机器人工程

Robotics Engineering

专业代码：080803T　　学　制：4 年

Program Code: 080803T　　Duration: 4 years

培养目标（Educational Objectives）

为顺应培养国家机器人工程专业技术人才的迫切需要与战略发展，华南理工大学在广州国际校区　　"□

other application fields. Aiming at cultivating leading robot talents with global competitiveness.

Students will achieve the following objectives in 5 years after graduation:

1. An ability of research and innovation in the field of Robotics Engineering.

2. An ability of critical thinking to discover, analyze, and solve problems;

3. Cross-domain, cross-cultural, and cross-border written expression and communication skills;

4. An ability of team leadership with holistic view, coordination, tolerance, and execution;

5. An ability to engage in lifelong learning and further develop in the field of Robotics Engineering.

毕业要求（Student Outcomes）

№1.工程知识：能够将数学、自然科学、工程基础和专业知识用于解决复杂工程问题。

№2.问题分析：能够应用数学、自然科学和工程科学的基本原理，识别、表达、并通过文献研究分析复杂工程问题，以获得有效结论。

№3.设计/开发解决方案：能够设计针对复杂工程问题的解决方案，设计满足特定需求的系统、单元（部件）或工艺流程，并能够在设计环节中体现创新意识，考虑社会、健康、安全、法律、文化以及环境等因素。

№4.研究：能够基于科学原理并采用科学方法对复杂工程问题进行研究，包括设计实验、分析与解释数据、并通过信息综合得到合理有效的结论。

№5.使用现代工具：能够针对复杂工程问题，开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具，包括对复杂工程问题的预测与模拟，并能够理解其局限性。

№6.工程与社会：能够基于工程相关背景知识进行合理分析，评价专业工程实践和复杂工程问题解决方案对社会、健康、安全、法律以及文化的影响，并理解应承担的责任。

№7.环境和可持续发展：能够理解和评价针对复杂工程问题的专业工程实践对环境、

社会可持续发展的影响。

№8.职业规范：具有人文社会科学素养、社会责任感，能够在工程实践中理解并遵守工程职业道德和规范，履行责任。

№9.个人和团队：能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色。

№10.沟通：能够就复杂工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令。并具备一定的国际视野，能够在跨文化背景下进行沟通和交流。

№11.项目管理：理解并掌握工程管理原理与经济决策方法，并能在多学科环境中应用。

№12.终身学习：具有自主学习和终身学习的意识，有不断学习和适应发展的能力。

№1.Engineering Knowledge: An ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialization to the solution of complex engineering problems.

№2.Problem Analysis: An ability to identify, formulate and analyze complex engineering problems, reaching to substantiated conclusions using basic principles of mathematics, science, and engineering.

№3.Design/Development Solutions: An ability to design solutions for complex engineering problems and innovatively design systems, components or process that meet specific needs with societal, public health, safety, legal,

contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

№7.Environment and Sustainable Development: An ability to understand and evaluate the impact of professional engineering solutions in environmental and societal contexts and demonstrate knowledge of and need for sustainable development.

№8.Professional Standards: An understanding of humanity science and social responsibility, being able to understand and abide by professional ethics and standards responsibly in engineering practice.

№9.Individual and Teams: An ability to function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

№10.Communication: An ability to communicate effectively on complex engineering problems with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, give and receive clear instructions, and communicate in cross-cultural contexts with international perspective.

№11.Project Management: Demonstrate knowledge and understanding of engineering management principles and methods of economic decision-making, to function in multidisciplinary environments.

№12.Lifelong Learning: A recognition of the need for, and an ability to engage in independent and life-long learning with the ability to learn continuously and adapt to new developments.

专业简介（Program Profile）

机器人工程专业是面向智能工程前沿高新技术及其应用的专业性本科专业，同时也是计算机工程与应用、机械工程、自动化控制、电子电信以及认知和生命科学等多学科的交叉融合专业。该专业通过集聚国内外创新前沿资源，深化机器人科学与工程学科特

