

# 材料成型及控制工程

## Materials Molding & Control Engineering

专业代码：080203      学制：4年

Program Code: 080203      Duration: Four years

### 培养目标：

本专业致力于培养德智体美劳全面发展，掌握必需的自然科学、工程技术的基础知识，具有一定人文科学和社会科学素养及创新创业意识，掌握金属材料成型及控制工程专业基础理论及应用知识，能在国内外知名机构、企事业单位从事科学研究、工程技术、经营管理等方面工作的具有国际视野的创新型复合人才。

### Educational Objectives:

In order to meet the economic, science, technology and social development demands, the talent cultivation in the major pays attention to overall development in knowledge, ability, quality aspects. The students in the major are essentially required for not only mastering basic knowledge in the field of natural science, engineering technology, and human science, social science, innovation and entrepreneurship awareness to a certain extent, but also mastering fundamental theories, professional knowledge and basic skills in the discipline of metal materials Molding & Control Engineering, and comprehending disciplines and industries development trends. The objectives of talent cultivation in the major is to cultivate the senior comprehensive professional talents who will be equipped with the ability and quality of being engaged in scientific research, technology development and management in the fields of metal material forming process control and process optimization, new materials and new product development and preparation, material molding equipment and mold design and computer simulation.

### 毕业要求：

#### Student Outcomes:

No1.工程知识：掌握从事金属材料成型及控制工程工作所需的数学和其它相关自然科学知识、工程基础理论和专业基本原理、方法和手段，具备一定的企业管理知识，了解专业前沿发展状态和趋势，能解决该领域企业的实际复杂工程问题。

No2.问题分析：能够应用数学、自然科学、专业基本原理、方法和技术手段以及经济管理知识，识别、表达、并通过文献研究分析金属材料成型及控制中的复杂工程问题，以获得有效结论。

No3.设计/开发解决方案：能够考虑社会、健康、安全、法律、文化以及环境等因素、并能够在设计环节中体现创新意识，针对金属材料成型及控制领域的复杂工程问题，提供综合解决方案，设计和开发出满足特定需求的金属成型设备和模具的系统、单元（部件）及其工艺流程。

No4.研究：能够综合运用自然科学原理、基础工程理论和专业技术技能，包括实验设计、数据

分析、数值模拟等方法，结合文献专利检索和查阅，对金属材料成型及控制领域的复杂工程问题，通过信息综合得到合理有效的结论。

№5.使用现代工具：能够针对金属材料成型及控制领域生产和研发过程中的复杂工程问题，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和模拟，并能够理解其局限性。

№6.工程与社会：能够基于金属材料成型及控制领域的相关背景知识进行合理分析、评价工程实践和复杂工程问题的解决方案对社会、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金属材料成型及控制领域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：具备在多学科背景下的团队中的沟通和合作能力，具有团队合作精神，以及科学决策和组织管理的基本能力，承担个体、团队成员以及负责人的角色。

№10.沟通：能够就金属材料成型及控制领域的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，包括撰写各类报告和设计文件、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：理解并掌握金属材料成型及控制工程领域的工程项目管理相关的法律法规、管理知识与经济决策方法，并能在多学科环境中应用，初步具备风险评估和管理能力。

№12.终生学习：掌握自主学习方法和技能，具有终生学习的意识，有不断学习和适用发展的能力。

№1.Engineering Knowledge: An ability to master the required knowledge of mathematics and other relevant natural science, engineering basic theory and professional basic principles, methods and means to engage in metal materials Molding & Control Engineering work, have a certain enterprise management knowledge, understand the professional forefront development state and trends, and can solve the solution of complex engineering problems.

№2.Problem Analysis: An ability to analyze complex engineering problems of metal material forming and control by identifying, formulating and literature research, reaching to substantiated conclusions using basic principles of mathematics, natural science, professional basic principles, methods and technical means with management knowledge.

