

SYSTEMS ENGINEERING DEGREE REQUIREMENTS

M.SE. in Electrical Engineering program requirements (for students starting Spring 2017 and later)

Students must complete TEN (10) COURSE UNITS at the graduate level (500+), following the requirements below:

Category A: Required SE Core (3 course units)

Three (3) required courses that must be taken:

ESE 503: Simulation Modeling and Analysis

ESE 504: Introduction to Optimization Theory

ESE 540: Engineering Economics

Category B: Systems Area Electives (3 course units)

Three (3) course units from the approved course list below:

ENM 503: Probability

ESE 500: Linear Systems Theory

ESE 502: Introduction to Spatial Analysis

ESE 505: Control of Systems

ESE 507: Introduction to Networks and Protocols

ESE 519: Real-Time Embedded Systems

ESE 520: Agent-Based Modeling and Simulation

ESE 527: Design of Smart Systems

ESE 531: Digital Signal Processing

ESE 542: Statistics for Data Science

ESE 543: Human Systems Engineering

ESE 544: Project Management

ESE 545: Data Mining: Learning from Massive Datasets

ESE 550: Advanced Transportation Seminar

ESE 590: Systems Methodology

ESE 605: Modern Convex Optimization

ESE 617: Non-Linear Control Theory

ESE 619: Model Predictive Control

ESE 632: Random Process Models and Optimum Filtering

ESE 650: Learning in Robotics

ESE 680: Special Topics in ESE

ESE 597: Thesis Research (2 course units for thesis option)

ESE 599: Independent Study (requires approval for proposal)

Category C: Technical Elective (1 course unit)

One (1) course unit from graduate-level offerings within: ESE, CIS, CIT, IPD, MEAM, EAS**, or ENM

Category D: Approved Open Electives (3 course units)

Three (3) course units of approved electives from graduate courses offered at Penn in SEAS, SAS, Medicine, Law, Wharton MBA, Social Policy, and Education. These must have technical/scientific content and relevance to the student's program. Approval must be obtained from the ESE department prior to enrollment in the course.

Important notes:

- **Cross-listed courses:** Must be registered with the 500-level course number to be eligible as a graduate level course. Any cross-listed section at the 400-level or below is ineligible towards the degree.
- **CIT courses:** Maximum of two (2) cu are allowed towards the degree
- **EAS course eligibility:** Only the following EAS courses are allowed - EAS 504, 507, 510, 512, 545, 546, 595
- **ESE 680 Special Topics:** This course can be taken several times and counted more than once towards the degree. Each ESE 680 course taken must address different topics to be eligible.
- **ESE 599 Independent Study:** Maximum of one (1) course unit can be used toward the degree
- **ESE 597 Master's Thesis option:** If a thesis is completed, it will count for 2 course units of ESE 597)
- **TRANSFER courses:** Maximum of two (2) graduate-level course units may be transferred from another school to apply towards the degree. These two courses cannot have been used to fulfill requirements of an undergraduate degree.