Ryerson University

Department of Electrical, Computer, & Biomedical Engineering
Faculty of Engineering & Architectural Science

Course Outline (W2020)

COE800: Design Project

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Calendar Description	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 student individually or in a group, where the topic is a group project, 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 in the laboratory. The completed project must be demonstrated operational by the last week of the term. A final bound project report that conforms to professional guidelines is required. The students must demonstrate their working project at an Open House in May.
Prerequisites	COE 700
Antirequisites	None
Corerequisites	None
Compulsory Text(s):	TBA
Reference Text(s):	

Learning Objectives (Indicators)	At the end of this course, the successful student will be able to: 1. Appraises the validity/reliability of data relative to the degrees of error and limitations of theory and measurement. Creates simulated data for pre-analysis. Integrates the calculations of error and uncertainty as integral components of investigations. (**3a**) 2. Integrates the calculations of error and uncertainty as integral components of investigations. Practices critical and continual assessment of experimental data and associated models. Creates predictions of outcomes and experimental uncertainties. Justifies the assumptions given test conditions. Draws on other knowledge to aid the decision-making process. Proposes improvements to investigative procedures and methods. (**3b**) 3. Anticipates the needs of the project, customizes design processes, analyzes progress, and revises plans as necessary. Consistency of produced problem definition with needs statement and reality. Predicts unstated customer and user needs. Defines design parameter uncertainties and their impacts. Gathers information and identifies constraints (e.g. health and safety risks, codes, economic, environmental, cultural, and societal). (**4a**) 4. Consistency of produced problem definition with needs statement and reality. Predicts unstated customer and user needs. Defines design parameter uncertainties and their impacts. Gathers information and identifies constraints (e.g. health and safety risks, codes, economic, environmental, cultural, and societal). Generates solutions for more complex design engineering problems/systems. (**4b**) 5. Applies selection/decision-making techniques to more complex design engineering problems/systems. Demonstrates iterative process in complex design engineering projects. (**4c**) 6. Designs and develops simple tools (software, hardware) to perform given tasks as required by the project. Evaluates skills and tools to identify their limitations with respect to the project needs. Evaluates results using several skills and tools to determine the one that best explains â€˜realityâ€™. (**5a**) 7. Effectively contributes to multidisciplinary team to achieve project goals. Applies conflict resolution principles on teamwork. Applies principles of conflict management to resolve team issues. (**6a**) 8. Applies conflict resolution principles on teamwork. Applies principles of conflict management to resolve team issues. Mentors and accepts mentoring from others in technical and team issues. Demonstrates capacity for technical or team leadership while respecting other's roles. Evaluates team effectiveness and plans for improvements. (**6b**) 9. Constructs effective arguments and draws conclusions using evidence. Writes and revises documents using appropriate discipline specific conventions. Adapts format, content, organization, and tone for various audiences. Demonstrates accurate use of technical vocabulary. (**7a**) 10. Demonstrates fluency in using current software for communications appropriate to discipline. Uses graphics to explain, interpret, and assess information. (**7c**) 11. Contributes to teamwork in an equitable and timely manner. (**8a**) 12. Integrates standards and codes of practice relevant to the discipline into decision-making processes. Knows regulations governing professional practice (e.g. Professional Engineers Act). Adheres to guidelines dictating use of intellectual property and contractual issues. (**8c**) 13. Designs economic evaluation approaches to support decision making at a system level with real world constraints and demands. (**11a**) 14. Negotiates project scope, critical assumptions, and deliverables with stakeholders. Systematically decomposes project into key tasks and allocates resources to each task according to project timelines. Understands task inter-relationships and manages project accordingly to meet budget and time deadlines. Allocates tasks to team members and coordinates dynamically as problems or opportunities emerge. Identifies issues related to implementing projects in ways that are sensitive to the needs of all stakeholders. Displays awareness of environmental, safety, economic, social, and other risks associated with the project and ability to respond proactively to minimise these risks. (**11b**) 15. Gains a working knowledge of the literature of the field and how it is produced. (**12b**) **NOTE:** *Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).*
Course Organization	0.0 hours of lecture per week for 13 weeks 5.0 hours of lab/tutorial per week for 12 weeks
Teaching Assistants	TBA

Course Evaluation

Theory	
Final Engineering Design Report	30 %
Laboratory	
Project Management & Teamwork	15 %
Milestones Compliance Reports	15 %
Oral Examination	20 %
Milestones and Final Demonstration	15 %
Open-House Presentation	5 %
TOTAL:	100 %

Note: In order for a student to pass a course with **"Theory and Laboratory"** components, in addition to earning a minimum overall course mark of 50%, the student must pass the Laboratory and Theory portions separately by achieving a minimum of 50% in the combined Laboratory components and 50% in the combined Theory components. Please refer to the **"Course Evaluation"** section for details on the Theory and Laboratory components.

