I. **Identifying information**
Students: Matham Latif Al-Saaty
Course: MTRE 4400 Directed Research – Mechatronics, 1 credit
Instructor: Kevin McFall, PhD.

II. **Course Description**
This directed study aims to implement localization and path planning capabilities into a small mobile robot. Doing so involves developing localization and path planning algorithms and integrating them into the sensor and actuator systems of a physical robot.

III. **Objective of the Course**
The primary goal of this course is for the student to understand and implement the technology for an autonomous mobile robot.

IV. **Detailed Schedule**
- Week 1: Familiarize with existing robot platform
- Week 2: Familiarize with ROS and existing ROS nodes
- Week 3: Identify any necessary modifications to robot
- Week 4: Test robot odometry and control
- Week 5: Test LiDAR point cloud acquisition
- Week 6: Explore existing software libraries for localization and path planning
- Week 7: Develop software architecture to solve the problem
- Week 8: Implement software
- Week 9: Implement software
- Week 10: Implement software
- Week 11: Implement software
- Week 12: Test robot
- Week 13: Test robot
- Week 14: Write draft of final report
- Week 15: Review draft of final report
- Week 16: Finalize report

The student is expected to work independently on this project, of course under direction of the instructor. Meeting with the instructor is expected at least once weekly, demonstrating completion of the week’s task. A minimum total of 48 hours of time is required on this project. The student is expected to follow all safety guidelines when interacting with equipment as directed by instructors and laboratory technicians.

V. **Basis for Evaluation**
The primary deliverable for this course is working autonomous robot. The student will be evaluated on satisfactory operation of the robot (40%), compilation of a logbook documenting the progress made and time spent (20%), and preparing a manuscript describing the system and its operation appropriate for submission to the Early Career Technical Conference\(^1\) (40%). Grades will be assigned for each component according to the following rubric:

- **A** (90-100): Exceptional deliverable quality and/or completion of extended topics
- **B** (80-89): Satisfactory completion of deliverables
- **C** (70-79): Incomplete completion of deliverables
- **D** (60-69): Partial completion of deliverables
- **F** (0-59): Little or no completion of deliverables

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\(^1\) [https://www.uab.edu/engineering/home/departments-research/me/conferences/ectc2017](https://www.uab.edu/engineering/home/departments-research/me/conferences/ectc2017)