№3.Design/Development Solutions: An ability to provide the comprehensive solutions for complex engineering problems of metal materials Molding & Control field, and innovatively design and study systems, units (components) and process that meet specific needs of metal/polymer forming equipment and molds with societal, health, safety, legal, cultural and environmental considerations.

№4.Research: An ability to conduct complex engineering problems of metal material forming and control field based on scientific theories and adopting scientific methods including design of experiments,

analysis and interpretation of data and synthesis of information to provide valid and reasonable conclusions.

№5.Applying Modern Tools: An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including the prediction and Simulation of complex engineering activities in the production and development process of metal material forming and control, with an understanding of the limitations.

№6.Engineering and Society: An ability to apply reasoning analysis and evaluation by relevant contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and complex engineering problems.

№7.Environment and Sustainable Development: An ability to understand and evaluate the impact of professional engineering solutions in environmental and social sustainability in the field of metal material forming and control.

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

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

№10.Communication: An ability to communicate effectively on complex engineering problems with the engineering community and general public, such as being able to comprehend and write effective reports and design documentation, make effective presentations, give clear expression or respond to instructions, and communicate in cross-cultural contexts with a certain international perspective.

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

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

### **专业简介：**（限 500 字以内）

材料成型及控制工程专业属于机械类本科专业，开办于 2004 年，专业知识主要涉及金属材料科学、材料成型工艺、成型加工机械与模具、材料成形控制、计算机和数值模拟等，具有显著的多学科交叉特色。本专业依托国家金属材料近净成形工程技术研究中心、金属材料近净成形技术与装备教育部重点实验室（B 类）和广东省金属新材料制备与成形重点实验室以及“粤海华金”产业化基地，由院士、国家杰出青年科学基金获得者等组成的多学科交叉的高水平研究和工程技术以及企业管理团队使得本专业一直保持着良好的发展。本专业以培养金属材料成型领域创新型复合人才为目标，学生毕业后可在材料制备、机械与模具、航空、航天、车辆、家电、手机和计算机等行业和部门内

从事产品设计、工艺制造、科学研究、检测和控制、数值模拟、工程技术管理等方面工作，也可以从事相关学科的研究和教学工作。

### **Program Profile:**

Metal material forming and control engineering is one of mechanical specialties and was opened in 2004. The specialty has remarkable interdisciplinary features, and its professional knowledge of is mainly related to metal materials science, material forming technology, forming & processing machine and mold , automatic control, computer and numerical simulation, This specialty mainly rely on National Engineering Research Center of Near-Net-Shape Forming for Metallic Materials, near net-shape technology of metallic materials and Key Laboratory of the Ministry of Education (B) and the key laboratory for forming in Guangdong Province and industrialization base of Huajin technology, this high-level interdisciplinary research and engineering technology as well as an enterprise management team, made up of one academician and many winners of the National Outstanding Young Scientists Fund, have kept the profession well developed. The specialty aims to cultivate high-quality and comprehensive talents in the field of forming of metal/polymer materials. Graduates in this major are primarily employed in the industry of materials preparation, machinery and mold, aviation, aerospace, vehicles, household electrical appliances, mobile phone and computer etc., and the department which is engaged in designing product, manufacturing process, scientific research, detection and control, computer simulation, management of engineering technology and be engaged in related disciplines of research and teaching.

### **专业特色：**（限 100 字以内）

基于“厚基础，重应用”的指导思想，通过材料、机械、计算机等多领域多学科交叉，突出金属材料铸造、粉末冶金与材料成形装备制造方向，加强学生与校企院所间的产学研用合作及工程实践创新创业，培养具有国际视野的创新型复合人才。

### **Program Features:**

This specialty is based on the multi-disciplinary comprehensive teaching and practice platform of materials science, mechanics, computer etc. Graduates in this major not only master the professional knowledge of the field of material forming, but also have obvious interdisciplinary characteristics, extensive knowledge, excellent engineering practice, good adaptability to employment and good sense of innovation and entrepreneurship.

