

Wellesley ENGR120: Making a Difference through Engineering (Fall 2016)

Course Info / Syllabus

A project-based exploration of the technical challenges facing under-served communities in developing countries. Technologies are focused primarily at the household level, exploring the benefits and limitations of existing and proposed solutions. Students learn and apply engineering design skills – including estimation, prototyping, and creativity – to address real problems facing community partners affiliated with the class. Methodologies for participatory development and co-creation will be considered and utilized. The necessity for interdisciplinary work when generating solutions will be emphasized.



Course Objectives. By the end of the course, a student should be able to:

- Understand and apply an engineering design process
- Use basic engineering design processes and tools to construct sketch models and physical prototypes
- Have physical intuition for fundamental engineering concepts and associated units
- Understand the engineering principles behind and have direct hands-on experience with a variety of technologies that benefit humanity
- Evaluate the utility and trade-offs for different potential implementations of engineering projects
- Understand the practice of design for under-served populations, including consideration of local adaptability and socio-economic impacts
- Develop prototypes and/or analyses of technical needs in collaboration with local stakeholders

Prerequisite: Passing the basic skills component of the quantitative reasoning requirement.

Course website: TBA

Course Staff

Amy Banzaert, Ph.D. Director of Engineering Studies & Lecturer
SCI L001, abanzaert@wellesley.edu

The best way to reach me outside of office hours (TBA next week) is email; you can expect a response within one business day (this includes appointment requests).

I welcome meeting with you during office hours and by appointment/drop-in to help you with the class, offer advice about engineering, and similar topics. My door is always closed, but that's only because the Science Library is nearby and noisy. My blinds will be closed if I would prefer not to be disturbed; otherwise, knock and enter.

Larry Knowles, machinist
SCI L023, lknowles@wellesley.edu
Hours: 7:30-4:30, Tues, Weds, & Fri

Thessaly McFall, We-Lab studio assistant
SCI L024, tmcfall@wellesley.edu
Hours: may vary week to week, see [We-Lab Calendar](#), look for Thessaly's office hours.

Attendance and Responsibility

Class attendance is required due to the hands-on nature of the class. If you must miss a class for a legitimate reason, inform the course instructor and your project partners as early as possible so that we can plan appropriately and provide you with makeup materials. Students are expected to come to class on time.

You should check the course website and your email frequently as part of your responsibilities for the class. If the course schedule and due dates cause you difficulty in observing any religious holidays, please talk to the course instructor about making alternate arrangements well in advance. All course work is covered by the Wellesley College honor code: "*As a Wellesley College student, I will act with honesty, integrity, and respect.*" <http://www.wellesley.edu/studentlife/aboutus/honor>

Grading

This class is mandatory credit/non, with the expectation that you will focus on learning and engaging with the materials and activities without the pressure a grade can create, especially in what is likely to be a new area of learning. You are still expected to attend class regularly, be on time, and contribute meaningfully in class and on projects. You should expect to spend about 11 hours per week on this class (if you are spending far more or less than that, please let me know). If your work is not minimally satisfactory, credit will not be given.

Collaboration Policy

Frequently, you will work on projects in pairs or groups. You are strongly encouraged to change partners for each new project. Although you are working with a partner it is essential that you each maintain your own design blog. There will be certain deliverables for each project that can be submitted jointly and others that need to be submitted individually. Details will be specified with each assignment.

Safety

In this class, you will learn how to use equipment (e.g. drill press, band saw, soldering iron, hand tools) that are potentially dangerous to you and your classmates if not used properly. Many are also expensive to repair if broken. You are not allowed to use these pieces of equipment without direct supervision by an instructor or TA unless you have been explicitly certified to use them by an instructor.

Come to class dressed appropriately for hands-on work: avoid wearing loose clothing or dangling jewelry; pull back long hair into a ponytail or bun; wear comfortable clothing and closed toed shoes. You must acquire safety glasses by the second day of class, and have them with you whenever you are in the lab. Be sure to label them with your name. There are many pairs of safety glasses available from past classes that you can "adopt." Alternatively, you can purchase a new pair from the campus bookstore.