色，培养精通机器人基础理论和专业知识，具有创新精神和实践能力的高素质、国际化、复合型研发应用人才。机器人工程专业综合应用自然科学、工程技术、社会科学、人文科学等相关学科理论、方法与技术，研究机器人的智能感知、优化控制与系统设计、人机交互模式等学术问题。主要学习控制理论、机械工程、计算机技术与应用和人工智能等方面的基本理论和基本知识。作为机器人及人工智能领域最前沿的学科专业，机器人工程专业的毕业生将具有厚基础、宽口径、重实践、富创新的特点。我们将着重培养学生综合运用所学知识的能力与团队组织协调能力，使其具有融合掌握多学科基础理论的专业优势，打造广阔的就业机会与继续深造前景。学院目前已全面引入美国密西根大学本科生教学体系，拥有最先进的实验室和实习等科研与实操平台，从软件和硬件层面建立了完善的人才培养体系。学生毕业后可到高校科研机构、相关企事业单位、政府机关等从事相关领域的研发、管理工作，也可以继续深造，攻读机器人工程、智能制造及相关学科的研究生，寻求更加广阔的发展机会。

Robotics Engineering is an undergraduate major for emerging technologies and applications of intelligent engineering. It is also a multi-disciplinary major that includes knowledges of computer science, mechanical engineering, automation control, electronic engineering, telecommunications engineering, cognitive and life science, and so on. Robotics Engineering aims to cultivate talent students that are professional in fundamental theorems and technologies, innovative in practice, and competitive in world markets and interdisciplinary areas, by gathering domestic and foreign cutting-edge innovation resources to develop distinctive robotics engineering. The robotics engineering major comprehensively applies natural sciences, engineering technology, social sciences, humanities, and other related disciplines theories, methods, and technologies to study the intelligent perception of robots, optimized control and system design, human-computer interaction modes, and other academic issues. The students mainly study the basic theories and basic knowledge of control theory, mechanical engineering, computer technology and application, and artificial intelligence. As it's the most frontier discipline in the field of robotics and artificial intelligence, graduates of robotics engineering will have the characteristics of a solid foundation, wide application, strong

practical ability, and innovation. We will focus on cultivating students' ability to comprehensively use the knowledge they have learned, and the ability to organize and coordinate teams. These bring them the professional advantages of integrating and mastering multidisciplinary basic theories, creating broad employment opportunities and prospects for further studies. The school has fully introduced the undergraduate teaching system of the University of Michigan in the United States. We have the most advanced scientific research and practical operation platform than can be used for experiments and practices, have established a perfect talent training system from the software and hardware level. After graduation, students can go to scientific research institutions, relevant enterprises and institutions, government agencies and other related fields to engage in R&D and management work, and can also continue to pursue further studies, and pursue postgraduates in robotics engineering, intelligent manufacturing and elated disciplines, so as to seek broader opportunities.

专业特色（Program Features）

1. 以工科为基础，通过将机械工程、自动化、电子电信、计算机等多个学科交叉融合教学培养，形成强交叉新工科的鲜明特色。

2. 专业设置对标密西根大学，并参照美国 ABET 课程认证标准要求。通过引入全新教学方法、让学生获取国际视野与国际竞争力。

1. Robotics Engineering emphasizes on a multidisciplinary teaching method, encompassing an engineering-orientated integration of courses and topics from mechanical engineering, automation engineering, electronics and telecommunications, computer engineering, and featuring a highly interdisciplinary Emerging Engineering Education.

2. The program is designed and built on the concept of discipline construction from University of Michigan and the requirements of ABET accreditation. The program aims to establish an innovative teaching method, able to train the students to gain an international perspective and competitiveness

授予学位（Degree Conferred）

工学学士学位 Bachelor of Engineering

核心课程（Core Courses）

人工智能技术及应用、机器视觉及传感系统、机器人理论及技术、机电一体化、工程导论、人机交互、工业机器人及应用、嵌入式系统与设计、数据结构与算法

Artificial Intelligence and its Applications, Machine Vision and Sensing System, Theory and Technology of Robotics, Mechatronics, Introduction to Engineering, Human-Machine Interaction, Industrial Robot and its Applications, Embedded Systems and Design, Data Structures and Algorithms

特色课程（Featured Courses）

- 新生创新实践导论课：工程导论II
- 学科前沿课：机器人理论及技术、工业机器人及应用
- 创新实践课：设计与制造Ⅰ 、设计与制造II
- 创业教育课：产品开发（“三个一”课程）
- 专题设计课：设计与制造Ⅰ、设计与制造II
- 劳动教育课：毕业设计（论文）
- Freshmen Innovative Seminars:Introduction to Engineering Ⅱ
- Subject Frontiers Courses: Theory ad Technology of Robotics, Industrial Robot and its Applications
- Innovation Practice: Design and Manufacturing Ⅰ, Design and Manufacturing Ⅱ
- Entrepreneurship Courses:Product Development ("Three ones" Courses)
- Special Designs: Design and Manufacturing Ⅰ, Design and Manufacturing Ⅱ
- Labor Education Courses: Capstone (Thesis)