### **授予学位：工学学士学位**

### **Degree Conferred: Bachelor of Engineering**

**核心课程：**材料科学基础；材料成型技术基础；材料的力学与物理性能；金属材料及热处理；金属材料成型装备；材料微观分析方法；粉末冶金基本原理与应用；材料加工的数字化设计与控制

## **Core Courses:**

Fundamentals of Materials Science, Fundamentals of Material Forming Technology, Materials Mechanical and Physical Properties, Metallic Materials and Heat Treatment, Metal Forming Equipment, Microstructure Analysis Methods, Basic Principle and Application of Powder Metallurgy, Digital Design and Control of Material Processing

## **特色课程:**

新生研讨课：自动驾驶与智能网联汽车技术、太阳能电池制造技术与应用实践、城市公共安全与人文精神、内燃机结构创新设计、高端产品及其先进制造、增材制造（3D 打印）及精密连接技术、轻工自动装备的未来与挑战

专题研讨课：金属材料成型装备创新设计方法

跨学科课程：环境材料学；材料加工的数字化设计与控制；汽车制造技术基础；

竞教结合：金属材料基础实验；

创新实践课：金属材料成形课程设计；金属材料性能测试课程设计；金属材料成型装备课程设计；铸造成型模具课程设计；

创业教育课：金属材料成型产业模式与创业；

等等

## **Featured Courses:**

Freshmen Seminars: An Introduction to Unmanned Vehicle and Intelligent Connected Vehicle; Solar Cell Manufacture Technology and Application Practice; City Public Security and Humanistic Spirit; Innovating Design on Structure of Internal-Combustion Engine; High-end Products and Advanced Manufacturing; Additive Manufacturing (3D Printing) and Precision Joining Technology; Opportunity and Challenge for Automatic Equipment in Light Industry

Special Topics: Innovative Design Method of Metal Material Forming Equipment

Interdisciplinary Courses: Eco-materials; Digital Design and control of Material Processing; Fundamentals of Automotive Manufacturing Technology

Contest-Teaching Integrated Courses: Basical Experiment of Metal Materials

Innovation Practice: Course Project of Metal Material Forming; Course Project of Metal Materials Properties Testing; Course Project of Metal Processing and Molding Equipment; Course Project of Casting Mold

Entrepreneurship Courses: Mode and Entrepreneurship of Metal Processing Industry

etc.

## 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	65.5	1276	
	通识 General Education	10	160	
专业基础课 Specialty Basic Courses	必修 Compulsory	44.5	730	
选修课 Elective Courses	选修 Elective	15	240	
合计 Total		135	2406	
集中实践教学环节(周) Practice Training (Weeks)		35	40周	
毕业学分要求 Credits Required for Graduation	170			

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-concentrated Training	理论教学学分 Theory Course Credits	实验教学学分 Lab	创新创业教育学分 Innovation and Entrepreneurship Education
2406	2006	400	2090	316	170	145	25	35	125	10	11

