CME/EE 495.3 (3P)
Capstone Design Project

Department of Electrical and Computer Engineering
Fall 2014

Description: Emphasizes the application of a formal design process. Students, working in small groups, apply top-down design principles to a year-long project starting with a basic description of the product or system and culminating with an oral presentation of the final working design.

Prerequisites: 81 credit units from (EN Four Year Common Core and CME Program Core).

Corequisites: None

Instructor:

Co-ordinator: Anh Dinh
Associate Professor, Department of Electrical and Computer Engineering
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Supervisors:
Francis Bui (francis.bui@usask.ca)
Khan Wahid (khan.wahid@usask.ca)
Rajesh Karki (rajesh.karki@usask.ca)
Denard Lynch (denard.lynch@usask.ca)
5 Support Engineers.

Lectures: Tuesday, Thursday, 11:30 am-12:50 pm, Room 0D26

Tutorials: TBA

Laboratory: N/A

Website: Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website. Students are responsible for keeping up-to-date with the information on the course website.
http://www.engr.usask.ca/classes/CME/495/

Course Reference Numbers (CRNs): 86725 (lectures)

Textbook: Required text(s): None.
Supplementary text(s): Design for Electrical and Computer Engineers (Salt and Rothery)

Office Hours: Students are welcome and encouraged to drop by the offices of the instructor and supervisors at any time for help with the course material. Alternatively, students can email or phone the instructor to schedule a meeting time.

Reading List: N/A

Assessment: The methods of assessment and their respective weightings are given below based on reports and presentations:

Statement of Work: Include a draft User's Manual	5%
Requirement Specification: Include a test plan	5%
System Block Diagrams and Analysis Plan	5%

System specification: Include a test plan for each block	10%
Project Plan: Define responsibilities of group members, list tasks and deliverables associated with tasks along with delivery times, list the milestones and dates, list the times and places of meetings with your supervisor	5%
System presentations	10%
Lab books and Schematic Diagrams / Pseudocode / Flow Charts and Circuit / Module Descriptions of each block. It is suggested that the lab books count 5%, but the supervisor will decide on the split	10%
Working Breadboards / programs of each block demonstrated to satisfy the tests specified in the System Specification Document	5%
Working Breadboard / program of the entire system demonstrated to satisfy the tests specified in the requirement specification	5%
Design presentations	15%
Final report	15%
Class/meeting participation (Coordinator/Supervisor)	10%

Final Grades: The final grades will be consistent with the "literal descriptors" specified in the university's grading system.

http://students.usask.ca/current/academics/grades/grading-system.php

For information regarding appeals of final grades or other academic matters, please consult the University Council document on academic appeals.

http://www.usask.ca/university_secretary/honesty/StudentAcademicAppeals.pdf

Course Content:

1. Introduction, what is design, top-down design process (3hr)
2. Need analysis, optimization, documentation, statement of work (3hr)
3. System engineering, preparing requirements specification (6hr)
4. Alternatives, preparing system specification (3hr)
5. Block design, testing, verification, preparing block design documentation (6hr)
6. Managing the design process (3hr)
7. Case study (6hr)
8. Integration, system test, preparing final report and oral presentation (6hr)

Assignments: A self-assessment report to be written by the student to describe the individual and team work experience and the knowledge in ethic and equity.

Tutorials: TBA

Quizzes: None

Exams: None

Important Dates:

Wednesday, September 03, 2014	CME/EE 495 class begins
TBD in November, 2014	Term I presentation
TBD in March, 2015	Term II presentation

Student Conduct: Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGS (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall "conduct themselves with fairness, courtesy and good faith

towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism" (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer's relationships with his or her colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking. However, if you have questions at any time during lectures, please feel free to ask (chances are very good that someone else may have the same question as you do).

