Department of Mechanical and Energy Engineering

Program of Robotics Engineering for International Students (2022)

I. Introduction

Robotics Engineering is an interdisciplinary program that integrates the learning of mechanical, electronic, and computer technologies. The aim of the program is to cultivate leading talents with solid scientific foundation, excellent innovative practical ability and broad international vision, who are good at comprehensive application of theories and methods of robotics and related disciplines, and who can solve engineering problems with the latest scientific development for the future. In terms of research, its directions cover industrial robots, robot software, bionic robots, medical robots, field robots, microrobots and emerging frontier areas of science and technology such as artificial intelligence, autonomous system, supporting the national economic development plan and Shenzhen's local informatization, intellectualization and manufacturing comprehensive upgrade.

Academic subject area: Automation; Program code: 080803T

II. Objectives and Learning Outcomes

1. Objectives

This program bases its objectives on the future development of robotics engineering and serves the human resource demand of the field in the background of the national mid and long term development planning. The program is committed to fostering students with a solid scientific foundation, excellent innovation capacity, broad international vision, integrated use of robotics theories and related disciplines, and skills of solving the engineering problems for the future with the latest science development.

2. Learning Outcomes

a) Solid and broad basic theoretical knowledge (including mathematics, physics, machinery, automation, electronics, computer, etc.), as well as subject knowledge in robot engineering.

b) Master the robotics theories, research and engineering design methods of robot engineering, and have a good knowledge of engineering technology and frontier development of the industry.

Robotics Engineering is a multidisciplinary and interdisciplinary program and foster its students to become leading cross-disciplinary talents for the future.

c) Develop students with rigorous and practical attitude toward science and research, engagement in pursuing excellence, a strong sense of social responsibility and mission, and good communication skills.

d) Develop students with innovative thinking and the ability to independently identify, understand and solve problems in the real world with the application of robotics via the learning of the program.

e) Develop the international outlook and skills of communication and collaboration with international professionals of the related industry.

III. Study Length, Degree, and Graduation Requirements

1. Study length: 4 years. The academic credit system of SUSTech allows flexible study years, but not less than 3 years or more than 6 years

2. Degree conferred: Students who complete and meet the degree requirements of the undergraduate program will be awarded a Bachelor's Degree in Engineering.

3. The minimum credit requirement for graduation: 152 credits. The specific requirements are as follows.

Module		**Category**	**Minimum Credit Requirement**
General Education Courses	Chinese Language and Culture Module	Chinese Language and Culture	16
	Arts and Physical Education Module	Physical Education	4
		Arts	2
	Competence Development Module	Computer Programming	3
		Writing	2
		Chinese Studies	2
		Foreign Languages	14
	Humanities and Social Sciences Module	Humanities	6
		Social Sciences	
	Mathematics and Natural Sciences Module	Mathematics	12
		Physics	10
		Chemistry	3
		Biology	3
	Introduction to Majors Module	Introduction to Majors	2
Major Courses	Major Required Courses	Major Foundational Courses	26
		Major Core Courses	20
		Practice-based Learning (Undergraduate Thesis, Internships, Research projects, etc.)	12
	Major Elective Courses	Major Elective Courses	15
Total			152
Note: please see the General Education Requirement for more details on Chinese Language and Culture Module, Arts and Physical Education Module, Competence Development Module（Foreign Languages & Chinese Studies & Writing）, Humanities and Social Sciences Module, and Introduction to Majors Module.			

IV. Course Requirements for the Mathematics and Natural Sciences Module and Computer Programming

Course Category	Course Code	Course Name	Credits	Terms	Prerequisite	Dept.
Mathematics	MA101a/ MA117	Mathematical Analysis I /Calculus I	5/4	1 Fall	None	Department of Mathematics
	MA102a/ MA127	Mathematical Analysis II /Calculus II	5/4	1 Spring	Mathematical Analysis I / Calculus I	Department of Mathematics
	MA107/ MA113	Advanced Linear Algebra I / Linear Algebra	4	1 Spring & Fall	None	Department of Mathematics
Physics	PHY101/ PHY105	General Physics I / College Physics I	5/4	1 Fall	None	Department of Physics
	PHY102/ PHY106	General Physics II / College Physics II	5/4	1 Spring	General Physics I / College Physics I	Department of Physics
	PHY104B	Experiments of Fundamental Physics	2	1-2 Spring & Fall	None	Department of Physics
Chemistry	CH103/ CH105	General Chemistry / Chemistry: The Central Science	4/3	1-2 Spring & Fall	None	Department of Chemistry
Biology	BIO102B/ BIO103	Principles of Biology / Introduction to Life Science	3	1-2 Spring & Fall	None	Department of Biology
Computer Programming	CS109/ CS110/ CS111/ CS112	Introduction to Computer Programming/ Introduction to Java Programming/ Introduction to C programming/ Introduction to Python Programming Python	3	1-2 Spring & Fall	None	Department of Computer Science and Engineering

