![Industrial Solutions Laboratory logo]

<u>***Department Project Information***</u>

Department Name	*MEES*	Date Submitted	*05/06/2022*
Project Title	*Mechanical communication between mobile robots coupled through a compliant medium* **(UNCC_ME_COMMS)**	**Planned Starting Semester**	*Fall 2022*

Funding

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

The project will utilize resources already available within the faculty mentors' research labs, and can be completed without additional external funding, but is likely to be supplemented by newly acquired grant money during the project timeline.

Is this source of funds already secured? Yes __X__ No _____

Work Space

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

Faculty Mentor/Grading Instructors *

	Name	Email	Phone
1	Scott Kelly	scott.kelly@uncc.edu	704-687-7498
2	Artur Wolek	awolek@uncc.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.

<u>***Senior Design Project Description***</u>

INDUSTRIAL SOLUTIONS LABORATORY

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. Assume 10 hours per week per student.

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	3	Electrical	1
Computer	1	Systems	
Other ( )			

Project Overview:

Animals frequently sense one another mechanically through the dynamics of their shared environs, and can sometimes exploit mutual awareness of this kind for mutual benefit. Birds flying in formation or fish swimming in schools, for instance, are able to sense one another's movements and adjust their collective behavior to diminish their collective drag and thus improve their propulsive efficiency. The dynamic coupling of animals through a compliant solid medium is more commonly associated with predator-prey scenarios — a spider sensing that it's caught a meal in its web, for instance — but it's easy to imagine a situation in which a team of mobile robots operating together on a compliant solid substrate — the surface of a small body in space, for instance, or an elastic membrane — could infer and exploit information about one another's activities. This project will investigate the feasibility of cooperative information exchange between two mobile robots operating atop a common horizontal platform with translational compliance.

Project Requirements:

The project team will design and construct a laboratory apparatus comprising a pair of small mobile robots, each endowed with inertial measurement capability, operating atop a solid platform suspended in such a way as to allow it to translate freely — with its own inertial dynamics — as a result of the robots' maneuvers. The team will be expected to demonstrate that each robot can infer information about the other's movements and that the two can achieve coordinated maneuvers through the mutual exploitation of such information.

Expected Deliverables/Results:

- *A functional laboratory apparatus of the kind described above*
- *Data and text documenting experimental results of the kind described above, suitable for inclusion in a manuscript submitted for publication in a scientific journal or conference proceedings*

Disposition of Deliverables at the End of the Project:

Following completion of the project, the hardware to be developed will be the property of the project mentors and their department.

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

Members of the project team should have experience with the design, manufacture, and assembly of basic mechanical parts and with the programming of microcontrollers (like the Arduino) and computers with general-purpose input/output capability (like the Raspberry Pi).