一、各类课程学分登记表（Registration Form of Curriculum Credits）

1.学分统计表（Credits Registration Form）

课程类别 Course Category	课程要求 Requirement	学分 Credits	学时 Academic Hours	备注 Remarks

公共基础课 General Basic Courses	必修 Compulsory	57.5	1084	
	通识 General Education	10	160	
专业基础课 Specialty Basic Courses	必修 Compulsory	52	828	
选修课 Elective Courses	选修 Elective	10	160	
合 计 Total		**129.5**	**2232**	
集中实践教学环节（周） Practice Training (Weeks)	必修 Compulsory	28	36 周	
毕业学分要求 Credits Required for Graduation		**157.5**		

备注：毕业学分要求格式：合计学分+集中实践教学环节学分=毕业学分要求

2.类别统计表（Category Registration Form）

学时 Academic Hours					学分 Credits					
总学时数 Total	其中 Include		其中 Include		总学分数 Total	其中 Include		其中 Include			其中 Include
	必修学时 Compulsory	选修学时 Elective	理论教学学时 Theory Course	实验教学学时 Lab		必修学分 Compulsory	选修学分 Elective	集中实践教学环节学分 Practice	理论教学学分 Theory Course	实验教学学分 Lab	创新创业教育学分 Innovation and Entrepreneurship Education
2232	1912	320	1861	371	**157.5**	137.5	20	28	119	10.5	3

备注：

1.通识课计入选修一项中；

2.实验教学包括“专业教学计划表”中的实验、实习和其他；

3.创新创业教育学分：培养计划中的课程，由各学院教学指导委员会认定，包括竞教结合课程、创新实践课程、创业教育课程等学分；

4.必修学时＋选修学时=总学时数；理论教学学时＋实验教学学时=总学时数；必修

学分＋选修学分=总学分数；集中实践教学环节学分＋理论教学学分＋实验教学学分=总学分数。

二、课程设置表（Courses Schedule）

类别 Course Category	课程代码 Course No.	课程名称 Course Title	是否必修 C/E	学时数 Total Curriculum Hours				学分数 Credits	开课学期 Semester	毕业要求 Student Outcomes
				总学时 Class Hours	实验 Lab Hours	实习 Practice Hours	其他 Other Hours			
公共基础课 General Basic Courses	031101761		必 C							

	044104181	学术英语与科技交流(一) EAP and Technical Communication (1)	必C	48				3.0	1	№10
	044104191	学术英语与科技交流(二) EAP and Technical Communication (2)	必C	48				3.0	2	№10
	052100332	体育（一） Physical Education (1)	必C	36			36	1.0	1	№5
	052100012	体育（二） Physical Education (2)	必C	36			36	1.0	2	№12
	052100842	体育（三） Physical Education (3)	必C	36			36	1.0	3	№12
	052100062	体育（四） Physical Education (4)	必C	36			36	1.0	4	№12
	045100772	C++程序设计基础 C++ Programming Basis	必C	40			8	2.0	1	№12
	006100112	军事理论 Military Principle	必C	36			18	2.0	2	№8,9
	040102631	微积分Ⅱ（一） Calculus Ⅱ (1)	必C	80				5.0	1	№1,2,4
	040102641	微积分Ⅱ（二） Calculus Ⅱ (2)	必C	80				5.0	2	№1,2,4
	040102601	线性代数与解析几何 Linear Algebra & Analytic Geometry	必C	48				3.0	1	№1
	040100026	概率论与数理统计 Probability & Mathematical Statistics	必C	48				3.0	2	№1
	041101155	大学物理Ⅲ（一） General Physics Ⅲ (1)	必C	64				4.0	2	№1,2,4
	041100671	大学物理实验（一） Physics Experiment (1)	必C	32	32			1.0	2	№1,2,4
	041100344	大学物理Ⅲ（二） General Physics Ⅲ (2)	必C	64				4.0	3	№1-5
	041101051	大学物理实验（二） Physics Experiment (2)	必C	32	32			1.0	3	№1-5
	037102786	大学化学 General Chemistry	必C	32				2.0	1	№1-3