V. Prerequisites for Major Declaration

<table>
<tr><th>Major Declaration Time</th><th>Course Code</th><th>Course Name</th><th>Prerequisite</th></tr>
<tr><td rowspan="6">Declare major at the end of the first academic year</td><td>MA101a/ MA117</td><td>Mathematical Analysis I /Calculus I</td><td>None</td></tr>
<tr><td>MA102a/ MA127</td><td>Mathematical Analysis II /Calculus II</td><td>Mathematical Analysis I / Calculus I</td></tr>
<tr><td>PHY101/ PHY105</td><td>General Physics I /College Physics I</td><td>None</td></tr>
<tr><td>PHY102/ PHY106</td><td>General Physics II /College Physics II</td><td>General Physics I / College Physics I</td></tr>
<tr><td colspan="3">Note:
The above courses are required to be completed. In addition, at least one of the following Course Category should be passed:
1. Mathematics: MA107/MA113 Advanced Linear Algebra I / Linear Algebra
2. Physics: PHY104B Experiments of Fundamental Physics.
3. Chemistry: CH103/CH105 General Chemistry / Chemistry: The Central Science.
4. Biology: BIO102B/BIO103 Principles of Biology / Introduction to Life Science.
5. Computer Programming: CS109/CS110/CS111/CS112 Introduction to Computer Programming/ Introduction to Java Programming/ Introduction to C programming/ Introduction to Python Programming Python</td></tr>
<tr><td rowspan="6">Declare major at the end of the second academic year</td><td>MA101a/ MA117</td><td>Mathematical Analysis I /Calculus I</td><td>None</td></tr>
<tr><td>MA102a/ MA127</td><td>Mathematical Analysis II /Calculus II</td><td>Mathematical Analysis I / Calculus I</td></tr>
<tr><td>PHY101/ PHY105</td><td>General Physics I /College Physics I</td><td>None</td></tr>
<tr><td>PHY102/ PHY106</td><td>General Physics II /College Physics II</td><td>General Physics I / College Physics I</td></tr>
<tr><td>MA107/ MA113</td><td>Advanced Linear Algebra I / Linear Algebra</td><td>None</td></tr>
<tr><td colspan="3">Note:
The above courses are required to be completed. In addition, at least one of the following Course Category should be passed: CS109/CS110/CS111/CS112 Introduction to Computer Programming/ Introduction to Java Programming/ Introduction to C programming/ Introduction to Python Programming Python.</td></tr>
<tr><td colspan="4">Note:
1. If the number of students entering a major at the end of the first academic year in the department is greater than or equal to the total number of the teaching-research faculty (PI)*2*60%, all majors in the department may implement the prerequisites for major declaration at the end of the second academic year.
2. If the number of students entering a major at the end of the first academic year in the department is less than the total number of the teaching-research faculty (PI)*2*60%, all majors in the department do not implement the prerequisites for major declaration at the end of the second academic year.
3. Suppose the number of students applying for a major at the end of the first academic year exceeds four times the total number of the teaching-research faculty (PI), then the department may select students according to predetermined rules. In principle, the rules set by the department shall examine the students' suitability for the major and not based on weighted GPA (Specific rules shall be set by the department and announced in advance).
4. For departments that do not implement prerequisites for major declaration at end of the second academic year, if the cumulative number of students applying for a major at the end of the second academic year and the number of students who have entered a major at the end of the first academic year exceeds four times the total number of the teaching-research faculty (PI), the department may select students according to predetermined rules. In principle, the rules set by the department shall examine the students' suitability for the major and not based on weighted GPA (Specific rules shall be set by the department and announced in advance).</td></tr>
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VI: Major Course Arrangement

