ROBOTICS ENGINEERING (BS)

Program Overview

Robotics Engineering degree is a four-year course of study leading to exciting careers and/or advanced studies in robotics and automation. The robotics engineering faculty are dedicated to undergraduate and graduate teaching and to working closely with students at all levels of their study. The program equips students with the practical skills of an engineer combined with the fundamental knowledge and understanding gained through the study of physics. The program allows for a focus on the hardware, modeling and programming all of which are the integral components of robotics.

The application of robotics is a "multi-craft" activity in that it is the blending of multiple disciplines including computer engineering, mechanical engineering, and electrical engineering. A roboticist engages in the design, construction, and programming of robotic systems, including wheeled mobile robots, drones (unmanned aerial systems), autonomous marine vehicles, space systems, and industrial robot manipulators.

Career Opportunities

Students graduating with a Bachelor's degree in Robotics Engineering typically work in the robotics and automation industry or continue their studies in graduate school, or enter the armed services.

Program of Study

Code	Title	Credit Hours
Core IMPACTS Area : Institutional Priorities [1]		**4-5**
Choose one of the following communication options		3
COMM 1110	Public Speaking	
Foreign Language Course Options		
AMSL, ARAB, CHIN, FREN, GERM, GREK, ITAL, JAPN, KREN, LATIN, PORT, SPAN - 1001, 1002, 2001, 2002; SWAH - 1001, 1002.		
Take one of the following courses		1-2
ITDS 1779	Scholarship Across the Disciplines	
LEAD 1705	Introduction to Servant Leadership	
PERS 1506	Perspectives 1-hour	
PERS 1507	Perspectives 2-hour	
Core IMPACTS Area : Mathematics & Quantitative Skills [1]		**3-7**
DATA 1501	Introduction to Data Science	3
MATH 1001	Quantitative Skills and Reasoning	3
MATH 1101	Introduction to Mathematical Modeling	3
MATH 1111	College Algebra	3
MATH 1113	Pre-Calculus	4
MATH 1125	Applied Calculus	3
MATH 1131	Calculus with Analytic Geometry I	4
MATH 1132	Calculus with Analytic Geometry II	4
MATH 1165	Computer-Assisted Problem Solving	3
MATH 1401	Introduction to Statistics	3
MATH 1501	Calculus I	4
MATH 2125	Introduction to Discrete Mathematics	3
STAT 1401	Elementary Statistics	3
Core IMPACTS Area : Political Science and U.S. History		**6**
HIST 2111	U. S. History to 1865	3
or HIST 2112	U. S. History since 1865	
POLS 1101	American Government	3
Core IMPACTS Area : Arts, Humanities, and Ethics		**6**
Select one Fine Arts course		3
ARTH 1100	Art Appreciation	
ARTH 2125	Introduction to the History of Art I– Prehistoric through Gothic	
ARTH 2126	Introduction to the History of Art II– Renaissance through Modern	
MUSC 1100	Music Appreciation	
THEA 1100	Theatre Appreciation	
ITDS 1145	Comparative Arts [2]	
Select one Humanities course		3
ENGL 2111	World Literature I	
ENGL 2112	World Literature II	
ITDS 1155	The Western Intellectual Tradition	
ITDS 1774	Introduction to Digital Humanities	
PHIL 2010	Introduction to Philosophy	
ITDS 1145	Comparative Arts [2]	
Core IMPACTS Area : Communicating in Writing		**6**
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
Core IMPACTS Area : Technology, Mathematics, and Sciences [1,3]		**7-11**
ANTH 1145	Human Origins	3
ASTR 1105	Descriptive Astronomy: The Solar System	3
ASTR 1106	Descriptive Astronomy: Stars and Galaxies	3
ASTR 1305	Descriptive Astronomy Lab	1
ATSC 1112	Understanding the Weather	3
ATSC 1112L	Understanding the Weather Lab	1
BIOL 1125	Contemporary Issues in Biology Non-Lab	3
BIOL 1215K	Introductory Biology	4
BIOL 1225K	Contemporary Issues in Biology with Lab	4
CHEM 1151 & 1151L	Survey of Chemistry I and Survey of Chemistry I Lab	4
CHEM 1152 & 1152L	Survey of Chemistry II and Survey of Chemistry II Lab	4
CHEM 1211 & 1211L	Principles of Chemistry I and Principles of Chemistry I Lab	4
CHEM 1212 & 1212L	Principles of Chemistry II and Principles of Chemistry II Lab	4
CPSC 1105	Introduction to Computing Principles and Technology	3
CPSC 1301K	Computer Science I	4
ENVS 1105	Environmental Studies	3
ENVS 1105L	Environmental Studies Laboratory	1
ENVS 1205K	Sustainability and the Environment	4
GEOG 2215	Introduction to the Geographic Information Systems	3
GEOL 1110	Natural Disasters: Our Hazardous Environment	3
GEOL 1121	Introductory Geoscience I: Physical Geology	3
GEOL 1121L	Introductory Geoscience I: Physical Geology Lab	1

