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# Special Issues in Swarm and Decision Making- 229.4103

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**Prerequisites:** robot motion planning courses, machine learning and reinforcement learning courses, distributed-agents' courses.

**About the course:**

This course will be given as full one week workshop, as advance course in this field. This course covers advance topics in swarms and decision-making problems, focusing mainly on software and algorithms for autonomous decision making (autonomy) and will include advance algorithms methods in swarm using AI tools.

As part of the course, algorithms will be implemented on MOOS environment. That will introduce students to underwater acoustic communication environment, as well as the various options for undersea navigation, both crucial to the operation of collaborative undersea networks for environmental sensing. Sensors for acoustic, biological and chemical sensing by underwater vehicles and their integration with the autonomy system for environmentally adaptive undersea mapping and observation will be covered. The subject will have a significant lab component, involving the use of the MOOS-IvP autonomy software infrastructure for developing integrated sensing, modeling and control solutions for a variety of ocean observation problems, using hands-on work on the MOOS simulation environments.

The course will include major algorithms in collective behavior and reinforcement learning from distributed agents field:

- Ant Colony Optimization (ACO)
- Particle Swarm Optimization (PSO)
- Artificial Bee Colony (ABC)
- Bat Algorithm
- Firefly Algorithm
- Cuckoo Search (CS)

During this workshop, the students will learn these algorithms and will implement these adaptation and research ideas on MOOS environment.

**Grading**

Grading is based entirely on workshop performance and attendance. Attendance for workshop is mandatory. There will be no final exam, and tutorials and hands-on work will be evaluated, by developing, simulating, analyzing, and improving swarm algorithms in MOOS environment.