University of Portland

DONALD P. SHILEY SCHOOL OF ENGINEERING

EGR 110 - Introduction to Engineering

First Year Design Project – Fall Semester 2014

http://teaching.up.edu/egr110/

INTRODUCTION:

The central focus of EGR 110 is a semester-long project. Students will work in teams of three to five to solve an open-ended challenge of the students' choice. The challenge is designed to emphasize the essence of engineering and computer science; that is to solve a problem under a variety of constraints, attempting to meet criteria that are often conflicting, and to do so in association with colleagues who may have slightly different viewpoints than their own. Successful completion of the challenge will not only involve following through the design process from a conceptual design to a product, but also emphasize non-technical aspects of engineering. The process will involve innovative thinking, the design process, sketching, hands-on creation, technical writing and oral communication.

SUMMARY OF PROJECT:

The 2014 project will require student teams to use a variety of skills to accomplish one of several proposed problems, each of which is summarized below. Teams are allowed to use a variety of materials, some of which are supplied by the Shiley School of Engineering, and some of which may be scavenged by student teams. Student designs/products will be judged on a variety of criteria, including cost, innovation, practicality, robustness, functionality, and sustainability. The design will result in a prototype that demonstrates a proof of concept. Part of the course grade will be based on the effort put into the project.

Challenges:

During the first week of classes, student teams will select one of the challenges listed below. In general, the challenges this year are related to assistive technologies.

Challenge 1. Design a cane that will stay upright when not in use, but without the cumbersome prongs that some current canes have.

Challenge 2. Design a device to allow a blind person to test batteries to determine if they can still provide power.

Challenge 3. Design a device capable of notifying a deaf person when a person passes through a doorway.

Challenge 4. Design a device to allow a blind person to easily determine the temperature of the air.

Challenge 5. Design a kayak paddle capable of being used effectively by a person with one arm.

Challenge 6. Design a device that will measure the temperature of shower or bath water and notify the user, for example an elderly person with decreased sensitivity to temperature.

Challenge 7. Design a robot that will retrieve an object that is out of reach from a person who cannot easily get up form a chair.

By the end of the semester, team members will provide evidence that the prototype they have designed and built can successfully accomplish the assigned challenge. Evidence of successful completion will be a demonstration of the product. Where visible demonstration is impractical, for example software code, a video of the product's operation, a report providing details of the design, or some other means that allows faculty to judge the worthiness of the effort, will be allowed, with approval from course faculty.

WORK SPACE:

Room 110 in Shiley Hall is set aside for the use of EGR 110 students during the semester. Adjacent rooms hold tools and materials. Lockers and locks will be available in room 110 for storage of tools/devices. Students are allowed access to Shiley 110 by getting their ID cards swiped at Public Safety. Shiley 110 is available during building hours and will be staffed during specified hours, to be posted.

TOOLS:

Early in the semester each team will be provided with a construction kit with a tool box including some hand tools and some materials. Appendix A lists tools found in the tool box. All tools in the construction kit **must** be returned to the Lab Coordinator or student workers before the last day of classes. Failure to do so will result in a course grade of F for all team members.

In addition to the tools provided in the construction kit, students have access to the tools listed in Table 1 below. These tools can be checked out from the Lab Coordinator or student workers during hours of operation. Failure to return tools on time will compromise a team's ability to use other tools. Team members will be charged for any tools that are not returned. Students may use their own hand tools, but only those that are available to all students.

Table 1. Hand Tools Available for Checkout

Coping saw	Tri-square	Electrical tape
Channel lock pliers	Screw drivers	Hammer
Needle nose pliers	Bending tool	Scissors
Adjustable crescent wrench	Calipers	Sheet metal sheers (for cans)

MATERIALS:

Students will be allowed use of four different categories of materials to assist in meeting their chosen challenge. They are detailed below.

Project Materials. Materials not provided in the Construction Kit can be obtained from the Project Storekeeper in Shiley 117. Appendix B lists the available materials. Team members may order materials by completing a Materials Order Form (Appendix C). No tools (from construction kit, project storeroom, or LEGO® kit) can be used as part of the device. Steel weights must be returned in their original condition (for example, do not cut them). Materials may only be ordered after a specified date. Those marked with an asterisk (*) on the list must be returned to the Tool Room during the last week of the semester. Any material that must be returned to the tool room at the end of the semester must be returned in its original condition.

Recycled Materials. Students may use recycled products that are listed in Table 2. If used, these materials must be obtained by students; they will not be supplied. Recycled materials cannot be purchased for this project; they must have had a previous life fulfilling their intended purpose. They must have been discarded for recycling. In addition, nothing can be used that has residual food, oils, cleaners, or other toxic chemicals.

Table 2. Acceptable Recycled Materials.

Paper	Newspapers, magazines, catalogs, phone books, cardboard boxes, scrap paper, milk cartons, drink boxes
Plastic	Drink bottles, juice and milk jugs, CDs
Metal	Aluminum drink cans, soup cans

Manufactured Materials. Students may request that components be manufactured in the shop. Students must submit a detailed description (usually a drawing) to Paige Hoffert. Typically teams should expect at least a one week turnaround time. A fabrication work request form can be found in Appendix D.

Procured Materials. Students may purchase (using their own money) materials from off campus, however each team is limited to a total of $20 for such materials. The purchase must be documented, showing a copy of appropriate receipts in an appendix of the design report.

Students may decorate devices to improve their aesthetic appearance. However, painting can only be done with approval from Lab Coordinator, Paige Hoffert, at scheduled times in the shop. Paint may not be used on any materials that need to be returned to the tool room.

REPORTS:

Project Proposal. Each team must submit a proposal briefly describing the intent and function of the proposed device (or system, program, etc.). Team members should have agreed on the same design concept and must present this concept in the report.

