ENGG 1100 Introduction to Engineering Design

Faculty of Engineering

The Chinese University of Hong Kong

2013-2014 Term 2

1 Project Description

Welcome to the Introduction to Engineering Design! This course aims to give you engineering design experience through a design task. Though engineering design seems to be challenging to first-year university students, who may have little or no electronic and mechanical backgrounds, this project-based design course is devised to provide you with basic engineering design concept; essential knowledge in electronic, mechanical, logical, and system components; and lab-driven, hands-on experience with carrying out a design task. Guidance will be provided throughout the whole course and you will able to develop and finish your project parts by parts.

In this project, you are going to design and build an Automatic Pick-and-Place Vehicle that is able to:

a. Move along a track made with magnetic strips; and
b. Use electromagnets to pick up and put down specific kind of objects.

To be more specific, we will have three different kinds of tasks for testing your vehicle.

Task 1: Tracking and picking up a cylindrical object (e.g. a soda can);
Task 2: Picking up multiple objects placing at different locations in a single run; and
Task 3: Picking up objects of different shapes.

Further details will be released later. Both the design and development work will be done by you and your class partner. To finish the project work smoothly, you are expected to:

a. Attend both the lectures and the laboratories, in which you will learn the basic and essential knowledge for your project;
b. Identify and understand design requirements and constraints;
c. Make your own working plan;
d. Communicate and cooperate with your partner effectively to work out the project;
e. Complete the machine and demonstrate it; and
f. Submit a final report at the end of the term to conclude your design experience.

We hope you will enjoy engineering design, gain more experience during the process, and accomplish your project.

2 Course Description

Week	Date	Lecture Section ***ENGG1100 CA-CF***: ERB LT Mon 8:30am-9:15am ***ENGG1100 DA-DD***: LSB LT6 Mon 11:30am-12:15pm	Lab Section ***ENGG1100 CA-CF***: Labs Mon 9:30am-12:15pm ***ENGG1100 DA-DD***: Labs Mon 1:30pm-4:15pm	Important Events
1	6/1	Introduction		
2	13/1	Mechanical Drawing	Workshop 1: Mechanical Drawing I	• Project Grouping *(via e-learning platform by 17/1)*
3	20/1	Engineering Design & Management	Lab 1: Mechanical Drawing II	• Release of 3D Design Homework 1 – 3D Drawing Exercise • Release of Project Specification
4	27/1	Laboratory Safety & Basic Electronics	Lab 2: Basic Electronics	• **29/1: Deadline of 3D Design Homework 1**
	3/2	**Lunar New Year Holiday**		
5	10/2	Electronic Instrumentation & Components	Lab 3: Electronics Assembly	• Release of Mid-term Test Run Specification
6	17/2	Sensing and Actuator	Lab 4: Actuator	• Release of Project Material
7	24/2	Tutorial on Mid-term Test Run	Lab 5: Sensing + **Mid-term Test Run**	• Release of 3D Design Homework 2 – Project Component
8	3/3	Digital Logic I: Logic Gates	Lab 6: Digital Logic with Arduino	• **7/3: Deadline of 3D Design Homework 2**
9	10/3	Digital Logic II: MCU	Workshop 2: Arduino Programming	
10	17/3	Project Briefing & **MC Quiz**	Mentor Meeting 1	
11	24/3		Mentor Meeting 2	• Release of Final Report Requirement
12	31/3		Mentor Meeting 3	
13	7/4	Final Report Briefing	Mentor Meeting 4	
14	14/4		**Demo**	• **22/4: Deadline of Project Report**

Important dates to note:

1. **Week 2: group forming.** Find a peer to form a group with you. The group size is 2. Make sure your partner is registered to the **same lab section** as yours. You are required to register with your partner using the CU eLearning System. Group sign up procedure is provided to you in the "Elearn information.pdf" document in eLearn. You must sign up by **17 January 2014**; otherwise, you will be randomly assigned to a partner.
2. **All the homework deadlines are at 5:30pm of the listed dates.**
3. **Week 14: submission of the final project report** using the CU eLearning System. The deadline is on **Tuesday, 22 April 2014**.