	037101943	大学化学实验 General Chemistry Experiment	必C	16	16			0.5	2	№1-3
		人文科学领域 Humanities	通识课E	128				8.0	2-8	№8
		社会科学领域 Social Science							2-8	№8
		科学技术领域 Science and Technology		32				2.0	2-8	№8
	合 计 Total			1244	80		198	67.5		

备注：学时中其他可以为上机和实践学时。

二、课程设置表（续）(Courses Schedule)

类别 Course Category	课程代码 Course No.	课程名称 Course Title	是否必修 C/E	学时数 Total Curriculum Hours				学分数 Credits	开课学期 Semester	毕业要求 Student Outcomes
				总学时 Class Hours	实验 Lab Hours	实习 Practice Hours	其他 Other Hours			
专业基础课 Specialty Basic Courses	082100262	工程导论Ⅱ Introduction to Engineering Ⅱ	必C	60				4.0	1	№1-3,5-7,9-11
	082100181	机器视觉及传感系统 Machine Vision and Sensing System	必C	48			20	3.0	3	№1-3
	082100451	数据结构与算法 Data Structures and Algorithms	必C	64			16	4.0	3	№1-6,9-11
	082100601	工程力学 Engineering Mechanics	必C	64				4.0	3	№1-5
	082100701	电路导论 Introduction to Circuits	必C	48				3.0	3	№1-6,9-11
	082100251	工程热力学及流体力学 Thermodynamics and Fluid Mechanics	必C	64				4.0	4	№1-6,7

	082100281	动力学及振动导论 Introduction to Dynamics and Vibration	必 C	64				4.0	4	№1-8,12
	082100671	设计与制造 I Design and Manufacturing I	必 C	48				3.0	4	№1-3,5-7,9-11
	082100162	人工智能技术及应用 Artificial Intelligence and its Application	必 C	48			12	3.0	4	№1,5,10
	082100291	动力系统建模、分析与控制 Modeling, Analysis, and Control of Dynamic System	必 C	64				4.0	5	№1-3,5,10
	082100091	数据分析建模 Data Analysis and Modeling	必 C	64			24	4.0	5	№1,4,5,9,10
	082100711	嵌入式系统与设计 Embedded Systems and Design	必 C	48				3.0	5	№1-6,9-11
	082100661	设计与制造Ⅱ Design and Manufacturing Ⅱ	必 C	48				3.0	6	№1-3,5-7, 9-11
	082100191	机器人理论及技术 Theory and Technology of Robotics	必 C	48			16	3.0	6	№1, 2, 5, 6, 8,12
	082100541	经典控制理论 Classical Control Theory	必 C	48			5	3.0	6	№1-5,10
	合 计 Total		**必 C**	**828**			**93**	**52.0**		
选修课 Elective Courses	082100731	Python 程序设计基础 Python Programming Foundations	选 E	48			20	3.0	2	№1, 3, 5,11
	082100611	计算机网络 Computer Networks	选 E	64	16			4.0	4	№1-3
	082100631	产品开发 Product Development	选 E	48				3.0	5	№2,3,5,
	082100621	信号处理 Signal Processing	选 E	60	12			4.0	6	№1,3,5

082100741	自然语言处理 Natural Language Processing	选 E	48		20	3.0	6	№1, 3, 5,11
082100221	机电一体化 Mechatronics	选 E	48	16		3.0	7	№1-8
082100151	人机交互 Human-Machine Interaction	选 E	48			3.0	7	№2,3, 6-12
082100581	工业机器人及应用 Industrial Robot and its Applications	选 E	48	28		2.0	7	№ 1-3,12
082100591	软体机器人 Soft Robotics	选 E	32	12	4	2.0	5, 7	№ 1-10, 12
082100071	现代控制理论 Modern Control Theory	选 E	48		12	3.0	7	№1-6, 9-11
082100491	柔性电子设计及制造 Flexible Electronic Design and Manufacturing	选 E	32	10		2.0	5, 7	№ 1-7,9
082100471	数据库 Databases	选 E	32		8	2.0	5, 7	№1-3
082100551	自动驾驶系统 Autonomous Driving Systems	选 E	48			3.0	7	№ 1-7,10
082100571	物联网导论 Introduction to Internet of Things	选 E	32			2.0	8	№1-5
082100521	先进制造技术 Advanced Manufacturing Technology	选 E	48			3.0	8	№1-6, 8, 12
082100561	软件工程 Software Engineering	选 E	48	16		3.0	8	№1-3
	工程管理概论	选 E	32			2.0	5	
020100051	创新研究训练 In							