Table 1: Major Required Courses

Program of Robotics Engineering

Course Category	Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
Major Foundational Courses	ME103	Awareness Practice of Manufacturing Engineering	3	2	1/Summer, 1-2 Spring &Fall		MEE
	ME102	CAD and Engineering Drawing	3	1.5	2 Spring &Fall		MEE
	EE104	Fundamentals of Electric Circuits	2		2 Spring &Fall	MA101B, MA113	EE
	EE205	Signals and Systems	3	1	2/Fall	MA127	EE
	MAE203B	Engineering Mechanics I – Statics and Dynamics	3		2/Fall	MA113	MAE
	MA212	Probability and Statistics	3	1	2 Spring &Fall	MA127	MA
	ME212	Materials Mechanics in Mechanical Engineering	3		2/Fall		MEE
	ME307	Fundamentals of Control Engineering	3	0.5	2/Spring	EE104	MEE
	ME213	Principles of Machinery	3		2/Spring		MEE
	Total		**26**	**6**			
Major Core Courses	ME331	Robot Modeling and Control	3		3/Fall	MAE203B	MEE
	ME311	Mechanical Design	3		3/Fall		MEE
	ME316	Machinery and Mechanical Design Labs	2	2	3 Spring &Fall		MEE
	ME322	Robotic Actuation System	3	1	3/Fall	MA127	MEE
	ME323	Sensing Technologies	3	0.5	3/Spring	EE104, EE205	MEE
	ME333	Mechatronic Systems	3	1	3/Spring	ME331	MEE
	ME338	Machine Learning for Engineering	3		4/Fall	MA212, CS109/ CS110/ CS111/ CS112, MA107A	MEE
	Total		**20**	**4.5**			

Practice-based Courses	ME498	Senior Project*	12	12	4/Spring		MEE
	Total		**12**	**12**			
Total			**58**	**22.5**			
Note: *Students who have completed Comprehensive Design Ⅰ & Ⅱ are not required to take the Senior Project（ME498）.							

Table 2: Major Elective Courses

Program of Robotics Engineering

Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
ME332	Robot Operating System	3	1	2/Spring	CS109/ CS110/ CS111/ CS112/ CS113	MEE
CS205	C/C++ Program Design	3	1	2/Spring		CS
EE202-17	Digital Circuits	3		2 Spring &Fall	PHY106	EE
MEE5002	Fundamentals and practices of project management	3		2/Spring		MEE
EE201-17	Analog Circuits	3		3 Spring &Fall	PHY106, EE104	EE
CS203B	Data Structures and Algorithm Analysis B	3	1	3/Fall	CS109	CS
ME315	Mechanisms and Applications	3		3/Fall	ME212, MA113	MEE
MEE5103	Walking Robot	3	0.5	3/Fall	ME331	MEE
CS308	Computer Vision	3	1	3/Fall		CS
ME301	Dynamics and Vibration	3	1	3/Spring	MAE203B, MA201b	MEE
ME302	Fundamentals of Manufacturing	3		3/Spring	ME103	MEE
ME313	Product Design Practice	3	1	3/Spring	ME213/ ME311/ ME316/ ME331	MEE
ME314	Finite Element Theory and Its Engineering Applications	3		3/Spring	ME212, MA113	MEE
ME336	Collaborative Robot Learning	3	1	3/Spring	ME331	MEE
MEE5108	Microrobotics	3		3/Spring	ME307	MEE
MEE5116	Advanced Kinematics and Dynamics of Mechanisms	3		3/Spring	ME331	MEE
CS401	Intelligent Robotics	3	1	3/Spring	MA212, CS102B, CS203	CS
ME424	Modern Control and Estimation	3		4/Fall	ME307	MEE
MEE5105	Fundamentals of Engineering Optimization	3		4/Fall	MA127, MA113	MEE
MEE5107	Microfabrication and Microsystems	3		4/Fall	ME307	MEE
MEE5110	Soft Robotics	3		4/Fall	ME213	MEE
MEE5115	Autonomous Robotic Systems	3		4/Fall	MA113, MA212	MEE
Total		**66**	**8.5**			

Note:

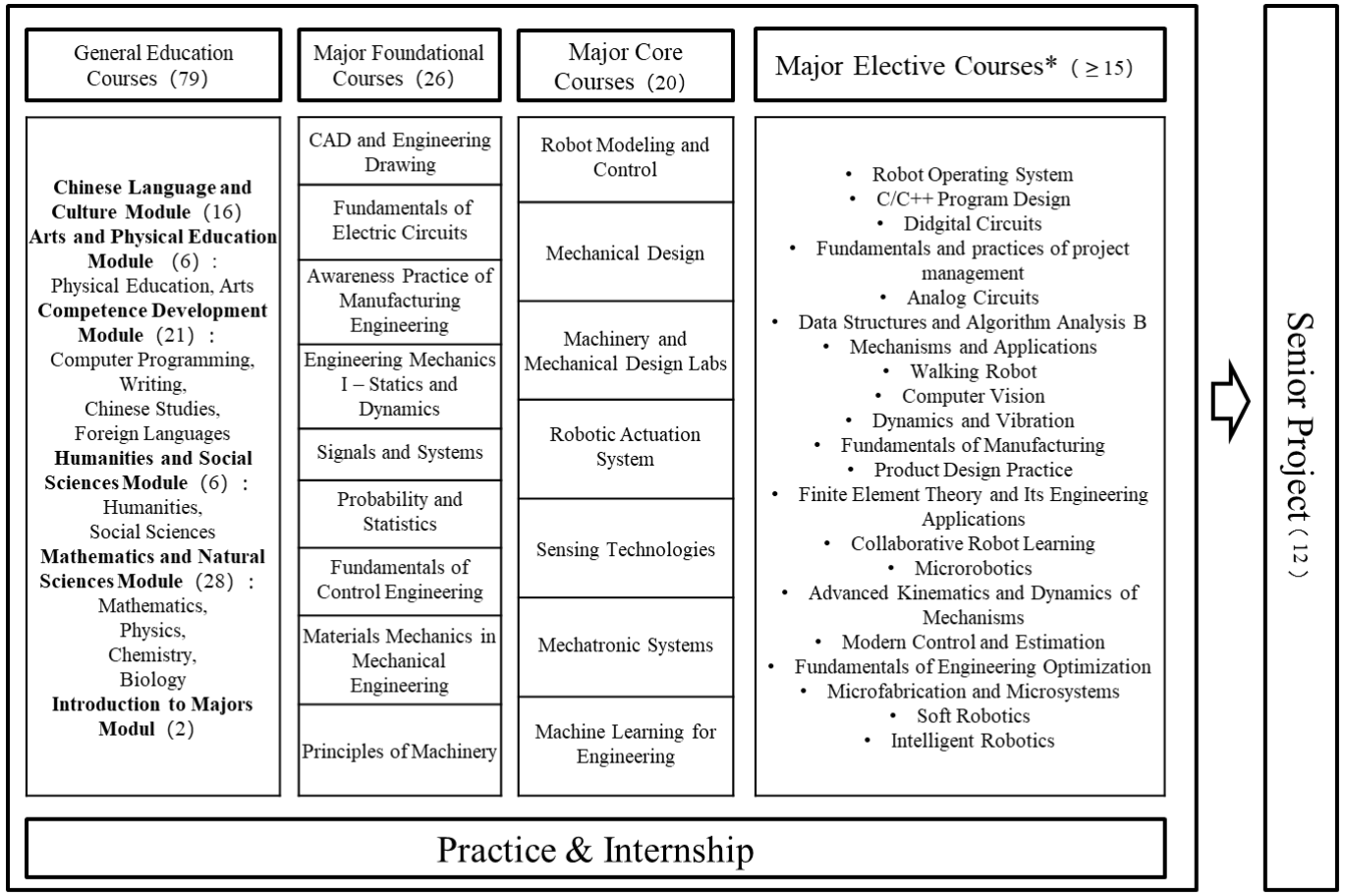
1. The minimum requirement for graduation in this module is 15 credits. In addition, the courses starting with MEE can't be more than 6 credits.
2. Major elective courses selected by a student during any specific semester may be changed according to the loading situation.
3. The number and contents of major elective courses offered by the department may be adjusted according to the development of curriculum construction.

Table 3: Overview of Practice-based Learning

Program of Robotics Engineering

Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
ME103	Awareness Practice of Manufacturing Engineering	3	2	1/Summer, 1-2 Spring &Fall		MEE
ME102	CAD and Engineering Drawing	3	1.5	2 Spring &Fall		MEE
EE205	Signals and Systems	3	1	2/Fall	MA127	EE
MA212	Probability and Statistics	3	1	2 Spring &Fall	MA127	MA
ME307	Fundamentals of Control Engineering	3	0.5	2/Spring	EE104	MEE
ME316	Machinery and Mechanical Design Labs	2	2	3 Spring &Fall		MEE
ME322	Robotic Actuation System	3	1	3/Fall	MA127	MEE
ME323	Sensing Technologies	3	0.5	3/Spring	EE104, EE205	MEE
ME333	Mechatronic Systems	3	1	3/Spring	ME331	MEE
ME332	Robot Operating System	3	1	2/Spring	CS109/ CS110 / CS111/ CS112/ CS113	MEE
CS205	C/C++ Program Design	3	1	2/Spring		CS
CS203B	Data Structures and Algorithm Analysis B	3	1	3/Fall	CS109	CS
MEE5103	Walking Robot	3	0.5	3/Fall	ME331	MEE
CS308	Computer Vision	3	1	3/Fall		CS
ME301	Dynamics and Vibration	3	1	3/Spring	MAE203B, MA201b	MEE
ME313	Product Design Practice	3	1	3/Spring	ME213/ ME311 / ME316/ ME331	MEE
ME336	Collaborative Robot Learning	3	1	3/Spring	ME331	MEE
CS401	Intelligent Robotics	3	1	3/Spring	MA212, CS102B, CS203	CS
ME498	Senior Project	12	12	4/Spring		MEE
Total		**65**	**31**			

Curriculum Structure of Robotics Engineering



Note*: Major Elective Courses only list some courses, all courses are detailed in the program.