Robotics and Intelligent Systems, MEng

Either a thesis option or a course option may be selected. The special requirements for these options are as follows:

Course Option

The Master of Engineering in Robotics (MEngR) is an academic master's degree designed mainly for both full-time and part-time students interested in proceeding to the departmental full-time doctoral program and/or an industrial career. Under the course option, students may not take ESE 7998 Masters Research. With faculty permission, they may take up to 3 units of graduate-level independent study.

Thesis or Project Option

This option is intended for those pursuing full-time study and engaged in research projects. Candidates for this degree must complete a minimum of 24 credit units of course instruction and 6 credit units of ESE 7998 Masters Research or ESE 7970 Masters Project; up to 3 thesis or project units may be applied toward the 15 core electrical engineering units required for the MSEE program. Any of these 6 units of thesis or project research may be applied as electives for the MSEE, MSSSM, MSDAS, MCEng, and MEngR programs. Students can take at most 3 thesis or project units in a semester. For the thesis, the student must write a master's thesis and defend it in an oral examination. For the project, the students must complete a paper documenting their work and either present their work orally or at a departmental or school wide poster session.

Degree Requirements

The principal goal of the MEngR program is to prepare individuals for professional practice in robotics engineering by leveraging the technical skills developed in an undergraduate engineering or physical science program.

- Required courses (the 12 units listed below as well as 9 more units from three groups) for the MEngR degree include the following:

Required Courses (12 units)

Code	Title	Units
ESE 4170	Introduction to Machine Learning and Pattern Classification	3
or CSE 4107	Introduction to Machine Learning	
or CSE 5107	Machine Learning	
ESE 5510	Linear Dynamic Systems I	3
ESE 4450	Sensing, Planning, and Control in Robotics	3
or MEMS 5206	Modern Robotics: Mechanics, Planning, and Control	
or MEMS 5207	Robot Design	
CSE 5100	Deep Reinforcement Learning	3

- At least one course must be selected from each of the following three groups for a total of 9 units:

AI/ML & Optimization

Code	Title	Units
CSE 4102	Introduction to Artificial Intelligence	3
CSE 5105	Bayesian Methods in Machine Learning	3
CSE 5109	Advanced Machine Learning	3
CSE 5270	Natural Language Processing	3
CSE 5403	Algorithms for Nonlinear Optimization	3
CSE 5509	Computer Vision	3
CSE 5519	Advances in Computer Vision	3
CSE 5610	Large Language Models	3
ESE 4150	Optimization	3

Autonomy & Systems Science

Code	Title	Units
CSE 5106	Multi-Agent Systems	3
CSE 5370	Trustworthy Autonomy	3
ESE 4210	Decision and Estimation Theory for Discrete Stochastic Processes	3
ESE 4460	Robotics: Dynamics and Control	3
ESE 5530	Nonlinear Dynamic Systems	3
ESE 5430	Control Systems Design By State Space Methods	3

Robotics & Control Labs

Code	Title	Units
ESE 4480	Control Systems Design Laboratory	3
ESE 4481	Autonomous Aerial Vehicle Control Laboratory	3

- A maximum of 6 credits may be transferred from another institution and applied toward the master's degree. Regardless of the subject or level, all transfer courses are treated as electives and do not count toward the core requirements for the degree.
- All full-time graduate students are required to take ESE 5980 Electrical & Systems Engineering Graduate Seminar each semester. This course is taken with the Pass/No Pass grade option.
- The degree program must be consistent with the residency and other applicable requirements of Washington University and the McKelvey School of Engineering.

- Students must obtain a cumulative grade-point average of at least 3.0 out of a possible 4.0 overall for courses applied toward the degree. Courses that apply for the degree must be taken with the credit/letter grade option.

Degree Electives

- Any course numbered 4001 or greater in the Engineering (with the prefix of BME, CSE, EECE, ESE, or MEMS), Physics, Mathematics, or Statistics and Data Science department, excluding the exceptions listed below, are approved by the department as electives.
- Students may take either ESE 4170 Introduction to Machine Learning and Pattern Classification or CSE 4107 Introduction to Machine Learning, but they may not use both as electives for the degree.
- For students who have already taken ENGR 3180 Engineering Mathematics A, ESE 3180, ENGR 3190 Engineering Mathematics B, ESE 3190, and ESE 5010 Mathematics of Modern Engineering I may not be used as electives for graduate credit.
- The degree must include at least 15 units of 5000-level courses.
- Undergraduate lab courses, research, independent study, senior design, and capstone courses are not approved as electives. Requests for an exception to this policy may be submitted to the graduate program coordinator with the approval of the student's academic advisor.