	020100031	创新研究实践Ⅱ Innovation Research Practice Ⅱ	选 E	32				2.0	7	№3,4
	020100061	创业实践 Entrepreneurial Practice	选 E	32				2.0	7	№3,9,11
	合 计 Total		选 E	选修课修读最低要求 10.0 学分 minimum elective course credits required:						

备注：学时中其他可以为上机和实践学时。

学生根据自己开展科研训练项目、学科竞赛、发表论文、获得专利和自主创业等情况申请折算为一定的专业选修课学分（创新研究训练、创新研究实践 I、创新研究实践 II、创业实践等创新创业课程）。每个学生累计申请为专业选修课总学分不超过 4 个学分。经学校批准认定为选修课学分的项目、竞赛等不再获得对应第二课堂的创新学分。

三、集中实践教学环节（Practice-concentrated Training）

课程代码 Course No.	课程名称 Course Title	是否必修 C/E	学时数 Total Curriculum Hours		学分数 Credits	开课学期 Semester	毕业要求 Student Outcomes
			实践 Practice weeks	授课 Lecture Hours			
006100151	军事技能 Military Training	必 C	2 周		2.0	1	№9
082100691	工程导论实践Ⅱ Practice of Introduction to Engineering Ⅱ	必 C	2 周		2.0	1	№1-3,5-7,9-11
031101551	马克思主义理论与实践 Marxism Theory and Practice	必 C	2 周		2.0	3	№8
082100641	电路导论实践 Practice of Introduction to Circuits	必 C	2 周		2.0	3	№1-6,9-11
082100651	设计与制造实践 I Practice of Design and Manufacturing I	必 C	2 周		2.0	4	№1-3,5-7,9-11

067101783	工程创新训练 III Engineering Innovation Training III	必 C	4 周		4.0	4	№3,4,6,7,11
082100721	嵌入式系统与设计实践 Practice of Embedded Systems and Design	必 C	2 周		2.0	5	№1-6,9-11
082100681	设计与制造实践 II Practice of Design and Manufacturing II	必 C	2 周		2.0	6	№1-3,5-7,9-11
082100501	毕业设计（论文） Capstone (Thesis)	必 C	18 周		10.0	7-8	№1-12
合 计 Total		**必 C**	**36 周**		**28.0**		

四、第二课堂（"Second Classroom" Activities）

第二课堂由人文素质教育和创新能力培养两部分组成。

1.人文素质教育基本要求

学生在取得专业教学计划规定学分的同时，还应结合自己的兴趣适当参加课外人文素质教育活动，参加活动的学分累计不少于 3 个学分。其中新增大学体育教学团队开设课外体育课程，高年级本科生必修，72 学时，1 学分，纳入第二课堂人文素质教育学分。

2.创新能力培养基本要求

学生在取得本专业教学计划规定学分的同时，还必须参加国家创新创业训练计划、广东省创新创业训练计划、SRP（学生研究计划）、百步梯攀登计划或一定时间的各类课外创新能力培养活动（如学科竞赛、学术讲座等），参加活动的学分累计不少于 4 个学分。

4."Second Classroom" Activities

"Second Classroom" Activities are comprised of two parts, Humanities Quality Education and Innovative Ability Cultivation.

1) Basic Requirements of Humanities Quality Education

Besides gaining course credits listed in one's subject teaching curriculum, a student is required to participate in extracurricular activities of Humanities Quality Education based on one's interest, acquiring no less than three credits.

The advanced undergraduates must complete one of courses of Humanities Quality Education which has seventy-two class hours (it's equivalent to one credit which belongs to Humanities Quality Education Credit of Extracurricular Class) offered by the College Physical Education Teaching Group.

2) Basic Requirements of Innovative Ability Cultivation

Besides gaining course credits listed in one's subject teaching curriculum, a student is required to participate in any one of the following activities: National Undergraduate Training Programs for Innovation and Entrepreneurship, Guangdong Undergraduate Training Programs for Innovation and Entrepreneurship, Student Research Program (SRP), One-hundred-steps Innovative Program, or any other extracurricular activities of Innovative Ability Cultivation that last a certain period of time (e.g. subject contests, academic lectures), acquiring no less than four credits.