Robotics Engineering Major

Degree Type
Bachelor of Science

Mathematics (Minimum 7/3 Units)

Must include Differential and Integral Calculus, Differential Equations, Linear Algebra, and Probability.

Basic Science (Minimum 4/3 Units)

Must include at least 2/3 units in Physics.

Entrepreneurship (Minimum 1/3 Units)

Social Implications (Minimum 1/3 Units)

Must include at least 1/3 unit of Social Implications of Technology (CS 3043, GOV 2302, GOV/ID 2314 or RBE 3100). If GOV 2302 or GOV/ID 2314 are double-counted as meeting the Social Science Requirement and the Social Implications Requirement, then the Distribution Requirements total 10 units, otherwise the Distribution Requirements total 10 1/3 units.

Engineering Science and Design, including the MQP (Minimum 18/3 Units)

Must include at least 5/3 units in Robotics Engineering, including RBE 2001, RBE 2002, RBE 3001, and RBE 3002, or equivalent. RBE 3100 may not be used to fulfill this requirement. Must include at least 1 unit in Computer Science, including Object-Oriented Programming and Software Engineering. Must include at least 2/3 units in Electrical and Computer Engineering, including Embedded Systems. Must include at least 1/3 unit in Statics and 1/3 unit in Classical Controls (ES 3011, ECE 3012, AE 2310, or equivalent). RBE 502 cannot satisfy this requirement. Must include at least 1 unit of Engineering Science and Design Electives, of which at least 2/3 unit must be at the 4000-level or higher. The MQP must be a Capstone Design Experience in Robotics Engineering.

Robotics Engineering

Item #	Title	Units
RBE 1001	Introduction to Robotics	1/3
RBE 2001	Unified Robotics I: Actuation	1/3
RBE 2002	Unified Robotics II: Sensing	1/3
RBE 3001	Unified Robotics III: Manipulation	1/3
RBE 3002	Unified Robotics IV: Navigation	1/3
RBE 3100	Social Implications of Robotics	1/3
RBE 4322/ME 4322	Modeling and Analysis of Mechatronic Systems	1/3
RBE 4540	Vision-based Robotic Manipulation	1/3
RBE 4815	Industrial Robotics	1/3

Item #	Title	Units
BCB 4002/CS 4802	Biovisualization	1/3
BCB 4003/CS 4803	Biological and Biomedical Database Mining	1/3
CS 1004	Introduction to Programming for Non-Majors	1/3
CS 1101	Introduction to Program Design	1/3
CS 1102	Accelerated Introduction to Program Design	1/3
CS 2011	Introduction to Machine Organization and Assembly Language	1/3
CS 2022/MA 2201	Discrete Mathematics	1/3
CS 2102	Object-Oriented Design Concepts	1/3
CS 2103	Accelerated Object-Oriented Design Concepts	1/3
CS 2119	Application Building with Object-Oriented Concepts	1/3
CS 2223	Algorithms	1/3
CS 2301	Systems Programming for Non-Majors	1/3
CS 2303	Systems Programming Concepts	1/3
CS 3013	Operating Systems	1/3
CS 3041	Human-Computer Interaction	1/3
CS 3043	Social Implications of Information Processing	1/3
CS 3133	Foundations of Computer Science	1/3
CS 3431	Database Systems I	1/3
CS 3516	Computer Networks	1/3
CS 3733	Software Engineering	1/3
CS 4032/MA 3257	Numerical Methods for Linear and Nonlinear Systems	1/3
CS 4033/MA 3457	Numerical Methods for Calculus and Differential Equations	1/3
CS 4099	Special Topics in Computer Science	1/3
CS 4100/IMGD 4100	Artificial Intelligence for Interactive Media and Games	1/3
CS 4120	Analysis of Algorithms	1/3
CS 4123	Theory of Computation	1/3
CS 4233	Object-Oriented Analysis and Design	1/3
CS 4241	Webware: Computational Technology for Network Information Systems	1/3
CS 4300/IMGD 4300	Graphics, Simulation, and Aesthetics	1/3
CS 4341	Introduction to Artificial Intelligence	1/3
CS 4342	Machine Learning	1/3
CS 4401	Software Security Engineering	1/3
CS 4404	Tools and Techniques in Computer Network Security	1/3
CS 4432	Database Systems II	1/3
CS 4433/DS 4433	Big Data Management and Analytics	1/3
CS 4445	Data Mining and Knowledge Discovery in Databases	1/3
CS 4513	Distributed Computing Systems	1/3
CS 4515	Computer Architecture	1/3
CS 4516	Advanced Computer Networks	1/3
CS 4518	Mobile and Ubiquitous Computing	1/3
CS 4533	Techniques of Programming Language Translation	1/3
CS 4536	Programming Languages	1/3
CS 4731	Computer Graphics	1/3
CS 4732	Computer Animation	1/3
CS 4801/ECE 4802	Introduction to Cryptography and Communication Security	1/3
CS 4804	Data Visualization	1/3
MA 3457/CS 4033	Numerical Methods for Calculus and Differential Equations	1/3

