

ENTE - ENGINEERING TEST AND EVALUATION

ENTE401 Development, Test & Evaluation, Verification & Validation (DTEVV) Fundamentals (3 Credits)

This course provides a basic understanding of the Development, Test & Evaluation, Verification & Validation (DTEVV) process used to produce new aviation systems. While the course will mainly focus on DTEVV of aviation platforms/systems, the basics taught can be applied to any domain. The course will provide students with: the history and development of DTEVV; basic DTEVV concepts and ways to approach DTEVV; issues relating to various forms of DTEVV (i.e., Contractor, Government, Developmental, and Operational); common tools used in the test and evaluation community; the role of DTEVV during a systems lifecycle; and the engineering rigor that is applied to DTEVV to properly assess risk prior to fielding. This course will provide a solid foundation to join the DTEVV community upon completion.

Restriction: Permission from the ENTE Graduate Director.

Credit Only Granted for: ENTE401 or ENAE788F.

Formerly: ENAE788F.

Additional Information: Students must have prior coursework similar to the content offered in undergraduate courses ENAE432 or ENME361 along with enrollment in or completion of an engineering capstone course. Exceptions may be made on a case-by-case basis by the ENTE Graduate Director.

ENTE601 Autonomy and AI Fundamentals for the Development, Test & Evaluation, Verification & Validation (DTEVV) Workforce (3 Credits)

The future of transportation is uncrewed and ultimately autonomous. Before these systems can be fielded, they will need to go through a risk mitigation and acceptance process that is managed by professionals in and out of the government. This course is designed to give the students the skills required to evaluate autonomous aviation systems during this Development, Test & Evaluation, Verification and Validation (DTEVV) process. The course will cover the basic concepts and challenges faced by the DTEVV community when evaluating systems that contain Autonomous/AI functionality. It will examine control methods that are used by the DTEVV community. The course will provide practical experience in evaluating these systems through formal methods analysis, reinforcement learning, and programming to perform perception tasks required within the DTEVV community. This course will give the student a solid understanding and the skills needed to perform DTEVV on autonomous/AI systems in aviation.

Prerequisite: ENME472 or equivalent (undergraduate engineering capstone course), basic programming course (Python preferred), ENAE202/ENME202, or equivalent.

Restriction: Permission from ENTE Graduate Director.

ENTE602 Evaluation of Perception for Development, Test & Evaluation, Verification & Validation (DTEVV) of Autonomous Systems (3 Credits)

Provides a comprehensive and rigorous introduction to computer vision principles and their application in the Development, Test & Evaluation, and Verification & Validation (DTEVV) of autonomous systems. Students will explore the entire computer vision pipeline, from the physics of image formation to the implementation and validation of state-of-the-art deep learning models. The course is grounded in the theoretical foundations of machine learning and deep learning, while also emphasizing the practical challenges of building robust and reliable systems. A significant portion of the course will be dedicated to hands-on labs and a final project where students will develop, train, and rigorously evaluate a computer vision model for an object tracking task, simulating real-world DTEVV scenarios by analyzing performance against both nominal and disturbed data.

Restriction: Permission from the ENTE Graduate Director.

Additional Information: Students must have prior coursework similar to the content offered in basic programming (Python preferred) courses. Must also be enrolled in or completed an engineering capstone course like ENME472. Exceptions may be made on a case-by-case basis by the ENTE Graduate Director.

ENTE603 Human Robotics Teaming in Development, Test & Evaluation, Verification and Validation (DTEVV) of Autonomous Systems (3 Credits)

Human Teaming with Robotic Systems is slowly becoming a reality in multiple industries. As more of these systems deploy, a broad question arises about how to complete the Development, Test & Evaluation, Verification & Validation (DTEVV) process for these systems. This course will address this broader question by asking students to develop a simulated Human Robotics System to gain an intuitive understanding of how these systems work. Furthermore, we will use the developed Human Robotic System to illustrate the usage of different algorithmic DTEVV techniques. The outcome of this course is a broader understanding of the challenges of testing Human Robotics Teaming from a variety of different perspectives (e.g. Developer, Tester, Safety Engineer).

Restriction: Permission from the ENTE Graduate Director.

Additional Information: Students must have prior coursework similar to the content offered in basic programming (Python preferred) courses. Must also be enrolled in or completed an engineering capstone course like ENME472. Exceptions may be made on a case-by-case basis by the ENTE Graduate Director.