Examinations

(a) Project Management & Teamwork: The FLC will mark each student in each phase 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, Milestones Compliance Report, Milestones & Final Demonstration: Students are required to demonstrate milestone (& submit milestone compliance report) during the 4 phases of the project, build a working prototype, and "individually" show a thorough knowledge of their EDP through an oral examination by their assigned 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: Students are required to participate in an "Open House" exhibition that will be scheduled by the department. Please advise prospective employers of this requirement. 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. One unbound copy of your group final Engineering Design report is required to submit to your FLC by the deadline set by dept/Course Coordinator. A report submitted without prior satisfactory demonstration of your group project will automatically be given a FAIL grade. The format of the report should conform to professional standards and adequately document the design activities. If the project includes software, a disk containing the source code must be included with the report. The final report will be returned to the students during the Open House together with corrections and suggestions for improvement. The students must make the necessary revisions and submit the final version by the deadline set by the department/CC. If the deadline set by the department/CC is not met for Engineering Design Report submission, the student will not be eligible to graduate. All written reports will be assessed not only on their technical merit, but also on the communication skills of the author as exhibited through these reports.

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 topics, 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 in determining the student grade.

(a) Laboratory Work
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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. 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

Other Evaluation Information	involved including the FLC. 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 etc? 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? 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. 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. (b) EDP Report ========== The EDP report, an essential course component, is the document on which anyone not intimately involved with the laboratory work assesses the project. The report should adequately describe the design activities undertaken in the project. 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 students. A poor EDP report will certainly demerit even excellent laboratory performance and will be reflected in the overall course grade. The EDP report will normally contain the following standard sections: Title Page, Abstract, Acknowledgements, Certification of Authorship, Table of Contents, Introduction, Objectives, Theory and Design, Documentation including Schematics and Parts Lists, Measurement Procedure, Performance Measurements, Analysis of Performance, Conclusions, Appendices, and References. A seminar on the EDP report writing may be scheduled. 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 present 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 skills by implementing the theory learnt in COE700 into practice in COE800. The objectives of the evaluation process in COE800 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 four phases of three weeks each:
-Phase 1: Week 1, 2 and 3
-Phase 2: Week 4, 5 and 6
-Phase 3: Week 7, 8 and 9
-Phase 4: Week 10, 11, and 12

•One student will act as a manager/team leader within a phase, 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 phase at the beginning of the respective phases and provide the names to the FLC

•Each student is marked in each phase 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 may attend one group meeting in each phase 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, milestones compliance reports, 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 COE800 Course D2L. Please check the course site regularly.

Other Information	Detailed Course Organization: ========== The semester is divided into four Phases (I, II, III, and IV). Each phase consists of three weeks. One student will act as a project manager/team leader within a phase, 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 phase at the beginning of each of the phases and provide the names to the FLC. In each of the phases, students will decide on the project manager/team leader for that Phase. After discussing with the team members the project manager will submit the milestones & deliverables for that Phase to the FLC (please refer to the GANTT chart for due dates). The team will work towards completing the milestones, submit a milestone compliance report, and demonstrate the deliverables for that Phase by the end of the Phase. This cycle repeats until all four phases are completed and the deliverables are demonstrated to the FLC. In Week 6, the project manager responsible for Phase II will also submit the theory and design sections of the EDP report. During each of the phases (i.e., the 3 weeks period) the respective project managers are responsible for submitting 3 weekly minutes of the meeting and 1 milestone compliance report to the FLC. During the FLC evaluations of deliverables, it will be the project manager's responsibility to explain and discuss with FLC on what was accomplished towards the stated milestone deliverables; what each member accomplished; and to conduct and manage the demo session. The FLC may ask any member of the team for further verification of his/her aspects of the contributions. In Week 12, individual project contribution summary will be submitted to the FLCs. Individual oral exam are scheduled during the Week 12 and/or 13. The team will submit their final EDP report during Week 13. Following Week 13, the team will present their project during the open house scheduled by the department and will submit the final EDP report to the department and FLC.