Design report. Each student must contribute to a team design report that describes the team's design. A "draft" design report will be handed in approximately two weeks before the final version is due (see schedule in Table 3). The draft will be graded and count toward the overall design report grade. Students will have the opportunity to incorporate changes in the final version of the design report based on their instructor's comments, presumably allowing students to improve grades.

Oral report. Each team must prepare and present in class an oral summary of its project, including its design, the design process, and performance in the competition. The instructors will provide details of their expectations for the oral report. Each team will be given approximately 10-15 minutes for its members to make a presentation at the end of the semester.

IMPORTANT DATES AND DEADLINES:

Details of the design project and challenges will be presented during the first week of class. Each team will prepare a proposal and midterm report, as described above. Each team will give an oral presentation about its device during the last week of classes. The schedule of project activities is given in Table 3.

Table 3. Dates and Deadlines for Project Activities

Activity/Deadline	Date
First day to order materials	19 September
Meet with Lab Coordinator	19 September
Project Proposal	22 September
Design Report (draft) due	10 October
Design Report (draft) returned	27 October
Design Report (final) due	3 November
Beta Test	17,19 November
Last day to order materials	21 November
Open House	22 November
Oral presentations	1, 3, 5 December
Construction/MindStorm kits returned	5 December

Appendix A – Tool Kit Contents

Team #_____

Tools

X-acto knife and extra blades (3)
Miter saw
Miter box
Construction clamps (3)
Sanding stick
Adjustable snap knife
Masking tape (this is not a part - for temporary construction use only)**
Sheet of sandpaper**
Safety glasses
Tweezers
T-pins
6" Ruler
Bottle of wood glue
Team tags (for tool check out)

Note: All items must be returned during the last week of class, except for items marked with **

Received by:_____ Date: _____

Received by:_____ Date: _____

Received by:_____ Date: _____

Received by:_____ Date: _____

Appendix B – Project Materials

(* Note: Items marked with an asterisk must be returned during the last week of classes)

Item No.	Item Description
110*	Flat LEGO adaptor (comes with 1 HPC and hardware, ea.)
111*	Right-angle LEGO adaptor (comes with 1 HPC and hardware, ea.)
112	Wire Tie, 4"
113	Wire Tie, 7"
114	Wire Tie, 11"
115	Velcro, hook
116	Velcro, loom
201	Cardboard Sheet Stock, 14"x22"
202	Paper Tube, 4.2cm x 76.3 cm
204	Brass Rod, 1/8" nominal
205	Brass Tube, 1/8" nominal
207	Dacron fishing line, 2700N (50 lb.) nominal
208	Rubber Bands
211	Wood, Balsa strip, 3.2mm x 12.7 mm x 90 cm (1/8" x 1/2" x 36")
212	Wood, Balsa strip, 3.2mm x 6.4 mm x 90 cm (1/8" x 1/4" x 36")
214	Dowel, Hardwood, 6.4mm (1/4") dia
215	Dowel, Hardwood, 3.2mm (1/8") dia
217	Wood basswood strip 3.1mm x 12.7mm x 60cm (1/8" x ½" x 24")
218	Plywood, 15cm x 30cm x 0.32cm (6" x 12" x 1/8")
304	Nylon bearing, 7.9mm
305	Nylon bearing, 14.2mm
308	Screw, wood, round head, small
309	Screw, wood, round head, medium
310	Screw, wood, round head, large
320	Wire, steel, 30cm length
501*	Weight, steel, 143 grams
600*	LEGO® Resource Kit
601*	LEGO® Motor / Servo
602*	LEGO® Color Sensor
603*	LEGO® Light Sensor
604*	LEGO® Bump Sensor
605*	LEGO® Ultrasonic Sensor
606*	LEGO® Temperature Sensor

Appendix C

MATERIALS ORDER FORM

UNIVERSITY OF PORTLAND

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EGR 110 - Introduction to Engineering - *First Year Design Project*

Part No.	Description	Number of Units

Team Number: _____ Date Ordered: _____

Team Signatures: _____ _____

_____ _____

Team contact email: _____

Turn in form to Lab Coordinator or Project Assistants

Note: No orders will be filled without **all** the above information and signatures

Received by: _____ Date received: _____

Appendix D
EGR 110 - FABRICATION WORK ORDER REQUEST

This form allows students to request a shop technician to fabricate a component for students to use with their design project device. Students should meet with the Lab Coordinator to discuss their request once all team members have decided on the details of the request and signed the form. This form is **required** at the time of the meeting for any student team seeking support from the shop. It is to be completed by students **as soon as a need has been identified**. Please plan ahead!

Team number/name: _____

Primary contact name and phone number: _____

Team members (all team members must sign the form)**:**

Name	**Signature**
_____	_____
_____	_____
_____	_____
_____	_____

Requested completion date: _____

Brief description of project (Use the reverse side of this form to describe the requested component in detail. Attach additional pages if necessary with: notes, a detailed sketch with dimensions, etc).

Think Ahead. Team members should be prepared to answer the following questions before meeting with the Lab Coordinator and submitting this form:

a) Are enough details provided, with this request (e.g., sketches, dimensions, notes, etc)?
b) If enough details were not provided, what other details or information are required and when will they be available?
c) Are materials or supplies required and if so, what are they, and who will provide them?
d) What is the "next step" for the team and when is that required?

Team members understand that this request is ***preliminary planning*** and ***further timely communication may be required*** before shop personnel can start manufacturing. It is the team's responsibility to make sure communication is occurring.

To be completed by Lab Coordinator or Shop Technician:

Technician signature and date: _____

Work Order Number:_____
(year-month-date-requester's name)

Based on the attached information:

Estimated completion date: _____

Estimated shop hours required: _____