Department of Mechanical and Energy Engineering

Program of Robotics Engineering (2017)

I. Introduction

Robotics Engineering is an interdisciplinary major focusing on mechanical, electronic and computer technology. The goal 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 major scientific problems and engineering challenges in the future. On research direction covers industrial robots, robot software, bionic robot, medical robots, special robot, micro robot and emerging frontier areas of science and technology such as artificial intelligence, autonomous system, service future demand for the forefront of technology and basic industries, strive to in a short period of time of the country's economic development strategy and shenzhen informatization, intellectualization and manufacturing comprehensive upgrade a long-term positive impact.

II. Objectives

This major strategic needs for mid-long term development planning and the development of Robotics Engineering in the future, committed to the training has a solid scientific foundation, excellent innovation practice ability and broad international vision, good at the integrated use of robotics and related disciplines theory and method, to solve the problem of future important scientific and engineering challenges of leading talents.

Undergraduates with degree from MEE will be equipped with the following knowledge, capability, and accomplishment.

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

Master the scientific research methods and engineering design methods of robot engineering major, and understand the theory, engineering technology and industry development trend and frontier of this major;

With rigorous and practical scientific attitude, the pursuit of excellence, a strong sense of social responsibility and mission, and good communication skills;

Innovative thinking and the ability to independently understand and solve problems;

Have international vision, connect with international professional and industrial development ability.

III. Period of Study and Degree Requirement

Program length: 4 years

Degree conferred: Bachelor of Science

The minimum credit requirement for graduation: 137.5 credits (not including English courses)

IV. Discipline

Robotics Engineering (080803T)

V. Main Courses

Fundamental Courses of Engineering:Fundamental Courses of Robotics Engineering:

Fundamentals of Electric Circuits, CAD and Engineering Drawing,, Engineering Mechanics I – Statics and

Dynamics, Mechanics of Materials,Signals and Systems, Probability and Statistics, Fundamentals of Control

Engineering, Fundamentals of Machine Design, etc.

Core Courses of Robotics Engineering : Fundamentals of Robotics (Robot Modeling and Control),

Pattern Recognition ,Machine Learning,, Advanced Actuation for Robots, Robot Operating System, Sensing

Technology , Advanced Actuation for Robots, Embedded System and Robot, etc.

VI. Practice-Based Courses

Engineering Training, Experiments, Course Projects, Practice I&II, Innovation and Entrepreneurship, Senior

Project, etc.

VII. Course Structure and Credit Requirements

General Education (GE) Required Courses: 50.5credits (not including English courses);

General Education (GE) Elective Courses: 10 credits;

Major Foundational Courses: 23credits;

Major Core Courses: 18 credits;

Major Elective Courses: 23 credits;

Undergraduate Thesis/Projects: 8 credits;

Research Projects: 5 credits;

The minimum credit requirement for graduation: 137.5credits (not including English courses).

VIII. Requirement for GE Required Courses

Course Code	Course Name	Credits
MA101B	Calculus I A	4
MA102B	Calculus II A	4
MA103B	Linear Algebra I B	4
PHY103B	General Physics I B	4
PHY105B	General Physics II B	4
CH101B	General Chemistry B	3
CS102B	Introduction to Programming B	3
BIO102B	General Biology B (Introduction to Life Science)	3
PHY104	Experiment for Foundation of Physics	1.5

IX. Pre-requisites for Major Declaration

Course Code	Course Name	Notes
EE104	Fundamentals of Electric Circuits	
MAE203B	Engineering Mechanics I – Statics and Dynamics	
EE205	Signals and Systems	
ME307	Fundamentals of Control Engineering	

X. Course Arrangement

Table 1: Major Required Course (Foundational and Core Courses)

Category Course	Course Code	Course Name	Credits	Lab Credits	Hours/week	Terms	course to take the Advised term	language Instruction	Prerequisite	Dept.
Major Foundational Courses	EE104	Fundamentals of Electric Circuits	2		2	Spr	1/Spr	B	MA101B,MA103B	EE
	ME102	CAD and Engineering Drawing	3	1.5	4.5	Fall/ Spr /Smr	1/Smr	E/B	NA	MEE
	MAE203B	Engineering Mechanics I – Statics and Dynamics	3		3	Fall	2/Fall	E	MA103B	MAE
	EE205	Signals and Systems	3	1	4	Fall	2/Fall	B	MA101B	EE
	MA212	Probability and Statistics	3	1	4	Fall	2/Fall	B	MA102B	MA
	MAE202	Mechanics of Materials	3		3	Spr	2/Spr	B	MA103A,MA102B	MAE
	ME307	Fundamentals of Control Engineering	3	0.5	3.5	Fall/ Spr	2/Spr	E	EE104	MEE
	ME303	Fundamentals of Machine Design	3	1	4	Fall/ Spr	3/Fall	E	MAE203B,ME102,MAE202	MEE
		Total	**23**	**5**	**28**					
Major Core Courses	ME332	Robot Operating System	3	1	4	Spr	2/Spr	B	CS102B	MEE
	ME331	Robot Modeling and Control*	3		3	Fall	3/Fall	B	MAE203B	MEE
	ME306	Fundamentals of Robotics*	3	1	4	Spr	3/Spr	B	ME303,ME307	MEE
	EE423-14	Pattern Recognition**	3	1	4	Fall	3/Fall	C/E	MA103A,EE205, MA212	EE
	ME338	Statistical and Deep Learning**	3		3	Spr	3/Spr	E		MEE
	CS405	Machine Learning*	3	1	4	Fall	4/Fall	B	MA103A,MA212	CS
	ME337	Advanced Actuation for Robots	3	1	4	Fall	3/Fall	B	MA102B	MEE
	ME425	Sensing Technology	3	1	4	Spr	3/Spr	E	ME306 or ME331	MEE

