APPLIED
PHYSICAL SCIENCES

THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

Course #APPL 89-002

Convergent Research: Solving the grand engineering challenges of the future

Fall, 2023

Introduction	Students will participate in various take-home and in-class activities, group discussion and problem-solving coaching to enhance understanding of how chemistry, physics, materials science, biology, math, and computer sciences are applied to engineering. Special focus will be given to Biomedical Engineering, Chemical Engineering, Mechanical Engineering and Environmental Engineering.
Methods	The lessons are built to introduce the topic through discussing relevant scientific literature on the subject. One of the key aspects is the use of guest lecturers with expertise on a particular topic, or faculty with specific interest or skills in another field like mathematical modeling, mechanical engineering, or electronics. The use of guest lecturers provides both subject matter expertise, as well as a new perspective of the problems, allowing the students to gain a true interdisciplinary view of the subject, instead of an isolated view of each.
Results	By the end of this course, students should be able to do the following: • Students explore engineering topics and problems together each week. • Students learn how basic science can be applied to engineering solutions. • Students learn the importance of working on teams and providing credit for work done by others. • Students directly engage with the primary literature in and identify topics at the frontier of Engineering • Students enhance skills in communicating science and debating scientific issues via oral and written forms • Students become acquainted with experimental methods and techniques • Students connect with a faculty member early in the educational process. • Students learn intensively among a small cohort of students. • Students produce knowledge through self-directed inquiry and active learning. • Students analyze and communicate issues associated with a specific, advanced topic, covering a wide range of knowledge.
Discussion	The course will impact students learning in the following ways: • initiates deep and lasting connections with course material • supports student motivation for learning • promotes learning through critical reflection

Engineering Student Outcomes	• Demonstrate constant curiosity about our real-world problems.
	• Integrate information from many sources to gain insight.
	• Identify personal passions and a plan for professional development
	• Fulfill commitments in a timely manner
	• Discern and pursue ethical practices
	• 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.

Class Essentials

➢ CONTACT INFORMATION

Dr. Ronit Freeman	
🏢 **Office Location** Caudill 160 ✉ **Email** **ronifree@email.unc.edu** 📞 **Phone** 919-962-5718	

➢ LOGISTICS

🕐 **Class meeting times** T, TH, 12:30-01:45 📍 **Class meeting location** Phillips 0328 📅 **Office Hours** by appointment	📖 **Required Texts & Software** Articles from scientific journals will be assigned and distributed. ➤ **Pre-requisites** None

Course content

➢ COURSE TOPICS

- Discuss current topics in various engineering disciplines
- Provide perspectives on how technology impact society
- Best practices for problem-solving teamwork

➢ COURSE SCHEDULE

See attached.

To help you succeed

Health

Your mental and physical health is very important to me! Let me know how I can support you and your health this semester. If you need accommodations from ARS, please let me know ASAP.

Course Expectations and policies

Attendance:
- Class attendance is required and I will record attendance. Let me know ahead of time if you are missing class for any reason and it will be an excused absence. Please do not come to class if you are not feeling well or under quarantine for COVID exposure.
- While in person attendance is expected, you can attend via Zoom if necessary, especially due to illness or COVID exposure. Let me know ahead of time if you need to attend via Zoom.

➢ COURSE EXPECTATIONS AND POLICIES

- Do all reading assignments before coming to class.
- Participate in class discussions and problem-solving activities.
- During class time, do not use your phone or computer for something unrelated to class; research shows that this is distracting to other students in the class. If there is an urgent situation, then you can leave the classroom to use your phone or computer.
- Come to every scheduled class and let me 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).

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.

CAPS is strongly committed to addressing the mental health needs of a diverse student body through timely access to consultation and connection to clinically appropriate services, whether for short or long-term needs. Go to their website: https://caps.unc.edu/ or visit their facilities on the third floor of the Campus Health Services building for a walk-in evaluation to learn more. *(source: Student Safety and Wellness Proposal for EPC, Sep 2018)*

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

The University of North Carolina at 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 barriers to fully accessing University courses, programs and activities.

Accommodations are determined through the Office of Accessibility Resources and Service (ARS) for individuals with documented qualifying disabilities in accordance with applicable state and federal laws. See the ARS Website for contact information: https://ars.unc.edu or email ars@unc.edu.

Title IX Resources

Any student who is impacted by discrimination, harassment, interpersonal (relationship) violence, sexual violence, sexual exploitation, or stalking is encouraged to seek resources on campus or in the community. Please contact the Director of Title IX Compliance (Adrienne Allison – Adrienne.allison@unc.edu), Report and Response Coordinators in the Equal Opportunity and Compliance Office (reportandresponse@unc.edu), Counseling and Psychological Services (confidential), or the Gender Violence Services Coordinators (gvsc@unc.edu; confidential) to discuss your specific needs. Additional resources are available at safe.unc.edu.

Community Standards in Our Course and Mask Use.

This semester, while we are in the midst of a global pandemic, all enrolled students are required to wear a mask covering your mouth and nose at all times in our classroom. This requirement is to protect our educational community — your classmates and me – as we learn together. If you choose not to wear a mask, or wear it improperly, I will ask you to leave immediately, and I will submit a report to the Office of Student Conduct. At that point you will be disenrolled from this course for the protection of our educational community. An exemption to the mask wearing community standard will not typically be considered to be a reasonable accommodation. Individuals with a disability or health condition that prevents them from safely wearing a face mask must seek alternative accommodations through the Accessibility Resources and Service. For additional information, see Carolina Together.

Fall 2023 Course Delivery: As long as it is possible to do so safely, we will be meeting in person this

semester. I understand the ongoing COVID-19 pandemic may require changes to this plan and will be monitoring the situation closely. If I need to change the format of the course temporarily due to outbreaks of illness, I will announce this via email and the course Sakai site.

Assignments & Evaluation

➢ YOUR COURSE GRADE

10%: Attendance and participation	
60%: Homework Assignments	Individual and team assignments
30%: Final Presentation and Poster	Pitching a new convergent solution to a current scientific or technological challenge
100%: total	

➢ GRADE INTERPRETATION & HONOR CODE

Your final course grade will be determined from a standard scale:	**ACADEMIC HONESTY**
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	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.

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.