Diversity & Inclusion

All enrolled students are welcome in my classroom. I expect and embrace different ways of thinking, living, being, working, and learning. If you have questions or concerns, please speak up in class or let me know individually. <http://www.wellesley.edu/about/diversityandinclusion/about>

Disabilities

Students with disabilities in this course who need disability-related accommodations should talk to Amy Banzaert to make appropriate arrangements. These students are also encouraged to work with Jim Wice, the Director of Disability Services. Jim's office is located in the Pforzheimer Learning & Teaching Center on the third floor of Clapp Library. If you have a physical disability or a learning disability, Jim is the person to see to arrange for accommodations. If your learning disability is undocumented or if you are uncertain as to whether you have an actual disability, Jim can arrange for you to be tested. <http://www.wellesley.edu/disability>

ENGR120 Class Schedule

Fall 2016

Note: the nature of project-based work is that some schedule shifting is required. Expect this schedule to change as the course progresses. Changes will be documented on the course website.

| | | Topic | Assignment Due |
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| F | 2-Sep | Introduction: engineering's role in society, brainstorming, estimation, class overview | - |
| T | 6-Sep | Energy introduction, estimation, safety; sharps container | - Safety Glasses - PPEO |
| F | 9-Sep | World Development Indicators, energy concepts revisited, circuits, sharps container demonstrated | - Finish your sharps container - Read Sparkfun Voltage, Current, Resistance & come to class w/ a question or comment |
| T | 13-Sep | Machine shop tools intro: keychain | |
| F | 16-Sep | Lighting & product development process | Bring functional LED Lantern to class |
| T | 20-Sep | Cooking, stoves, and fuel | Blog posts on LED & Sharps Container, Safety Rules |
| F | 23-Sep | Water transport & Discussion of interventions, working with community partners; project introductions; stove sketch model work | - Gravity light estimation - Project preferences due MONDAY 10 am |
| T | 27-Sep | ADE tech day: 3:30-5 (Come to class at 2:30) | Materials order (respond to subsequent email) |
| F | 30-Sep | NO CLASS: Inauguration | |
| T | 4-Oct | Needs assessment, specifications & Pugh charts; construct stoves; project: team formation, brainstorming, & background research; build stoves | Tech proposal |
| F | 7-Oct | Solar, wind, & pedal power; project specifications & 3 ideas gallery | Project specs & 3 ideas |
| T | 11-Oct | NO CLASS: Fall Break | |
| F | 14-Oct | Test stoves | Tech 1, rose thorn bud, final stoves |
| T | 18-Oct | Work on sketch models | Tech 2, rose thorn bud |
| F | 21-Oct | Design Review: sketch models | Tech 3, sketch models, materials order |
| T | 25-Oct | Project experimentation & construction | Tech 4, rose thorn bud |
| F | 28-Oct | Project experimentation & construction | Tech 5, rose thorn bud |
| T | 1-Nov | Design Review: initial working prototype | Tech 6, initial working prototype, materials order |
| F | 4-Nov | Refine prototype | Tech 7, rose thorn bud |
| T | 8-Nov | Refine prototype | Tech 8, rose thorn bud |

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| F | 11-Nov | Refine prototype | Tech 9, rose thorn bud |
| T | 15-Nov | Design review: second working prototype | Tech 10, rose thorn bud, second working prototype, materials order |
| F | 18-Nov | Refine prototype | Tech 11, rose thorn bud |
| T | 22-Nov | Refine prototype | Tech 12, rose bud thorn, Finish your final prototype! |
| F | 25-Nov | NO CLASS: Thanksgiving | |
| T | 29-Nov | Design review: final prototype | Present final prototype to project partners |
| F | 2-Dec | Project reflection & refinement & final poster draft due | Revise and refine your prototype based on feedback from your client. Posters (electronic) must be submitted today. |
| T | 6-Dec | Project reflection & refinement & final documentation due v1 | Submit your final project documentation v1 & any required poster revisions |
| F | 9-Dec | Final exhibition & class reflection & clean up | Final working prototypes |
| M | 19-Dec | Final documentation due v2 | Due at 10 am: - final physical working models and key prior prototypes - final paper including project documentation - survey on experience working with your team member(s) |