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	其它 OtherH ours			
公共基础课 General Basic Courses	043100413	思想道德修养与法律基础 Cultivation of Thought and Morals & Fundamental of Law	必 C	40			4	2.5	1	№8
	031101371	中国近现代史纲要 Skeleton of Chinese Modern History		40			4	2.5	2	№8
	031101423	毛泽东思想和中国特色社会主义理论体系概论 Thought of Mao ZeDong and Theory of Socialism with Chinese Characteristics		72			24	4.5	3	№8
	031101621	马克思主义基本原理概论 Fundamentals of Marxism Principle		40			4	2.5	4	№8
	031101331	形势与政策 Analysis of the Situation & Policy		128				2.0	1-8	№8
	044103681	大学英语 (一) College English(1)		48				3.0	1	№10
	044103691	大学英语 (二) College English(2)		48				3.0	2	№10
	045101644	大学计算机基础 Foundations of Computer		32			32	1.0	1	№5
	052100332	体育 (一) Physical Education (1)		32			32	1.0	1	№12
	052100012	体育 (二) Physical Education (2)		32			32	1.0	2	№12
	052100842	体育 (三) Physical Education (3)		32			32	1.0	3	№12
	052100062	体育 (四) Physical Education (4)		32			32	1.0	4	№12
	006100112	军事理论 Military Principle		36			18	2.0	2	№9
	040100051	微积分 II (一) Calculus(1)		80				5.0	1	№1,2
	040100411	微积分 II (二) Calculus(2)		80				5.0	2	№1,2
	040100401	线性代数与解析几何 Linear Algebra & Analytic Geometry		48				3.0	1	№1,2
	040100023	概率论与数理统计 Probability & Mathematical Statistics		48				3.0	2	№1,2
	040100471	积分变换 Integral Transformation		16				1.0	3	№1,2
	045100772	C++程序设计基础 C++ Programming Foundations		40			8	2.0	2	№5
	074102352	画法几何及机械制图 (一) Descriptive Geometry & Machine Drawing (1)		48				3.0	1	№3
	074102781	画法几何及机械制图 (二) Descriptive Geometry & Machine Drawing (2)		64				4.0	2	№3
	037102783	大学化学 General Chemistry		32				2.0	1	№1,2
	037101943	大学化学实验 General Chemistry Experiment		16	16			0.5	2	№1,2
041101151	大学物理 III (一) General Physics (1)	64				4.0	2	№1,2		

041100341	大学物理III (二) General Physics (2)		64				4.0	3	№4
041100671	大学物理实验 (一) Physics Experiment(1)		32	32			1.0	3	№1,2
041101051	大学物理实验 (二) Physics Experiment(2)		32	32			1.0	4	№4
	人文科学领域 Humanities	通识课 E	96				6.0		№8
	社会科学领域 Social Science		64				4.0		№8
	科学技术领域 Science and Technology								№8
<b>合 计</b> <b>Total</b>			1436	80	0	222	75.5		

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	其它 OtherHo urs			
专业基础课 Specialty Basic Courses	030102522	机械工程概论 Introduction to Mechanical Engineering	必 C	16				1.0	2	№6,7
	033100341	工程力学III Engineering Mechanics III		80	6		4	5.0	3	№1,2
	037101531	物理化学 I Physical Chemistry I		48				3.0	4	№1,2
	030100143	机械设计基础 Basis of Mechanical Design		64				4.0	4	№2,3
	030101782	互换性与技术测量 Interchangeability and Technological Measurement		24				1.5	4	№2
	024100152	电路与电子技术 Electric Engineering and Electronics		64				4.0	4	№3
	030101161	机械基础综合实验 I Poly-experiment of Mechanical Fundamentals I		10	10			0.5	4	№4
	067100532	流体力学 Fluid Mechanics		24				1.5	5	№1,2
	030106012	传热学 Heat Transfer		24				1.5	5	№1,2
	024100162	电路与电子技术实验 Experiment of Electric Engineering and Electronics		32	32			1.0	5	№4
	067101121	材料科学基础 Fundamentals of Materials Science		80				5.0	5	№2,4
	030100971	材料成型技术基础 Fundamentals of material forming technology		80				5.0	5	№3
	067101491	材料的力学与物理性能 Materials Mechanical and Physical Properties		40				2.5	6	№2,4
	067101501	金属材料及热处理 Metallic Materials and Heat Treatment		48				3.0	6	№1,2
	067101571	材料微观分析方法 Microstructure Analysis Methods		64				4.0	6	№3
	030100542	金属材料成型装备 Metal Forming Equipment		32				2.0	6	№3
	<b>合计 Total</b>		必 C	730	48	0	4	44.5		
选修课 Elective Courses	067101631	汽车覆盖件模具设计及数值模拟 Mold Design and Numerical Simulation for Car Body Panels	选 E ( 限 选)	32				2.0	6	№3
	067101581	粉末冶金基本原理与应用 Basic Principle and Application of Powder Metallurgy	选 E ( 限 选)	32				2.0	7	№1,2