Item #	Title	Units
BME 4011/ECE 4011	Biomedical Signal Analysis	1/3
BME 4023/ECE 4023	Biomedical Instrumentation Design	1/3
CS 4801/ECE 4802	Introduction to Cryptography and Communication Security	1/3
ECE 1799	Frontiers and Current Issues of Electrical and Computer Engineering	1/6
ECE 2010	Introduction to Electrical and Computer Engineering	1/3
ECE 2019	Sensors, Circuits, and Systems	1/3
ECE 2029	Introduction to Digital Circuit Design	1/3
ECE 2049	Embedded Computing in Engineering Design	1/3
ECE 2112	Electromagnetic Fields	1/3
ECE 2201	Microelectronic Circuits I	1/3
ECE 2305	Introduction to Communications and Networks	1/3
ECE 2311	Continuous-Time Signal and System Analysis	1/3
ECE 2312	Discrete-Time Signal and System Analysis	1/3
ECE 2799	Electrical and Computer Engineering Design	1/3
ECE 3012	Introduction to Control Systems Engineering	1/3
ECE 3113	Introduction to RF Circuit Design	1/3
ECE 3204	Microelectronic Circuits II	1/3
ECE 3308	Introduction to Wireless Networks	1/3
ECE 3311	Principles of Communication Systems	1/3
ECE 3500	Electric Power and Renewable Energy Systems	1/3
ECE 3501	Electromechanical Energy Systems	1/3
ECE 3829	Advanced Digital System Design with FPGAs	1/3
ECE 3849	Real-Time Embedded Systems	1/3
ECE 4305	Software-Defined Radio Systems and Analysis	1/3
ECE 4503	Power Electronics And Power Management	1/3
ECE 4703	Real-Time Digital Signal Processing	1/3
ECE 4801	Computer Organization and Design	1/3
ECE 4902	Analog Integrated Circuit Design	1/3
ECE 4904	Semiconductor Devices	1/3

Statics

Classical Controls

Engineering Science and Design Electives

Major Qualifying Projects

Robotics Engineering MQPs are capstone design activities that span a wide range of topics from autonomous ground/air/underwater vehicles to swarm robotics to human-robot interaction, with applications in surgery, inspection, manufacturing, security, and entertainment, to name but a few. All RBE MQPs must go through the breadth of the design experience, including conceptualization, requirements, design, implementation, evaluation, and documentation. Projects also address societal issues, including professional responsibility, ethical and environmental considerations, sustainability, aesthetics, and safety. RBE MQPs may be sponsored by industry, including the Lincoln Lab and Silicon Valley project centers, develop from faculty research, or be initiated by students. Please see the Robotics Engineering website http://robotics.wpi.edu/ for information on current projects.

Additional Advice

For additional advice about course selections, including elective choices, students should consult with their academic advisor.