

## MEMORANDUM

To: Undergraduate Students  
Undergraduate Student Services  
MAE Faculty

From: Michael Griffis, MAE Undergraduate Coordinator

Date: 20 Aug 2025 (updated 09 Sep 2025)

Re: Realization for MEs

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**Background:** According to ABET's Program Criteria for Mechanical Engineering, our curriculum must include applications of "realization of physical systems, components, or processes." The associated student outcomes do not have to be assessed but the requirement of realization is established. In 2016, MAE created EML4502, Mechanical Design 3, to help satisfy this requirement. The purpose of this memo is to highlight some additional realization options that the newest ME curriculum supports. It is desirable to lessen demand on the EML4502 course, especially considering enrollment growth.

**Realization:** MAE has broadly defined realization to be the process where students

- begin with an existing design of an artifact<sup>1</sup> where the requirements have been established<sup>2</sup>,
- vet and validate the design by way of theory, simulation or experimentation under the supervision of faculty mentor(s),
- realize (build, implement) the design under the supervision of faculty mentor(s),
- test and evaluate the implementation<sup>3</sup>, and
- document the study and orally defend the effort.

Some discretion of the faculty mentor(s) is acceptable with respect to nature of supervision and definition, scope, depth, breadth of study.

<sup>1</sup> Can be of a mechanical, aerospace, electronic, electrical, software, chemical, or other engineered full system, well-defined subsystem or substantial component of same. Students could also design (starting from "scratch") or improve the design of the system, subsystem, or substantial component under supervision of faculty.

<sup>2</sup> Students could also establish the requirements with the customer under supervision of faculty mentor(s).

<sup>3</sup> The evaluation is important and it should honestly describe how successful the projected design and current implementation is. The long-term goal (of success) is for the design to meet the requirements of the project. It is not necessary that the implementation be successful, as the evaluation might declare. Students should identify which requirements have been met and which have not been met and why.

**Options for 2025-2026:** The new catalog creates a “realization elective” which gives the student choice of the following courses:

EML4502: *Mechanical Engineering Design 3*. Design and realization of a mechanical engineering system, component, or process subject to appropriate standards and constraints. Team project.

EML4535C: *Automation in Production Engineering*. Design and manufacturing using computer numerical control (CNC) and automated techniques. Use of modern Computer Aided Manufacturing (CAM) methods to establish setup and manufacturing sequence. Focus on meeting functional, material, and tolerance requirements for each part of an assembly.

EML4842: *Autonomous Vehicles*. Methods and apparatus to automate vehicle navigation. Integration of sensors such as global positioning system (GPS), light detection and ranging (LIDAR), position encoders, inertial measurement units (IMU). Vehicle propulsion and steering. Python programming language, Linux operating system, robot operating system (ROS, ROS2). Autonomous navigation, obstacle avoidance, path planning, dead reckoning, vehicle localization. **Note: prerequisites for this course are changing. Starting Spring '26, this course will have realization-related outcomes, and EML4501 (or EAS4700 or EAS4710) will be required. For students who took EML4842 in prior semesters, it can be counted as a technical or specialization elective.**

EML4914: *Undergraduate Realization Thesis*. Individualized study that realizes a design under the supervision of a faculty mentor. Realization considers all steps in the design process with major focus on prototyping, testing, evaluation, and optimization. The student produces a written thesis that is defended orally.

**Previous Catalog Years:** Students on previous catalog years can avail themselves of the above options. This requires an advisor to do a “course directive” to manually substitute the option.

**Student Design Teams:** A group of students within a design club who have the support of a faculty mentor can create a dedicated EML4502 section. The section would typically need a dedicated meeting time and place. The associated faculty gets a teaching allocation for this. The faculty mentor is responsible for establishing the scope, depth, and breadth of the realization effort, including grading, individual role, and scheduling expectations. The faculty mentor is responsible to ensure the students generate a final report, so that the realization activity has been properly documented. The students need to be mindful of the prerequisites.

**Individual Realization:** (See also the MAE department syllabus for EML4914.) In some cases, a student anticipates the existence of a design of some artifact that they believe can be realized. (The student believes that they can build it.) Sometimes, a faculty mentor provides an initial concept. Either way, the student can do a self-directed realization study, under the supervision of a faculty member. While realizing the artifact, the student documents and creates a written thesis that is defended orally. The student is required to submit the written thesis and oral defense form to MAE advising. Each student can opt in to have their written thesis archived in UF library’s *Undergraduate Works Collection* for public access, but this step is not required.

**IPPD:** The two-course IPPD sequence is another viable option for MEs or dual AE/ME majors that supplant capstone design courses. See the IPPD memo.