067101521	材料加工的数字化设计与控制 Digital Design and control of Material Processing	选E (限选)	32				2.0	7	№3
030102361	太阳能电池制造技术与应用实践 Solar Cell Manufacture Technology and Application Practice	选E (新生研讨课)	16				1.0	2	№1,2
030103262	城市公共安全与人文精神 City Public Security and Humanistic Spirit		16				1.0	2	№1,2
067101021	内燃机结构创新设计 Innovating Design on Structure of Internal-Combustion Engine		16				1.0	1	№1,2
067101031	高端产品及其先进制造 High-end Products and Advanced Manufacturing		16				1.0	2	№1,2
067101041	增材制造(3D打印)及精密连接技术 Additive Manufacturing (3D Printing) and Precision Joining Technology		16				1.0	1	№1,2
067101051	自动驾驶与智能网联汽车技术 Technologies for Unmanned and Intelligent Connected Vehicles		16				1.0	2	№1,2
067101011	轻工自动装备的未来与挑战 Opportunity and Challenge for Automatic Equipment in Light Industry		16				1.0	1	№1,2
030103491	科技文献检索 Sci-Tech Literature Retrieval		选E	16				1.0	4
030102154	机械制造技术基础 Fundamentals of Machine Manufacturing Technology	32					2.0	5	№2
067101481	金属塑性成形原理及数值模拟 Metal plastic forming and numerical simulation	32					2.0	6	№3
030100681	先进连接技术 Advanced Joining Technology	32					2.0	6	№3
030102411	环境材料学 Eco-materials	32					2.0	6	№6,7
030100601	材料表面技术 Surface Engineering of Materials	32					2.0	7	№3
030101171	汽车制造技术基础 Fundamentals of Automotive Manufacturing Technology	32					2.0	7	№3
030105382	金属材料成型产业模式与创业 Mode and Entrepreneurship of Metal Processing Industry	16					1.0	7	№6,9,11
020100051	创新研究训练 Innovation Research Training	32					2.0	7	№1,2
020100041	创新研究实践 I Innovation Research Practice I	32					2.0	7	№1,2
020100031	创新研究实践 II Innovation Research Practice II	32					2.0	7	№1,2

020100061	创业实践 Entrepreneurial Practice		32	0	0	0	2.0	7	№1,2
<b>合计 Total</b>		选 E	选修课修读最低要求 15 学分（含限选课程），其中：标注限选的课程为本专业学生规定要求选修的课程。 minimum elective course credits required: 15						

备注：学时中其它可以为上机和实践学时；选修（限选）为本专业学生规定要求选修的课程。  
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
031101551	马克思主义理论与实践 Marxism Theory and Practice		2 周		2.0	3	№8
030100632	工程训练 II Engineering Training II		4 周		4.0	3	№9
030100091	机械设计基础课程设计 Course Project of the Basis of Mechanical Design		2 周		2.0	4	№3
030105581	金属材料成型装备课程设计 Course Project of Metal Processing and Molding Equipment		2 周		2.0	6	№3
030105611	铸造成型模具课程设计 Course Project of Casting Mold		2 周		2.0	6	№3
067101591	金属材料基础实验 Basical Experiment of Metal Materials		2 周		2.0	6	№3
067101511	金属材料成形课程设计 Course Project of Metal Material Forming		2 周		2.0	7	№3
067101641	金属材料性能测试课程设计 Course Project of Metal Materials Properties Testing		2 周		2.0	7	№3
030105601	金属材料成型装备创新设计方法 Innovative Design Method of Metal Material Forming Equipment		1 周		1.0	7	№3
030100291	生产实习 Practice of Production		4 周		4.0	7	№6
067100644	毕业设计 Diploma Project (Thesis)		15 周		10.0	8	№4,10,12
<b>合计 Total</b>			必 C	40 周		35	

### 四、第二课堂

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 2 个学分。

#### 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 two credits.

##### **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.