For more information, please consult the University Council Guidelines for Academic Conduct.

http://www.usask.ca/university_secretary/council/reports_forms/reports/guide_conduct.php

Academic Honesty: The latter part of the above statement from the APEGS Code of Ethics discusses giving credit where it is due. At the University, this is addressed by university policies on academic integrity and academic misconduct. In this class, students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow the rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Copying of assignments and lab reports is considered academic misconduct. Students are responsible for understanding the university's policies on academic integrity and academic misconduct. For more information, please consult the University Council Regulations on Student Academic Misconduct and the university's examination regulations.

http://www.usask.ca/university_secretary/honesty/StudentAcademicMisconduct.pdf
http://www.usask.ca/university_secretary/council/academiccourses.php

Safety: The APEGS Code of Ethics also states that Professional Engineers shall "hold paramount the safety, health and welfare of the public and the protection of the environment and promote health and safety within the workplace" (Section 20(a), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

Safety is taken very seriously by the Department of Electrical and Computer Engineering. Students are expected to work in a safe manner, follow all safety instructions, and use any personal protective equipment provided. Students failing to observe the safety rules in any laboratory will be asked to leave.

Laboratory Learning Outcomes: N/A

Course Learning Outcomes:

Upon completing this course students will be able to:

1. Understand the main elements of the design process. The students demonstrate the ability to:
    a. Adequately and accurately describe the problem in both the client's language and in technical terms, including the constraints on the design and the objectives which must be met
    b. Convert the requirements into an accurate and understandable set of technical specifications which can be successfully converted to a working design
    c. Generate and evaluate alternative means of achieving the goals and objectives of the client as well as fulfilling professional responsibility regarding regulations and the environment and justify selection of the "best" alternative
    d. Generate a detailed design including specification of components, layout, code, packaging, construction, assembly and testing
    e. Integrate various blocks into a complete system and appropriately test the system according to specs

2. Communicate the design.
    a. The students write formal reports that would provide:
        i. Documentation of the design process elements written and organized to facilitate effective understanding and feedback from the stakeholders
        ii. Supplementary documentation needed by the client, user or others to install, verify (test), operate or maintain the artifact
    b. The students present two oral presentations to the client or other stakeholders providing a summary and the results of the design process

3. Deliver of a working solution. The students involve:
    a. Demonstration that the major blocks of the design will perform their specified function on an individual basis
    b. Demonstration that the various blocks can be integrated into a complete solution, meeting the original needs of the client and meeting the published specifications

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Attribute Mapping:

*Level of Performance**

Learning Outcome	**Attribute****											
	A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**	**A10**	**A11**	**A12**
1		4	4	4	3	4	4	3	3	3	3	2
2		4	3	4	3	4	4	3	2	1	3	2
3		4	3	4	3	4	4	3	2	1	3	2

******Attributes:

- **A1** Knowledge base for engineering
- **A2** Problem analysis
- **A3** Investigation
- **A4** Design
- **A5** Use of engineering tools
- **A6** Individual and team work
- **A7** Communication skills
- **A8** Professionalism
- **A9** Impact of engineering on society

*Levels of Performance:

1 - **Knowledge** of the skills/concepts/tools but not using them to solve problems.
2 - **Using** the skills/concepts/tools to solve directed problems. (*"Directed" indicates that students are told what tools to use.*)
3 - **Selecting** and using the skills/concepts/tools to solve non-directed, non-open-ended problems. (*Students have a number of S/C/T to choose from and need to decide which to employ. Problems will have a definite solution.*)
4 - **Applying** the appropriate skills/concepts/tools to solve open-ended

and the environment
A10 Ethics and equity
A11 Economics and project management
A12 Life-long learning

problems. (*Students have a number of S/C/T to choose from and need to decide which to employ. Problems will have multiple solution paths leading to possibly more than one acceptable solution.*)

Accreditation Unit (AU) Mapping: (% of total class AU)

Math	Natural Science	Complementary Studies	Engineering Science	Engineering Design
-	-	-	-	45.8

Assessment Mapping:

Component	Weighting	Methods of Feedback***	Learning Outcomes Evaluated
Statement of work	5%	S	1,2
Requirements specification	5%	S	1,2
System block diagrams and analysis plan	5%	S	1,2
System specification	10%	S	1,2
Project plan	5%	S	2
System presentations	10%	S	2,3
Lab books and Schematic/Block diagrams.	10%	S	1,2,3
Working breadboards (individual blocks)	5%	S	1,2
Working breadboard (complete system)	5%	S	1,2
Design presentations	15%	S	
Final report	15%	S	3
Class/meeting participation	10%	S	2

***Methods of Feedback:
F – *formative* (written comments and/or oral discussions)
S – *summative* (number grades)