3 Assessment

Item	%	Detailed Information
Lab Report	20%	• 4% per lab x 5 labs (from lab 2 to lab 6) = 20% • For each lab session, 1% will be deducted for every student who fails to attend lab session on time (15-min buffer)
3D Design Homework	5%	• 2 homework items: exercise 2% + project 3%
MC Quiz	10%	• 30-min multiple choice quiz covering the contents taught in all lectures
Mid-term Test Run	5%	• Demonstrate your working prototype
Project Progress	20%	• Report your project progress to your mentor • Assessed by your project mentor and TA • Mentor meeting once a week during the implementation phase • *Attendance is counted; 5% deduction for each absence (individual)* • 5% per meeting x 4 meetings = 20%
Demo	30%	• Demonstrate your project: ▪ Standard Task: 15% ▪ Challenge Task 1: 10% ▪ Challenge Task 2: 5% • Assessed by a judge panel
Final Report	10%	• Deadline: 5:30pm, Tuesday, 22 April 2014
Total	100%	

4 Learning Outcomes

After participating in this design project, together with the associated lectures and laboratory sessions, we expect you to be able to

1. Understand basic mechanical design, electronics principles and appreciate their importance;
2. Gain basic engineering skills on the use of CAD software, instrumentation, hardware construction and testing;
3. Understand engineering design processes and systematic approaches to solving engineering problems;
4. Learn teamwork by working and communicating with your peer as a team towards milestones.

5 General Course Information

<table>
<tr><th>Item</th><th>Information</th></tr>
<tr><td>Lectures
(Weeks 1-10 & 13)</td><td>
<table>
<tr><td>Section</td><td>Time</td><td>Lecture Location</td></tr>
<tr><td>ENGG1100:
CA CB CC CD CE CF</td><td>Mon 8:30am-9:15am</td><td>William MW Mong Engineering Building LT (ERB LT)</td></tr>
<tr><td>ENGG1100:
DA DB DC DD</td><td>Mon 11:30am-12:15pm</td><td>Lady Shaw Building LT6 (LSB LT6)</td></tr>
</table>
</td></tr>
<tr><td>Laboratories
(Weeks 2-14)</td><td>
<table>
<tr><td>Section</td><td>Time</td><td>Lab Location</td></tr>
<tr><td>CA</td><td>Mon 9:30am-12:15pm</td><td>SHB 210 (Weeks 2,3&9: SHB 123)</td></tr>
<tr><td>CB</td><td>Mon 9:30am-12:15pm</td><td>SHB 210 (Weeks 2,3&9: SHB 123)</td></tr>
<tr><td>CC</td><td>Mon 9:30am-12:15pm</td><td>ERB 1112 (Weeks 2,3&9: SHB 218)</td></tr>
<tr><td>CD</td><td>Mon 9:30am-12:15pm</td><td>ERB 909</td></tr>
<tr><td>CE</td><td>Mon 9:30am-12:15pm</td><td>SHB 102</td></tr>
<tr><td>CF</td><td>Mon 9:30am-12:15pm</td><td>SHB 102</td></tr>
<tr><td>DA</td><td>Mon 1:30pm-4:15pm</td><td>SHB 210 (Weeks 2,3&9: SHB 123)</td></tr>
<tr><td>DB</td><td>Mon 1:30pm-4:15pm</td><td>SHB 210 (Weeks 2,3&9: SHB 123)</td></tr>
<tr><td>DC</td><td>Mon 1:30pm-4:15pm</td><td>ERB 1112 (Weeks 2,3&9: SHB 218)</td></tr>
<tr><td>DD</td><td>Mon 1:30pm-4:15pm</td><td>ERB 909</td></tr>
</table>
Notes: SHB: Ho Sin Hang Engineering Building
ERB: William MW Mong Engineering Building
</td></tr>
<tr><td>Website</td><td>In eLearn, see https://elearn.cuhk.edu.hk</td></tr>
<tr><td>Inquiry</td><td>Please email all your inquiries to engg1100@erg.cuhk.edu.hk</td></tr>
<tr><td>Course Coordinators</td><td>
<table>
<tr><td>Name</td><td>Dept.</td><td>Email</td></tr>
<tr><td>Prof. MA Wing Kin Ken</td><td>EE</td><td>wkma@ee.cuhk.edu.hk</td></tr>
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<tr><td>Prof. MENG Mei Ling Helen</td><td>SEEM</td><td>hmmeng@se.cuhk.edu.hk</td></tr>
</table>
</td></tr>
<tr><td>Project Mentors</td><td>
<table>
<tr><td>Section</td><td>Name</td><td>Dept.</td><td>Email</td></tr>
<tr><td>CA</td><td>Prof. MA Wing Kin Ken
Prof. CHING Pak Chung</td><td>EE</td><td>wkma@ee.cuhk.edu.hk
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<tr><td>CF</td><td>Prof. XU Qiang</td><td>CSE</td><td>qxu@cse.cuhk.edu.hk</td></tr>
<tr><td>DA</td><td>Prof. MA Wing Kin Ken
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<tr><td>DC</td><td>Prof. TSANG Hon Ki
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ptyung@ee.cuhk.edu.hk</td></tr>
<tr><td>DD</td><td>Prof. MENG Mei Ling Helen
Dr. NG To Bun Dorbin</td><td>SEEM</td><td>hmmeng@se.cuhk.edu.hk
tbng@se.cuhk.edu.hk</td></tr>
</table>
</td></tr>
<tr><td>Lecturers</td><td>Prof. WONG Kin Hong (CSE)
Prof. CHAN Chun Kit Calvin (IE)
Prof. MENG Mei Ling Helen (SEEM)
Prof. MA Wing Kin Ken (EE)
Prof. LIU Yunhui (MAE)</td></tr>
</table>