Course Content

Week	Hours	Chapters / Section	Topic, description
1 -13			Engineering Capstone Design

Laboratory/Tutorials/Activity Schedule

No lab information set for course.

Policies & Important Information:

1. Students are required to obtain and maintain a Ryerson e-mail account for timely communications between the instructor and the students;
2. Any changes in the course outline, test dates, marking or evaluation will be discussed in class prior to being implemented;
3. Assignments, projects, reports and other deadline-bound course assessment components handed in past the due date will receive a mark of ZERO, unless otherwise stated. Marking information will be made available at the time when such course assessment components are announced.
4. Refer to our **Departmental FAQ** page for information on common questions and issues at the following link: https://www.ee.ryerson.ca/guides/Student.Academic.FAQ.html.

Missed Classes and/or Evaluations

When possible, students are required to inform their instructors of any situation which arises during the semester which may have an adverse effect upon their academic performance, and must request any consideration and accommodation according to the relevant policies as far in advance as possible. Failure to do so may jeopardize any academic appeals.

1. ***Health certificates*** - If a student misses the deadline for submitting an assignment, or the date of an exam or other evaluation component for health

reasons, they should notify their instructor as soon as possible, and submit a Ryerson Student Health Certificate AND an Academic Consideration Request form within 3 working days of the missed date. Both documents are available at https://www.ryerson.ca/senate/forms/medical.pdf.. **If you are a full-time or part-time degree student, then you submit your forms to your own program department or school;**

2. ***Religious, Aboriginal and Spiritual observance*** - If a student needs accommodation because of religious, Aboriginal or spiritual observance, they must submit a Request for Accommodation of Student Religious, Aboriginal and Spiritual Observance AND an Academic Consideration Request form within the first 2 weeks of the class or, for a final examination, within 2 weeks of the posting of the examination schedule. If the requested absence occurs within the first 2 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 absence. Both documents are available at www.ryerson.ca/senate/forms/relobservforminstr.pdf. **If you are a full-time or part-time degree student, then you submit the forms to your own program department or school;**
3. ***Academic Accommodation Support*** - Before the first graded work is due, students registered with theAcademic Accommodation Support office (AAS - www.ryerson.ca/studentlearningsupport/academic-accommodation-support) should provide their instructors with an Academic Accommodation letter that describes their academic accommodation plan.

Academic Integrity

Ryerson's Policy 60 (the Academic Integrity policy) applies to all students at the University. Forms of academic misconduct include plagiarism, cheating, supplying false information to the University, and other acts. The most common form of academic misconduct is plagiarism - a serious academic offence, with potentially severe penalties and other consequences. It is expected, therefore, that all examinations and work submitted for evaluation and course credit will be the product of each student's individual effort (or an authorized group of students). Submitting the same work for credit to more than one course, without instructor approval, can also be considered a form of plagiarism.

Suspicions of academic misconduct may be referred to the Academic Integrity Office (AIO). Students who are found to have committed academic misconduct will have a Disciplinary Notation (DN) placed on their academic record (not on their transcript) and will normally be assigned one or more of the following penalties:

1. A grade reduction for the work, ranging up to an including a zero on the work (minimum penalty for graduate work is a zero on the work);
2. A grade reduction in the course greater than a zero on the work. (Note that this penalty can only be applied to course components worth 10% or less, and any additional penalty cannot exceed 10% of the final course grade. Students must be given prior notice that such a penalty will be assigned (e.g. in the course outline or on the assignment handout);
3. An F in the course;
4. More serious penalties up to and including expulsion from the University.

The unauthorized use of intellectual property of others, including your professor, for distribution, sale, or profit is expressly prohibited, in accordance with Policy 60 (Sections 2.8 and 2.10). Intellectual property includes, but is not limited to:

1. Slides
2. Lecture notes
3. Presentation materials used in and outside of class
4. Lab manuals
5. Course packs
6. Exams

For more detailed information on these issues, please refer to theAcademic Integrity policy(https://www.ryerson.ca/senate/policies/pol60.pdf) and to the Academic Integrity Office website (https://www.ryerson.ca/academicintegrity/).

Important Resources Available at Ryerson

1. The Library (https://library.ryerson.ca/) provides research workshops and individual assistance. Inquire at the Reference Desk on the second floor of the library, or go to library.ryerson.ca/guides/workshops
2. Student Learning Support(https://www.ryerson.ca/studentlearningsupport) offers group-based and individual help with writing, math, study skills and transition support, and other issues.