CONTROL SYSTEMS GRADUATE CERTIFICATE

The **CONTROL SYSTEMS CERTIFICATE** is designed to prepare for careers related to control systems technologies. Areas of emphasis include advanced control engineering concepts, state-space representation of dynamic systems, advanced analytical techniques, linear, optimal, and nonlinear control design methodologies, state and parameter estimation, as well as robust and adaptive control synthesis.

Who Should Participate?

Working professionals, military members, students at other universities worldwide, and current on-campus students who leave the Gainesville area to complete an internship, externship, or co-op (single or multiple terms) can participate in MAE Certificate Programs through the MAE EDGE distance learning platform.

All courses are offered through the online UF EDGE (Electronic Delivery of Gator Engineering) platform, which makes continuing your education possible no matter where you live or work! There are no campus visits required to earn this UF MAE graduate level certification, and the certificate conferred is identical to that earned as an on-campus graduate student.

What is the Admissions Process?

Distance Learning Professionals: Generally, for MAE certificate program admission, you need a bachelor's degree (BS) in engineering, science, technology, or a closely related discipline with a 3.0 undergraduate GPA, or you need a minimum of five years of professional employment experience in an engineering discipline (NOTE: a GRE exam score is not required for certificate program admission).

All applicants must apply online at the Office of Admissions: 1) complete the application at https://admissions.ufl.edu/apply/more [note there are two links on this page and you must select either "currently enrolled UF student" or "new student" link], 2) remit the $30 application fee plus a $7 processing fee, 3) submit official transcripts from your prior BS degree institution, and 4) complete the residency information and verification process. Once the Office of Admissions has reviewed your application, your information will be referred to the departments for an admission decision. New students should use the following link: https://www.applyweb.com/uflcert/index.ftl.

UF On-Campus Graduate Students: Currently enrolled UF graduate students may apply for admission to any MAE EDGE graduate certificate program offered to our distance learning professionals. For admission eligibility, you need a 3.0 graduate GPA in engineering, science, technology, or a closely related discipline.

All applicants must apply online at the Office of Admissions: http://admissions.ufl.edu/apply/more. No application fee is assessed for currently enrolled, degree seeking students. Once the Office of Admissions has reviewed your application, your information will be referred to MAE Student Services for an admission decision.

You **SHOULD APPLY** for certificate programs as early as possible to ensure you gain admission into the program; you **MUST APPLY** for certificate programs no later than the Graduate School midpoint deadline in the term you wish to certify. See Individual Term Calendars (https://catalog.ufl.edu/UGRD/dates-deadlines/pdfs/) to determine the midpoint deadline of your degree candidate term.

NOTE to UF On-Campus Graduate Students: Enrollment in certificate coursework may be on-campus or via the EDGE distance learning platform (for students participating in an internship, externship, or co-op.)
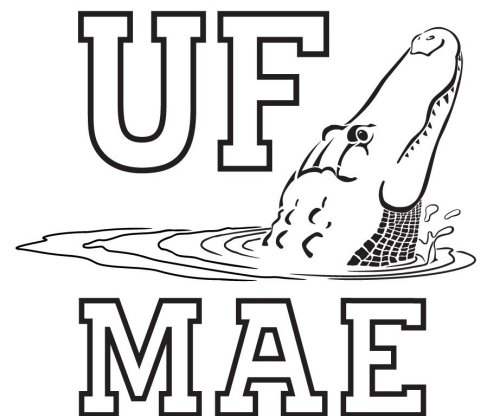
www.mae.ufl.edu

Certificate Structure

The **CONTROL SYSTEMS CERTIFICATE** consists of a total of 3 courses (9 credit hours). Lectures are available online in streaming and downloadable video, all semester, making it easy for students to review lectures before exams. Degree seeking and Certificate students view courses online, submit coursework online, and interact with professors using e-mail, telephone, and course websites via CANVAS. Students are never required to travel to campus, and course exams are proctored via internal employer supervisor, external testing agency, local 2-year or 4-year higher education institution, etc. For any questions about MAE Certificate Program or the UF EDGE distance learning platform, please contact the MAE Student Services Office: gradadvising@mae.ufl.edu or 352-392-1184.

Curriculum Requirements—Students complete 1 required and 2 elective courses

EML5311 (REQUIRED) — Control System Theory
Analyzing dynamic mechanical engineering control systems. Introduction to classical, digital, and state space techniques. Modeling, stability, transient response, and frequency response. Considers implementation.

EML6048 — Machine Learning and System Control
Focuses on an area of machine learning for solving decision-making problems when there is uncertainty in sensing and control. Relies on recent advances in artificial intelligence and machine learning. Studies new data-driven methods for the control design of autonomous systems in unknown environments using reinforcement learning. Theory, algorithms, and Python/Matlab implementations of reinforcement learning and their applications to solve control problems for unmanned vehicles and robots.

EML6350 — Introduction to Nonlinear Control
Introduction to nonlinear analysis and control systems theory. Lyapunov-based analysis and design techniques.

EML6351 — Nonlinear Control II: Adaptive Control
Control methods for uncertain nonlinear systems. Lyapunov-based robust, adaptive, learning, and estimation-based methods.

EML6352 — Optimal Estimation and Kalman Filtering
Methods of estimating parameters and random variables from noisy measurements with applications. State estimation of linear and non-linear dynamic systems with Kalman filtering and extended Kalman filtering, with mechanical and aerospace engineering applications such as target tracking.

EML6364 — Optimal Control
Demonstrates that optimizing the performance of a dynamic system is a problem of great interest in many branches of engineering. In such systems it is desired to determine the particular input that optimizes the system performance subject to constraints on the motion. This course develops the mathematical framework for optimal control.

EML6364 — Nonlinear Programming
Focuses on the identification and formulation of convex optimization problems, where such problems are those nonlinear problems that have optimal solutions. Studies the principles for the selection of algorithms and their programmatic implementation to solve them Derives convergence rates and compares these rates across major classes of problems. Explores the application to problems in approximate optimal control, such as model predictive control and reinforcement learning.

Completion Requirements

MAE Graduate certificate participants must 1) achieve certificate admission, 2) earn a grade of B or better in each course used to fulfill certificate requirements, and 3) file an application for certificate by the deadline with the Office of the University Registrar at ONE.UF during the final term of enrollment in a certificate course (https://one.uf.edu/dashboard/). To file an application, select Certificate/Degree Application under My Record on the left menu.

Contact Information

For additional information, please contact the MAE Student Services Office: gradadvising@mae.ufl.edu
For information on course content and professional development outcomes, please contact: Warren Dixon, Professor, Department of Mechanical & Aerospace Engineering Email: wdixon@ufl.edu.