GEOL 1122	Introductory Geo-sciences II: Historical Geology	3
GEOL 1322	Introductory Geo-sciences II: Historical Geology Lab	1
GEOL 2225	The Fossil Record	4
PHYS 1111 & PHYS 1311	Introductory Physics I and Introductory Physics I Lab	4
PHYS 1112 & PHYS 1312	Introductory Physics II and Introductory Physics II Lab	4
PHYS 1125	Physics of Color and Sound	3
PHYS 1325	Physics of Color and Sound Lab	1
PHYS 2211 & PHYS 2311	Principles of Physics I and Principles of Physics I Lab	4
PHYS 2212 & PHYS 2312	Principles of Physics II and Principles of Physics II Lab	4
Core IMPACTS Area : Social Sciences		**6**
Select one Behavioral Science course		
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
PHIL 2030	Moral Philosophy	
PSYC 1101	Introduction to General Psychology	
SOCI 1101	Introduction to Sociology	
Select one World Cultures course		3
ANTH 1107	Discovering Archaeology	
ANTH 1105	Cultural Anthropology	
ANTH 2105	Ancient World Civilizations	
ANTH 2136	Language and Culture	
ENGL 2136	Language and Culture	
GEOG 1101	World Regional Geography	
HIST 1111	World History to 1500	
HIST 1112	World History since 1500	
ITDS 1156	Understanding Non-Western Cultures	
Core IMPACTS Total Hours		**42**
Health and Wellness		**3**
KINS 1106	Lifetime Wellness	2
or PHED 1205	Concepts of Fitness	
Select one of the following		1
Any PEDS course		
MUSC 1206	Body Mapping (Music Majors Only)	

[1] The hours applied in the Institutional Priorities; Mathematics & Quantitative Skills; and Technology, Mathematics, and Sciences areas must add to 18 credit hours.

[2] ITDS 1145 Comparative Arts, though listed under both Fine Arts and Humanities, may be taken only once.

[3] At least 4 of the credit hours in this area must be in a lab science course.

Major Requirements

Code	Title	Credit Hours
Core Requirements		
Complete the core requirements for this program		45
Core Total		45
Field of Study Requirements		
Minimum grade of C is required		
ENGR 2221	Computing for Engineers 1	3
ENGR 2255	Engineering Graphics and Computer Aided Design	3
MATH 2115	Introduction to Linear Algebra	3
MATH 2135	Calculus with Analytic Geometry 3	4
PHYS 2212	Principles of Physics II	3
PHYS 2312	Principles of Physics II Lab	1
Take 1 hour of department-approved coursework		1
Field of Study Requirements Total		18
Required for the Major		
Minimum grade of C is required		
ENGR 1701	Introduction to Robotics	1
ENGR 2115	Statics	3
ENGR 2125	Dynamics of Rigid Bodies	3
ENGR 2206	Digital Logic	4
ENGR 3235	Circuit Analysis	3
ENGR 3236	Introduction to Signal Processing	3
ENGR 3245	Robotics Engineering Design Lab	2
ENGR 3255	Sensors and Actuators	3
ENGR 3275	Feedback Control Systems	3
ENGR 4391	Robotics Senior Design 1	2
ENGR 4392	Robotics Senior Design 2	2
ENGR 5151U	Computer Vision 1	3
ENGR 5161U	Elements of Machine Intelligence	3
ENGR 5176U	Kinematics and Dynamics	3
ENGR 5236U	Microelectronic Circuits	3
ENGR 5238U	Introduction to Embedded Systems	3
MATH 1131	Calculus with Analytic Geometry I (If course taken in Core IMPACTS, student may substitute department-approved elective coursework)	4
MATH 1132	Calculus with Analytic Geometry II (If course taken in Core IMPACTS, student may substitute department-approved elective coursework)	4
MATH 3107	Differential Equations	3
MATH 3175	Introduction to Probability	3
Required for the Major Total		58
Major Electives		
Choose 2 hours from the following options:		2
Any 1000+ science course		
Any 1000+ ENGR course		
Any 3000+ MATH/STAT class with advisor approval		
MATH 2125	Introduction to Discrete Mathematics	
Any 3000+ CPSC class with advisor approval		
Major Electives Total		2
Total Credit Hours		**123**

Course	Title	Credit Hours
First Year		
Fall		
ENGL 1101	English Composition I (minimum grade of C)	3

