activities undertaken in their project.</p> <p>A good EDP report will improve the primary assessment based on the laboratory work. In general, a good EDP report is required to consolidate the laboratory and project development work performed by the student.</p> <p>A poor EDP report will certainly demerit even excellent laboratory performance and will be reflected in the overall course grade. Students should make every effort to prepare at least a good EDP report, and for those wishing to achieve an "A" grade or win awards, an excellent Engineering Design report is essential.</p> <p>The EDP report will normally contain the standard sections:</p>

*Introduction, Acknowledgements, Certification of Authorship, Index, Abstract, Objectives, Theory, Design (including alternative design approaches examined and analysed), Documentation including Schematics and Parts Lists (together with the parts prices), Measurement / Testing Procedure, Performance Measurements, Analysis of Performance, Time spent on the design of each project component, Conclusions, Appendices, and References.*

A template of the report will be posted at D2L.

A few key suggestions are offered:

Particularly in engineering, it is essential that a project be properly designed. A designer must satisfy the examiner, the FLC, that the program or circuit will perform its tasks to specification under all or at least the usual, variations in the operating or manufacturing environment. Such issues as component tolerance, voltage variations, maximum and minimum computer cycle times and data throughputs are examples of variables. In other words, the examiner must be convinced that the project is battle-proof and its operation at the demonstration is not an unusual event.

Another guide used to assess whether the design is competent is to consider the mass production of this prototype. Could one anticipate a reasonable yield and customer satisfaction?

The working prototype performance must be measured to quantify the extent to which it meets the design specifications. The procedure used to measure performance is to be described in sufficient detail that the reader can repeat it. The measured results must be documented in conjunction with appropriate schematics or flow charts. The results should be analysed to ensure that they fit the anticipated performance and if not an explanation is called for.

The abstract must accurately précis the entire report contents in half a page or less. The conclusions should address the project's objectives; to what extent were they met? Where schematics and quotations are taken verbatim from other sources, these sources must be acknowledged to avoid the potentially serious charges of plagiarism.

It is recommended that the hardware be photographed with a digital camera along with a photograph of the student author. These photographs are to be included in the final report.

c. *Project Management*

The project teams are required to demonstrate their project management skill by putting the theory learnt in COE 700 into practice in COE 800. The objectives of the evaluation process in COE 800 are as follows:

- Each team member receives fair amount of training in project management, and is required to demonstrate the skills of a project manager.
- A project manager is evaluated for his/her capability of planning and achieving a tangible deliverable that can be demonstrated.
- Each student is also required to demonstrate the behavior of a professional team member.

Following management attributes and skills are used in the evaluation process:

- Project Management Attributes
  - Leadership
  - Manager of design process
  - Motivator
  - Organizer/planner
- Skills used to exhibit project management attributes
  - Understanding and managing scope of work/deliverables
  - Design review meeting, recording of minutes and design discussion
  - Timely follow-up

- Learn to identify strengths/weaknesses
- Conflict resolution
- GANTT chart, Critical Path analysis

The semester is divided into three periods of three weeks each:

- Period 1: Week 2, 3 and 4
- Period 2: Week 5, 6 and 7
- Period 3: Week 8, 9 and 10

One student will act as a manager/team leader within a period, thus each student will get a chance to play the role of manager/team leader. The team will select their manager/team leader for each period at the beginning of the semester and provide the names to the FLC.

Each student is marked in each period out of 5 marks in his/her role according to the following metric:

- Manager/Team Leader
  - Leadership
  - Conductor of meetings
  - Organizer/planner/motivator
  - Conflict resolution
- Team Member
  - Co-operation
  - Contribution
  - Conflict resolution

Project management evaluation:

- FLC will attend one group meeting in each period as an observer
- Each project manager is required to submit a **tangible deliverable that can be demonstrated** in the lab at the end of his/her term, and a plan to achieve that deliverable.
- Student's role is evaluated during the weekly progress meeting, through milestone submissions and exhibits.
- The group may be requested to provide necessary information/documents that help FLC in evaluating their project management role.

If there are any changes, announcements will be posted in COE 800 Course D2L. Please check the D2L regularly, at least once a week.

### Important Notes

1. All of the required course-specific written reports will be assessed not only on their technical/academic merit, but also on the communication skills exhibited through these reports.
2. All assignment and lab/tutorial reports must have the standard cover page which must be signed by the student(s) prior to submission of the work. Submissions without the cover page **will not** be accepted. The cover page can be found on the departmental web site: [Standard Assignment/Lab Cover Page](#)
3. Medical or Compassionate documents for the missing of an exam must be submitted within 3 working days of the exam. Students are responsible for notifying the instructor that they will be missing an exam as soon as possible.
4. **If a student is requesting accommodation due to a religious, aboriginal and/or spiritual observance, he or she must submit a Request for Accommodation of Student Religious, Aboriginal, and Spiritual Observance AND an Academic Consideration form within the FIRST TWO WEEKS OF CLASS or, for a final examination, within two weeks of the posting of the examination schedule.** If the required absence occurs within the first two weeks of classes, or the dates are not known well in advance as they are

linked to other conditions, these forms should be submitted with as much lead time as possible in advance of the required absence.

Both documents are available at <http://www.ryerson.ca/senate/forms/reobservforminstr.pdf>. Full-time or part-time degree students must submit the forms to their own program department or school.

5. Students are required to adhere to all relevant University policies including:
  - Undergraduate Grading, Promotion and Academic Standing: <http://www.ryerson.ca/senate/policies/pol46.pdf>
  - Student Code of Academic Conduct: <http://www.ryerson.ca/senate/policies/pol60.pdf>
  - Student Code of Non-Academic Conduct: <http://www.ryerson.ca/senate/policies/pol61.pdf>
  - Undergraduate Academic Consideration and Appeals: <http://www.ryerson.ca/senate/policies/pol134.pdf>
  - Examination Policy: <http://www.ryerson.ca/senate/policies/pol135.pdf>
  - Course Management Policy: <http://www.ryerson.ca/senate/policies/pol145.pdf>
  - Accommodation of Student Religious, Aboriginal and Spiritual Observance: <http://www.ryerson.ca/senate/policies/pol150.pdf>
  - Establishment of Student E-mail Accounts for Official University Communication: <http://www.ryerson.ca/senate/policies/pol157.pdf>
6. Students are required to obtain and maintain a Ryerson e-mail account for timely communications between the instructor and the students.
7. Any changes in the course outline, test dates, marking or evaluation will be discussed in class prior to being implemented.
8. Assignments, projects, reports and other deadline-bound course assessment components handed in past the due date will receive a mark of ZERO. Marking information will be made available at the time when such course assessment components are announced.

Approved by: \_\_\_\_\_  
*Course Instructor*

Date \_\_\_\_\_

Approved by: \_\_\_\_\_  
*Associate Chair or Program Director*

Date \_\_\_\_\_