	ME432	Embedded System and Robot	3	1	4	Fall	4/Fall	B	ME306 or ME331	MEE
	Total		**27**	**7**	**34**					
Practice	ME494	Practice I	1	1	2					MEE
	ME495	Practice II	2	2	4					MEE
	ME496	Projects of Innovation and Entrepreneurship	2	2	4					MEE
	ME493	Senior Project ***	8	8	16					MEE
	Total		**13**	**13**	**26**					

Notes:
1. *Must complete one of the following courses,ME331Robot Modeling and Control or ME306 Fundamentals of Robotics.
2. **Must complete one of the following courses,EE423-14 Pattern Recognition, ME338 Statistical and Deep Learning or CS405 Machine Learning.
3. ***Students who have completed Comprehensive Design Ⅰ&Ⅱ （COE491 & COE492）are not required to take the Senior Project（ME490）.

Table 2: Major Elective Courses

Course Code	Course Name	Credits	Lab Credits	Hours/week	Terms	course to take the Advised term	language Instruction	Prerequisite	Dept.
ME112	Introduction to Matlab	2	1	3	Spr	1/Spr	B	NA	MEE
ME232	Prolegomenon to Robotics	3		3	Spr	1/Spr	B	NA	MEE
ME103	Awareness Practice of Manufacturing Engineering	3	2	5	Fall/Spr/Smr	1/Smr	B	NA	MEE
CS205	C/C++ Programming Design	3	1	4	Fall/Spr	2/Fall	E	NA	CS
EE201-17	Analog Circuits	3		3	Fall	2/Fall	E	PHY105B,EE104	EE
EE202-17	Digital Circuits	3		3	Spr	2/Spr	C	PHY105B,EE201-17	EE
MA201b	Ordinary Differential Equation B	4	1	5	Fall/Spr	2/Spr	C	MA102B	MA
MA206	Mathematics Modelling	3	1	4	Spr	2/Spr	B	MA201b	MA
ME301	Dynamics and Vibration*	3	1	4	Fall/Spr	3/Spr	B	MAE203B,MA201b	MEE
ME426	Fundamentals of Engineering Optimization	3		3	Spr	3/Spr	E	MA102B,MA103B	MEE
ME424	Modern Control and Estimation	3		3	Fall	4/Fall	E	ME307	MEE
Total		**31**	**7**	**40**					

Notes:
1. Students are required to complete 6 credits for Science and Engineering Module.
2. *MAE314 Theory of Vibration can be identified as ME301 Dynamics and Vibration.

Course Code	Course Name	Credits	Lab Credits	Hours/week	Terms	course to take the Advised term	language Instruction	Prerequisite	Dept.
EE323	Digital Signal Processing	3	1	4	Fall	3/Fall	E	EE205	EE
CS203B	Date Structure and Algorithm Analysis B	3	1	4	Fall	3/Fall	B	CS101A	CS
CS305B	Computer Networks B	3	1	4	Fall	3/Fall	B	CS101A	CS
CS303B	Artificial Intelligence B	3	1	4	Fall	3/Fall	B	CS101A,CS203B,MA212	CS
EE326	Digital Image Processing	3	1	4	Spr	3/Spr	E	EE205	EE
EE332	Digital System Design	3	1	4	Spr	3/Spr	E	EE202-17	EE
EE328	Speed Signal Processing	3	1	4	Spr	3/Spr	E	EE323	EE
ME334	Microrobotics	3		3	Spr	3/Spr	E	ME307	MEE
ME335	Microfabrication and Microsystems	3		3	Spr	3/Spr	E	PHY105B	MEE
ME336	Collaborative Robot Learning	3	1	4	Spr	3/Spr	E	ME306 or ME331	MEE
ME43	Walking Robot	3	0.5	3.5	Spr	3/Spr	B	ME306 or	MEE

4								ME331	
CS308	Computer Vision	3	1	4	Spr	3/Spr	B	CS101A, CS203, MA102B, MA103A	CS
CS310	Multi-agent System	3	1	4	Spr	3/Spr	E	CS303	CS
CS401	Intelligent Robots	3	1	4	Spr	4/Spr	E	CS101A,CS203 C,S202	CS
ME435	Soft Robot	3		3	Fall	4/Fall	B	ME303	MEE
ME431	Application and Innovation of Robotics	3	1	4	Fall	4/Fall	B	ME306 or ME331	MEE
Total		**48**	**12.5**	**60.5**					