MATH 1131	Calculus with Analytic Geometry I (minimum grade of C; 3 credits Area A and 1 credit Area F)	4
CHEM 1211	Principles of Chemistry I (minimum grade of C)	3
CHEM 1211L	Principles of Chemistry I Lab (minimum grade of C)	1
ENGR 2255	Engineering Graphics and Computer Aided Design (minimum grade of C)	3
Institutional Priorities	ITDS 1779 (2), LEAD 1705 (2), PERS 1506 (1; may be repeated with different topic), PERS 1507 (2)	1
ENGR 1701	Introduction to Robotics (minimum grade of C)	1
	Credit Hours	**16**
Spring		
ENGL 1102	English Composition II (minimum grade of C)	3
MATH 1132	Calculus with Analytic Geometry II (minimum grade of C)	4
PHYS 2211	Principles of Physics I (minimum grade of C)	3
PHYS 2311	Principles of Physics I Lab (minimum grade of C)	1
Program Electives	Elective (minimum grade of C)	3
KINS 1106 or PHED 1205	Lifetime Wellness or Concepts of Fitness	2
	Credit Hours	**16**
Second Year		
Fall		
MATH 2115	Introduction to Linear Algebra (minimum grade of C)	3
PHYS 2212	Principles of Physics II (minimum grade of C)	3
PHYS 2312	Principles of Physics II Lab (minimum grade of C)	1
ENGR 2115	Statics (minimum grade of C)	3
ENGR 2221	Computing for Engineers 1 (minimum grade of C)	3
Social Sciences	Behavioral Science [1]	3
	Credit Hours	**16**
Spring		
MATH 3107	Differential Equations (minimum grade of C)	3
ENGR 2206	Digital Logic (minimum grade of C)	4
ENGR 2125	Dynamics of Rigid Bodies (minimum grade of C)	3
Program Electives	Elective (minimum grade of C)	3
Institutional Options	COMM 1110 Public Speaking or foreign language 1001, 1002, 2001, 2002	3
	Credit Hours	**16**
Third Year		
Fall		
MATH 2135	Calculus with Analytic Geometry 3 (minimum grade of C)	4
ENGR 3236	Introduction to Signal Processing (minimum grade of C)	3
ENGR 3235	Circuit Analysis (minimum grade of C)	3
Arts, Humanities, and Ethics	Humanities Elective	3
ENGR 3245	Robotics Engineering Design Lab (minimum grade of C)	2
	Credit Hours	**15**
Spring		
MATH 3175	Introduction to Probability (minimum grade of C)	3
ENGR 3275	Feedback Control Systems (minimum grade of C)	3
ENGR 3255	Sensors and Actuators (minimum grade of C)	3
Arts, Humanities, and Ethics	Fine Arts Elective	3
Health and Wellness	PEDS Physical Education course 1***	1
Program Electives	Elective (minimum grade of C)	3
	Credit Hours	**16**
Fourth Year		
Fall		
ENGR 4391	Robotics Senior Design 1 (minimum grade of C)	2
ENGR 5161U	Elements of Machine Intelligence (minimum grade of C)	3
ENGR 5176U	Kinematics and Dynamics (minimum grade of C)	3
ENGR 5236U	Microelectronic Circuits (minimum grade of C)	3
HIST 2111 or HIST 2112	U. S. History to 1865 or U. S. History since 1865	3
	Credit Hours	**14**
Spring		
ENGR 4392	Robotics Senior Design 2 (minimum grade of C)	2
ENGR 5238U	Introduction to Embedded Systems (minimum grade of C)	3
POLS 1101	American Government	3
ENGR 5151U	Computer Vision 1 (minimum grade of C)	3
Social Sciences	World Cultures Elective	3
	Credit Hours	**14**
	Total Credit Hours	**123**

[1] Students are recommended to take ECON 2105 Macroeconomics or ECON 2106 Microeconomics as their Social Sciences: Behavioral Science course.

Additional Notes

- Courses in Areas B, C, E, and Wellness are interchangeable and can be taken at any time, with a recommendation of only taking one per semester to spread them out.
- This course map assures placement in MATH 1131 Calculus I first fall semester. If the student is not able to take it first semester, then many courses are pushed back one year (Physics, Statics, and anything that has those as prerequisites). Students are highly encouraged to take a math placement test as soon as possible before their first semester.
- Students are recommended to take ECON 2105 or ECON 2106 as their Area E Behavioral Science course.
- This program map illustrates appropriate coursework for completing a degree within four years, provided the course grades allow for earned credit. Please consult with your advisor to determine when courses can be switched out with others and taken in a different semester or sequence than illustrated since not all courses are taught every semester. This map is for illustrative purposes only and does not constitute a legal contract on the part of CSU since degree requirements or course offerings could change. As always, check with your advisor.

Admission Requirements

Please see the general undergraduate admission requirements. There are no additional admission requirements for the Bachelor of Science in Robotic.

Additional Program Requirements

Please see the undergraduate academic regulations section of the catalog. There are no additional academic regulations for the Bachelor of Science in Robotics Engineering.