

APPL 101 Exploring Engineering Fall 2020

Introduction	<p>Engineers help to design and build solutions to a variety of problems, ranging from major global issues to local needs in the community. This course will explore some of the fundamental skills and tools in engineering. You will learn how to model and simulate systems, how to look to the natural world for engineering ideas and solutions, and how to explore sustainability issues from an engineering perspective. There will be an emphasis on developing strong professional skills, including work in a group setting and effectively communicating your efforts.</p>
Methods	<p>This class will largely meet on Zoom for fall 2020 due to COVID-19. Each class session will incorporate a small group activity using Zoom breakout rooms. For example, students may be developing or testing a simulation, discussing an ethical issue in engineering, or exploring engineering designs in the natural world.</p> <p>There will be a variety of assignments, including interviews, programming simulations using Matlab, and several group projects. Some class sessions will be project work time and the faculty and TAs will float between breakout rooms to provide extra help. Students will also be expected to work on their projects outside of class time.</p>
Results	<p>By the end of this course, students should be able to do the following:</p> <ul style="list-style-type: none"> • Develop models and simulations of different types of systems using the modeling principals and tools that we cover in class • Analyze a model and simulation to draw conclusions, based on its results as well as its limitations and assumptions • Examine and model designs found in the natural world to look for engineering solutions to problems • Analyze and model the performance of a commercial product from the standpoint of sustainability • Work effectively in teams • Communicate solutions to engineering problems in written and oral form
Discussion	<p>This class will provide students with a foundation in engineering skills and tools. It will be based on real world examples and will demonstrate the strong connection between engineering and the liberal arts.</p> <p>We encourage you to take the complementary class, APPL 110 Introduction to Design and Making: Developing Your Personal Design Potential. This class is appropriate for you if you are thinking about a minor in Applied Sciences and Engineering, anticipate that you could be working with engineering in your own career, or want to get some engineering experience to expand your own career or graduate school possibilities.</p>

Engineering Student Outcomes

- Demonstrate constant curiosity about our changing world
- Integrate information from many sources to gain insight.
- Identify unexpected opportunities to create extraordinary value
- Discern and pursue ethical practices
- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- An ability to communicate effectively with a range of audiences
- An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.

Class Essentials

CONTACT INFORMATION

Dr. Richard Goldberg

 **Office Location:** 156 Caudill
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 **Office Hours:** Mon 2-3pm, Tues 1-2pm

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Teaching assistants

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LOGISTICS

 **Class meeting times**
 Tues / Thurs 3:00-4:15 pm
 **Class meeting location**
 On Zoom: [link](#)
 **Office Hours**
 See above

Required Texts & Software

- Matlab, download from [here](#)

Pre-requisites

- Prior programming experience is helpful. However you can take this class with no programming experience.

Course content

COURSE TOPICS

- Engineering skills overview

- Introduction to programming in Matlab
- Modeling and simulation
 - Forest and trees
 - COVID
 - Falling Penny
 - Predator / Prey
 - Agent based simulation
- Ethics in engineering
- Engineering Grand Challenges
- Biomimicry – engineering in the natural world
- Sustainability engineering project
 - Research
 - Experiments
 - Modeling
 - Conclusions

➤ COURSE SCHEDULE

See link on Sakai for detailed schedule

To help you succeed

➤ COURSE EXPECTATIONS AND POLICIES

- Watch all online lectures and do all reading assignments before coming to class (in-class quizzes will help to encourage you to do this).
- Participate in class discussions and activities.
- During class time, do not use your phone or computer for something unrelated to class
- Come to every scheduled class and let us know ahead of time if you cannot attend.
- 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).

Zoom etiquette:

- Turn on your video if your Internet bandwidth is good enough to handle it
- Use a virtual background if you don't want anyone to see your sloppy room, your half-dressed roommate, or your mom in the background
- If you have to use the bathroom during class, don't take **anything** (AirPods, phone, etc.) with you!
- During class, put your phone and computer in "Do Not Disturb" mode, and close everything on your computer that is unrelated to the class
- Keep your mics muted when we are together as a large group, except breakout rooms, when you should unmute your mic
- We will frequently use the chat window, Google Docs, and breakout rooms for interaction this semester
- Use a computer instead of a phone or tablet for class. We will be using Matlab and doing other activities during class that are much easier to do with a computer

➤ STUDENT RESOURCES

SEE, SAY, DO SOMETHING

We're happy you are here and eager to learn. Despite our best intentions to follow a plan, life may throw us a curve ball. If you or someone you know is experiencing some distress or you are concerned about the well-being of a student, please report it here: <https://deanofstudents.unc.edu/carereport>. It is important to support one another. If you see something, say, and do something.

ACCESSIBILITY RESOURCES

UNC-CH provides accommodations for any students with documented disabilities. If you have a disability and believe you require accommodations, please contact the Department of Accessibility Resources at <http://accessibility.unc.edu>. Please contact us early in the semester so we can make any necessary arrangements and discuss the learning checks.

Assignments & Evaluation

➤ YOUR COURSE GRADE

Homework, simulations, and interviews	25%
In class activities, such as worksheets, quizzes	15%
Project 1 (predator / prey simulation)	15%
Project 2 (biomimicry)	15%
Project 3 (sustainable engineering)	30%
Total	100%

➤ GRADE INTERPRETATION & HONOR CODE

Your final course grade will be determined from a standard scale:

A	93+
A-	90.0 - 92.9
B+	87.0 - 89.9
B	83.0 - 86.9
B-	80.0 - 82.9
C+	77 - 79.9
C	73 - 76.9
C-	70 - 72.9
D+	67 - 69.9
D	60 - 66.9
F	<60

ACADEMIC HONESTY

There will be clear communication if assignments are individual or group. For individual assignments, while I encourage collaboration, it is a violation of the honor code if a student duplicates work or obtains solutions from another student and submits it on their own. Please reference the honor code: <http://honor.unc.edu>.

➤ MAJOR COURSE DUE DATES

Project 1	Sept 22, 2020
Project 2	Oct 13, 2020
Project 3	Exam week

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.