Notes：
1. The minimum of 12 credits is required for the above courses.
2. In addition, students are required to take optional courses under the guidance of tutors, with a minimum of 5 credits. Similar courses shall not be counted twice

Table 3: Overview of Practice-Based Courses

Course Code	Course Name	Credits	Lab Credits	Hours/week	Terms	course to take the Advised term	language Instruction	Prerequisite	Dept.
ME102	CAD and Engineering Drawing	3	1.5	4.5	Fall/Spr/Smr	1/Smr	E/B	NA	MEE
EE205	Signals and Systems	3	1	4	Fall	2/Fall	B	MA101B	EE
MA212	Probability and Statistics	3	1	4	Fall	2/Fall	B	MA102B	MA
ME307	Fundamentals of Control Engineering	3	0.5	3.5	Fall/Spr	2/Spr	E	EE104	MEE
ME303	Fundamentals of Machine Design	3	1	4	Fall/Spr	3/Fall	E	MAE203B,ME102,MAE202	MEE
ME332	Robot Operating System	3	1	4	Spr	2/Spr	B	CS102B	MEE
ME306	Fundamentals of Robotics	3	1	4	Spr	3/Spr	B	ME303,ME307	MEE
EE423-14	Pattern Recognition	3	1	4	Fall	3/Fall	C/E	MA103A,EE205,MA212	EE
CS405	Machine Learning	3	1	4	Fall	4/Fall	B	MA103A,MA212	CS
ME337	Advanced Actuation for Robots	3	1	4	Fall	3/Fall	B	MA102B	MEE
ME425	Sensing Technology	3	1	4	Spr	3/Spr	E	ME306 or ME331	MEE
ME432	Embedded System and Robot	3	1	4	Fall	4/Fall	B	ME306 or ME331	MEE
ME432	Embedded System and Robot	3	1	4	Fall	4/Fall	B	ME306 or ME331	MEE
ME112	Introduction to Matlab	2	1	3	Spr	1/Spr	B	NA	MEE
ME103	Awareness Practice of Manufacturing Engineering	3	2	5	Fall/Spr/Smr	1/Smr	B	NA	MEE
CS205	C/C++ Programming Design	3	1	4	Fall/Spr	2/Fall	E	NA	CS
MA201b	Ordinary Differential Equation B	4	1	5	Fall/Spr	2/Spr	C	MA102B	MA
MA206	Mathematics Modelling	3	1	4	Spr	2/Spr	B	MA201b	MA
ME301	Dynamics and Vibration	3	1	4	Fall/Spr	3/Spr	B	MAE203B,MA201b	MEE
EE323	Digital Signal Processing	3	1	4	Fall	3/Fall	E	EE205	EE
CS203B	Date Structure and Algorithm Analysis B	3	1	4	Fall	3/Fall	B	CS101A	CS
CS305B	Computer Networks B	3	1	4	Fall	3/Fall	B	CS101A	CS
CS303B	Artificial Intelligence B	3	1	4	Fall	3/Fall	B	CS101A,CS203B,MA212	CS

EE326	Digital Image Processing	3	1	4	Spr	3/Spr	E	EE205	EE
EE332	Digital System Design	3	1	4	Spr	3/Spr	E	EE202-17	EE
EE328	Speed Signal Processing	3	1	4	Spr	3/Spr	E	EE323	EE
ME336	Collaborative Robot Learning	3	1	4	Spr	3/Spr	E	ME306 or ME331	MEE
ME434	Walking Robot	3	0.5	3.5	Spr	3/Spr	B	ME306 or ME331	MEE
CS308	Computer Vision	3	1	4	Spr	3/Spr	B	CS101A, CS203, MA102B, MA103A	CS
CS310	Multi-agent System	3	1	4	Spr	3/Spr	E	CS303	CS
CS401	Intelligent Robots	3	1	4	Spr	4/Spr	E	CS101A,CS203 C,S202	CS
ME431	Application and Innovation of Robotics	3	1	4	Fall	4/Fall	B	ME306 or ME331	MEE
ME494	Practice I	1	1	2					MEE
ME495	Practice II	2	2	4					MEE
ME496	Projects of Innovation and Entrepreneurship	2	2	4					MEE
ME493	Senior Project	8	8	16					MEE
Total		**106**	**44.5**	**150.5**					

Table 4: Overview of Course Hours and Credits

Course Category	Total Course Hours	Total Credits	The Minimum Credit Requirement
General Education (GE) Required Courses (not including English courses)	848	50.5	50.5
General Education (GE) Elective Courses			10
Major Foundational Courses	448	23	23
Major Core Courses	486	27	18
Major Elective Courses	1608	81	23
Research Projects, Internship and Undergraduate Thesis/Projects	416	13	13
Total			137.5