

## Course description

Engineers help to design and build solutions to the world's problems. This course will explore some of the fundamental skills and tools in engineering. You will get experience using engineering tools, and you will also develop a mindset so that you can "learn how to learn" because technology changes rapidly and the tools that you use today may be obsolete in 20 years. There will be an emphasis on developing strong professional skills, including work in a group setting and effectively communicating your efforts.

In addition, a goal of this class is to help you develop an entrepreneurial mindset so that you will understand the bigger picture. For example, while it may be easy to develop an engineering solution to a problem, what are the economic and ethical considerations of various solutions? These concepts are important to help engineers build a better world.

This will be an "active learning" class in which we spend much of our class time working. For example, we will write computer programs to model and simulate real world systems. We will debate the ethical issues that are associated with engineering innovations. Students should be prepared to come to class and participate in these activities!

## Logistics

### Contact information:

Name: Richard Goldberg

Email: [r.goldberg@unc.edu](mailto:r.goldberg@unc.edu)

Office location: 156 Caudill Labs

### Office hours:

N/A

### TA contact information:

N/A

### Class meeting location and times:

N/A

### Textbook and other instructional materials:

No textbook required – materials will be provided to students throughout the semester. Students will be required to use Matlab software, which is available at no charge to UNC students.

**Online resources:**

We will use Sakai and Poll Everywhere throughout the semester

**Prerequisites:**

It is recommended to have taken COMP 110 or 116 or have other programming experience.

**Target audience:**

Undergraduate students in any major can take this class if they are interested in gaining a background in the fundamentals of engineering.

**Policies**

I expect all students to

- Watch all online lectures.
- Come to every scheduled class.
- Turn in assignments on time; if an assignment is up to 24 hours late, there is a 25% deduction, and if an assignment is beyond 24 hours late, you will get a zero. If you need an extension, you must ask at least 24 hours before the time that the assignment is due (you can avoid a grade deduction this way).

**Honor code**

I will let you know if an assignment should be done individually or as part of a group. While I encourage you to help each other for individual work, it is a violation of the honor code if you copy or obtain solutions from another student.

**Student learning outcomes**

*By the end of this course, students should be able to:*

- Create models of different kinds of systems using the engineering principals and tools that we cover in class
- Understand the pros and cons of different types of models and engineering tools
- Communicate solutions to engineering problems in written and oral form
- Analyze real world solutions to engineering problems in the context of a bigger picture; for example, what are the ethical and economic issues that should be considered
- Work effectively in teams

Class schedule:

- Weeks 1-2: Introduction to engineering as a profession
- Weeks 3-5: Using Matlab and Python for simulations and mini project to introduce application these tools
- Weeks 6-8: Project module 1
- Weeks 9-11: Project module 2
- Weeks 12-14: Project module 3

Each project module will consist of introduction and research, followed by several classes to support the work of the project, and concluding with a final report and/or final presentations. Projects may include topics such as: modeling a bike share system to insure proper allocation of bikes throughout the system, and modeling of football helmets to minimize the chances of injury.

### **Grading**

The final course grade will be computed as follows:

- Quizzes: 15%
- Worksheets: 25%
- Final exam: 15%
- Three projects, including final reports and presentations: 15% each or 45%

### **Major course due dates:**

- N/A

Final letter grades will be calculated with the following grade scale:

A: >93.0

A-: 90-92.9

B+: 87.0-89.9

B: 83.0-86.9

B-: 80.0-82.9

C+: 77.0-79.9

C: 73.0-76.9

C-: 70.0-72.9

D+: 67.0-69.9

D: 60.0-66.9

F: <60.0

### **Accommodation for students with disabilities**

*The University of North Carolina – Chapel Hill facilitates the implementation of reasonable accommodations, including resources and services, for students with disabilities, chronic medical conditions, a temporary disability or pregnancy complications resulting in difficulties with accessing learning opportunities. All accommodations are coordinated through the Accessibility Resources and Service Office. Please visit <http://accessibility.unc.edu> for more information.*

### **Syllabus changes**

I reserve to right to make changes to the syllabus, including project due dates and test dates (excluding the officially scheduled final examination), when unforeseen

circumstances occur. These changes will be announced as early as possible so that students can adjust their schedules.