6 Laboratory

1. Laboratory safety is very important! Strict observation of the Laboratory Safety Instructions listed in the homepage (http://www.cuhk.edu.hk/useo/) of the University Safety & Environment Office on the handling of electrical and electronic instruments and power sources is mandatory.
2. Please don't eat or drink in the laboratory.
3. Be punctual. Attendance will be checked, and 1 mark will be deducted for those who are late for more than 15 minutes.
4. Laboratory preparation is vital for you to conduct the lab works. Prior to each lab, please
    a. **read the lab manual**,
    b. **prepare lab sheet according to the lab manual**, and
    c. **bring the lab sheet to the lab with you**.
5. The laboratory provides you with all the equipment required to implement your project. If you want to use the lab outside the standard lab sessions, you may be allowed to do so subject to the discretion of the technicians and teaching assistants. The premises are that it's within office hours (9:30am-5:15pm) and that there is no other lab session running at that time.
6. There are components and hardware available in the lab; they are definitely sufficient to build your project (with a good working condition). If you want some special components, please consult the technicians or teaching assistants. In case the lab does not have components you requested, you may purchase them yourselves and then apply for reimbursement. The budget is HK$200 for each group. Note that you must give us a justification (why are they special or necessary), that the receipts are available, and that you show that you do have used those components in your final prototype.

7 Plagiarism, Cheating, and Academic Honesty

As a CUHK student, you are respectfully requested to observe and acknowledge the academic honesty in academic works, which is the core value of higher learning. This value together with plagiarism monitoring held here at CUHK and elsewhere in academic institutes and professional societies will guide you to accomplish your academic and professional works in a fair, honesty, and cherishable manner.

CUHK has clear definitions and guidelines on academic honesty. In addition, the Faculty of Engineering has provided discussions and examples of plagiarism in "computer" programming and lab report, making use of results from "discussions with fellow students," making use of materials from Internet, as well as penalty scheme for plagiarism. Please see the following two documents for the details. We adopt a policy of zero tolerance on plagiarism. Disciplinary actions, usually involving severe penalties, will be taken for detected plagiarism cases.

1. "Guidelines to Academic Honesty," Faculty of Engineering, CUHK, August 2012, http://www.erg.cuhk.edu.hk/erg-intra/upload/documents/ENGG_Discipline.pdf
2. "Honesty in Academic Work: A Guide for Students and Teachers," CUHK, September 2013, http://www.cuhk.edu.hk/policy/academichonesty/

8 Student / Faculty Expectations on Teaching and Learning

Learning process in university environment is an interactive engagement between faculty members and the student body. The Faculty of Engineering has always placed a strong emphasis on quality teaching and learning.

With a view to building up an atmosphere of mutual respect, acknowledgement, and responsibility between our students and faculty members as well as to enhancing teaching and learning in the Faculty, the Faculty has worked out a document on "Student/Faculty Expectations on Teaching and Learning" in consultation with our students and teachers, which clearly establishes a balanced set of expectations for the students and faculty members of our Faculty.

- "Student/Faculty Expectations on Teaching and Learning,"
  Faculty of Engineering, CUHK, 29 August 2011,
  http://www.erg.cuhk.edu.hk/erg-intra/upload/documents/StaffStudentExpectations.pdf

With this document, we believe that both of our students and faculty members could be well aware of the mutual expectations on teaching and learning of each other, which would help in driving their efforts with our ultimate goal of achieving and up-keeping quality teaching and learning in the Faculty.