



# GENERAL ENGINEERING FALL 2024 CREATIVE INQUIRY PROJECT LIST

Creative Inquiry (CI) is the imaginative combination of engaged learning, cross-disciplinary interactions and undergraduate research that is unique to Clemson University. Team-based investigations are led by faculty mentors and typically span a year or more. Students take on problems that spring from their own curiosity, from a professor’s challenge or from the pressing needs of the world around them. These invaluable experiences produce exceptional graduates.

The following list of CI projects in the College of Engineering, Computing, and Applied Sciences (CECAS) has been compiled for Fall 2024 General Engineering (GE) students. All projects on this list are appropriate for freshmen and new transfers. This list is comprised of several projects that are two or more semesters, meaning it can be continued once you have transitioned to your engineering major. Other projects may only last one or two semesters. Many of these CI projects are interdisciplinary and provide exposure to multiple fields of engineering (e.g., civil engineering, environmental engineering, electrical engineering, etc.).

All projects listed are open to any GE student. Projects with a “TBA” time, mean the faculty will work with students to decide on a meeting time. Information for each of the CI projects is presented as follows:

Project #   Title		Project Course Information
Primary Faculty ( <i>Faculty Dept./Program</i> )		Project Meeting Day and Time
Description of CI Project		

During orientation registration for Fall 2024 classes, interested students should register for the CI holding section (ENGR 1900-999, 1 credit hour). Engineering students are asked to submit their top three CI project choices via a Google Form that will be sent to their Clemson email address after their orientation session.

Please note: Students who register for the CI holding section **MUST** submit their project choices by 4 PM the day after their orientation session to remain enrolled in the ENGR 1900-999 holding section. Students who register for the holding section and do not submit their CI project choices via the Google Form will be dropped from the holding section. Students will be notified of their project placement via email. Please allow up to 7 business days for your class to update on your schedule.

Questions, please contact Monica Sint, GE Registration Coordinator, at [msint@clemson.edu](mailto:msint@clemson.edu).

# CI Projects for General Engineering Students

## Project 1 | Advanced Manufacturing by Ultrafast Lasers

ME 2900/3900/4900-037

Dr. Xin Zhao ( <i>Mechanical Engineering</i> )	1 Credit Hour	TBA
<p>This project includes hands-on participation to learn the state-of-the-art ultrafast laser and use it for micro-manufacturing, material strengthening, and multi-functional surface processing.</p>		

## Project 2 | Green Energy and Biodiesel Project

BE 4990-005

Dr. Tom Dodd ( <i>Biosystems Engineering</i> )	1 Credit Hour	TBA
<p>From Fields to Fuel, team members will be researching all aspects of sustainable biofuels production and engineering while facilitating biodiesel and ethanol production to be utilized by University Facilities. Projects will focus on facility optimization through relief of production bottlenecks, and research increasing biodiesel feedstock acquisition through cultivation of energy crops and harvest of waste lipid streams. Led by Biosystems Engineering faculty.</p>		

## Project 3 | Water Quality and Controlled Environment Agriculture

EES 4900-011

Dr. David A. Ladner ( <i>Environmental Engineering</i> ), Dr. Abayomi Alayande ( <i>Environmental Engineering</i> )	1 Credit Hour	TBA
<p>Students will assist with an ongoing National Science Foundation project, which uses an anaerobic membrane bioreactor (AnMBR) to treat wastewater. The treatment allows removal of pathogens and undesired organic carbon, but retains nutrients like nitrogen and phosphorus. The water is then fed to a hydroponic system for growing crops like lettuce. The student will assist with operation of the AnMBR as well as measurement of water quality parameters like nitrate, ammonia, phosphate, chloride, sulfate, carbonaceous oxygen demand (COD), methane, etc.</p>		

