



Department Project Information

Department Name	<i>Mechanical Engineering</i>	Date Submitted	<i>11 July 2025</i>
Project Title	<i>Development of a Hands-On Project for the Mechatronics Curriculum (UNCC_ME_MECH)</i>	Planned Starting Semester	<i>Fall 2025</i>

Funding

What is the source of funds that will be used to cover all direct costs of this project? MEES Department

Is this source of funds already secured? Yes

Work Space

Have you secured a lab/work space for the project to be built? Yes

Faculty Mentor/Grading Instructors *

	Name	Email	Phone
1	Stuart Smith	stusmith@charlotte.edu	704-687-8351
2	Artur Wolek	awolek@charlotte.edu	704-687-7226
3			

*List any graduate student that will be working on the project as a grading instructor so that they may be added to Canvas.

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

Discipline	Number	Discipline	Number
Mechanical (4)		Electrical (2)	
Computer		Systems	
Other ()			



Project Overview:

The Mechanical Engineering and Engineering Science (MEES) Department at UNC Charlotte is developing a series of educational mechatronics projects that will be used by future students in their laboratory courses. Students on this senior design team will assist in this effort by developing, building, refining between 1-2 such projects to become incorporated into the course offered to the next generation of UNC Charlotte mechanical engineers.

Project Requirements:

The student team will lead the development, testing, and documentation of several new mechatronics projects. Project development will require selecting and ordering stock material and components, CAD modeling, 3D printing, working with the machine shop and vendors, developing circuits, soldering, programming in LabView and with Arduino. The student will fabricate and assemble multiple kits for each project. Project testing will involve debugging each project and ensuring that it functions as expected and creating and visualizing resulting experimental data. Project documentation will involve organizing all project files, writing detailed guides for each project, including learning objectives, pre-lab and post-lab assignments, and reporting progress to faculty during weekly meetings.

Expected Deliverables/Results:

Students and faculty will agree upon the number and scope of projects in the first week of the semester (between 1-2 projects depending on the status of development at the time of project commencement). Example projects include: an acoustic-based distance sensor, a robot crane/manipulator arm, a spring tester, and a water-level sensor and LED indicator. For each project students are expected to:

- Design and document the project: bill of materials, schematics, CAD files, Arduino/LabView code in an organized electronic folder stored on Google Drive
- Prototype the project kit and refine design if necessary
- Fabricate twelve (12) kits with appropriate packaging to ensure compact and robust storage
- Test each kit, following the project guide developed, to ensure functionality
- Develop documentation:
 - Pre-project assignment that includes questions to help prepare students to perform the project activity during the lab session. Include grading rubric.
 - TA guide document for assembling the project, troubleshooting, and suggested delivery of content to students in the lab
 - Student guide and in-class document for assembling the project from the student's perspective including questions/deliverables. Include grading rubric.
 - Post-project assignment and grading rubric.

Disposition of Deliverables at the End of the Project:

Hardware developed is the property of the mentor and department. The work product will be displayed at the last Expo then handed over to the mentor for inclusion as instructional materials..

List here any specific skills, requirements, specific courses, club affiliation, knowledge needed or suggested (If none please state none):

The student team will be mentored by a team of faculty but should be capable of working independently to accomplish tasks.. The student should have at least some of the following skills and willingness to learn



where any gaps exist:

- CAD software
- 3D printing experience
- Machine shop experience and safety badge preferred
- Working with hand tools, assembly of mechatronic systems
- Soldering, circuit prototyping, fundamental concepts in circuit analysis/design
- Working with various sensors/actuators (servos, motors, solenoids, microphone, thermocouples, etc.)
- Electronics debugging tools (oscilloscope, multimeter, etc.)
- Programming in LabView and Arduino
- Circuit simulation tools (e.g., Multisim)
- Excel or MATLAB for plotting and analyzing experimental data