Distance Learning
Master’s Degree

Electrical Engineering
Guidance, Navigation & Control
Program Courses

Courses: General Characteristics
Almost all of the courses are centered on regular “hands-on” projects where students put into practice what they learn. Our goal is to provide a deep level of practical understanding that can only be obtained by implementing the various topics covered in this program. Students should walk away with a solid understanding of the theory and how it applies to real systems.

EENG 510 - Linear Systems
Develop tools for the analysis and simulation of linear dynamic systems. Emphasis is placed on state space analysis for estimation and control theory applications.

STAT 586 - Probability Theory for Communication and Control
Probability theory used in the analysis and design of modern communication, navigation, and control systems.

EENG 562 - Feedback Systems
Analysis and design of linear feedback control systems using standard methods. Project-based and focused on an end-to-end design process that includes modeling, linearization, design specifications, robustness, and control implementation. Emphasis is placed on systems in which both estimation and control are working together.

EENG 534 - Fundamentals of Aerospace Instruments and Navigation System
Focus on inertial navigation systems, including accelerometer and gyro error modeling, INS mechanization, and inertial system error modeling.

EENG 533 - Navigation Using the Global Positioning System

EENG 633 - Global Navigation Satellite System Receiver Design
Build upon EENG 533 to cover analog and digital signal processing of GNSS receivers, including GPS. Projects involve incremental development of a sample-level baseband GNSS signal simulator and processor. Labs culminate in a GNSS software receiver that processes live sky sampled data files to produce pseudo-range and accumulated Doppler range measurements.

EENG 765 - Stochastic Estimation and Control I
Fundamentals of estimation theory and modeling of systems with uncertainty (emphasis on navigation applications). Covers classic, commonly-used methods such as Kalman filtering.

EENG 766 - Stochastic Estimation and Control II
Extend concepts from EENG 765 into additional non-linear estimation techniques, such as extended Kalman filters, particle filtering (including Rao-Blackwellized particle filtering), batch/bundle adjustment approaches, and factor graphs.

EENG 644 – Alternative Navigation Methods
Introduce several non-GPS navigation techniques which can be used to complement GPS when it is not available. Includes study of the relevant literature and a series of projects which enable the student to interact deeply with the approaches using both simulated and real data. Additionally, timing and analysis of timing systems will be introduced.

Master’s Thesis
In addition to the coursework, every student will complete an independent study under the supervision of an AFIT faculty member who serves as thesis advisor and chairman of the student’s thesis committee. Thesis research will also be supported by a local mentor from the student’s organization. The results of the research are presented in a formal written thesis. An oral presentation and defense of the research is also required.
How to Apply

Step 1: Determine Academic Eligibility
Academic eligibility is determined by the Office of Admissions per the standard entrance criteria listed on the AFIT website. Please refer to www.afit.edu/admissions for a complete list of admittance procedures. In summary, prospective students are required to:

- Hold a bachelor’s degree from an accredited institution
- Submit an admissions application online: www.afit.edu/admissions/AFITApplicationProcess
- Provide official copies of academic transcripts
- Provide GRE scores

Applicants will receive a letter from the Office of Admissions regarding eligibility status. DoD contractors seeking admittance will also receive a Statement of Understanding memo. Please ensure that applications are submitted at least three months prior to the date you wish to enroll.

Step 2: Program Acceptance
Academic eligibility does not automatically result in program acceptance. This is contingent upon a number of factors, including available class space and coordination with AFIT faculty to determine thesis topic and research advisor assignments. Contact the Autonomy & Navigation Technology (ANT) Center to learn more about program acceptance criteria. ant@afit.edu | 937.255.3636 x4754

Note to DoD contractors:
You must also submit a letter signed by your employer on official company letterhead noting your employment status and intent to enroll as an AFIT student.

What to Expect
This program is tailored for working professionals. By aligning thesis research with daily job responsibilities, students efficiently undertake the independent study portion of this program while at work. Notionally, students will take one course per quarter, finishing all 9 courses within two and a half years regardless of when students first enroll. Thesis research begins partway through the program and is expected to finish approximately 3 years from the date of initial enrollment.

Program Benefits
- Degree program aligned with daily job responsibilities to create efficient and relevant educational experience
- Rapid workforce development opportunities for organizations within the DoD Positioning, Navigation, and Timing community
- Defense-focused, researched-based graduate education
- Ability to conduct classified research
- Unique combination of military and civilian faculty
- Diverse student population including other services, civilians, and international allies
- Strategic partnership with the Air Force Research Laboratory (AFRL)
- Regionally accredited by The Higher Learning Commission (HLC), and core engineering programs accredited by Accreditation Board for Engineering and Technology (ABET)