## Project 4 | NASA Micro-G NExT Competition Team

CE 2990/ 3990/4990-013

Dr. Laura Redmond ( <i>Civil Engineering</i> )	3 Credit Hours	TBA
<p>The NASA Micro-g Neutral Buoyancy Experiment Design Teams (Micro-g NExT) challenges undergraduate students to design, build, and test a tool or device that addresses an authentic, current, space exploration challenge outlined by NASA. The team will work through the research, design and prototyping process to put forth a proposal to NASA, which, if accepted, will give them the opportunity to travel to NASA JSC to test the device/tool. The team will also participate in public outreach in local K-12 schools to promote STEM education. More information on the challenge can be found at NASA's official website <a href="https://beta.nasa.gov/learning-resources/micro-g-neutral-buoyancy-experiment-designteams/">https://beta.nasa.gov/learning-resources/micro-g-neutral-buoyancy-experiment-designteams/</a></p>		

# CI Projects for General Engineering Students

## Project 5 | Timber Strong Design Build

CE 4990-026

Dr. Michael Stoner ( <i>Civil Engineering</i> )	1 Credit Hour	TBA
The competition seeks student teams to design and build an artistically creative 2-story wood light-framed building that is sustainable, aesthetically pleasing and structurally durable.		

## Project 6 | Robotic Systems Research

ECE 1990/2990/3990/4990-001

Dr. Hassan Raza ( <i>Electrical and Computer Engineering</i> )	1 Credit Hour	TBA
The team is to design and construct a robot which will compete in IEEE's Southeastcon conference hardware competition.		

## Project 7 | Nanotechnology

ECE 1990/2990/3990/4990-002

Dr. Hassan Raza ( <i>Electrical and Computer Engineering</i> )	1 Credit Hour	TBA
In this CI course, students will be introduced to the fundamentals and applications of Nanotechnology from Electrical and Computer Engineering (ECE) perspective. Nanotechnology is the art, science, and engineering of designing materials, devices, and systems at the nanoscale from bottom-up and/or top-down approaches. The role of this technology in ECE has been the driving force behind the information technology revolution over the past few decades and is further expected to be the enabling technology behind the next technological revolution in robotics, automation, and artificial intelligence. The course is structured around some introductory lectures, followed by student-driven research on a topic of student's choice. This CI experience may lead to publication of a review article, if a student takes the sequence over a few semesters.		

# CI Projects for General Engineering Students

## Project 8 | Circuit Cellar

ECE 1990/2990/3990/4990-006

Dr. Hassan Raza ( <i>Electrical and Computer Engineering</i> )	1 Credit Hour	TBA
<p>In this CI, students will have the opportunity to learn hands-on activities related to circuits and electronics based on integrated circuits (ICs) and discrete components. We will discuss various practical techniques complemented by simulations. Students may take this course sequence over multiple semesters to work on various aspects of hands-on skillset. Within the scope of this project-based learning, a student may work on a semester long project or on a project that spans over multiple semesters. Skillsets learned here include but are not limited to circuit analysis, electronics design techniques, PCB design and manufacturing, EDA tools, etc. We will conclude the semester by designing and implementing an electronic project based on the student's personal interest.</p>		

## Project 9 | Microfluidics and Lab-on-a-chip for Point of Care Technology

ENGR 1900-031

Dr. Xiangchun Xuan ( <i>Mechanical Engineering</i> )	1 Credit Hour	TBA
<p>We explore the use of electric, magnetic or flow field for the transport and control of biological and synthetic particles in engineered microchannels with lab-on-a-chip applications to chemistry and biomedicine for point of care technology.</p>		

## Project 10 | Makerspace Operations

ENGR 1900-219

Dr. Todd Schweisinger ( <i>Mechanical Engineering</i> )	1 Credit Hour	TBA
<p>The Clemson Makerspace provides students the ability to collaborate and innovate using current technologies such as 3D-Printing, laser cutting, textiles processing equipment, and electronics. The Makerspace educates and trains students of all majors on machines and processes. Students in this CI will learn to operate key equipment in the Makerspace such as 3D scanners, 3D printers, water jets, laser cutters, electronics, embroidery and sewing machines, direct to Garment Printers, etc. The objective is to develop a safe set of Standard Operating Procedures (SOPs) for training students on makerspace equipment within the culture and requirements of the university. Students will research, implement and evaluate the effectiveness of training methods that will likely include manuals, videos, and presentations. This CI has a strong hands-on component, and a team leadership aspect.</p>		