

# 软件工程（卓越班）

## Software Engineering (Excellent Engineer Class)

专业代码：080902

学 制：4 年

Program Code:080902

Duration: 4 years

### 培养目标：

#### Educational Objectives:

遵照党和国家的教育方针，贯彻“面向现代化，面向世界，面向未来”的指导思想，依据国家示范性软件学院的办学指导精神，依托珠江三角洲地区软件行业发展特点，参照 IEEE-CS 和 ACM 2005 学科教程知识体系（ESWBOK），引进 CDIO 国际工程教育改革模式，特制订本培养计划。

This training program is made based on the guideline of the educational policy of the Communist Party and the Nation. Implement the guiding ideology of "facing the modernization, facing the world and facing the future". Released by the running direction of National Demonstrative School of Software Engineering. Relied on the characteristics of Software Development Industry in Pearl River Delta region, it adopts an international engineering education and reform schema named CDIO, and takes ESWBOK of IEEE-CS and ACM 2005 into consideration.

本专业通过多种方式的教育、教学和实践环节，培养热爱祖国和中国特色社会主义现代化建设事业的德智体能全面发展的合格人才。按照“理论与实践并重、区域特色鲜明”的原则，培养立志从事软件工程事业，具有基础软件理论和软件工程知识，具备工程软件设计、开发与管理能力，具有领域知识和软件理论方法工程转化能力，具有国际竞争能力，具有团队精神和协调管理大型软件项目的领导潜质，富于创新思维和创业精神的高层次软件精英人才和软件产业领军人物，达到优秀的卓越软件工程师的知识与能力标准要求。

According to the principles of “balancing both theoretical and practical ability” and “reflecting regional characteristics”, cultivate qualified and talented people who love the motherland and the socialist modernization drive with Chinese characteristics. this program adopts various ways of education, teaching and practice, so as to train high level distinguished engineers and leaders in Software Industry with following characteristics: (1) solid theoretical knowledge of Software Engineering; (2) strong abilities in software design, development and management, (3) competitive, creative and enterprising spirit; (4) strong willingness on working on Software Engineering; (5) satisfying the standards and requirements of knowledge and ability for Excellent Software Engineers.

### 毕业要求：

#### Student Outcomes:

№1.工程知识：掌握从事软件设计和开发所需的相关数学、物理、电子、经济管理以及人文科学知识。

№1. Engineering Knowledge: Possessing related knowledge about Mathematic, Physics, Electronic, Economics and Culture for complex software engineering problems.

№2.问题分析：具有综合运用数学、自然科学和工程科学的基本原理以及软件理论、方法和技术手段独立地分析和设计软件项目的能力。

№2.. Analysis of problems: With the ability of Software project analysis and design by synthetically using the basic theories of mathematics, natural science and engineering science, as well as software engineering theories, methods and techniques independently to get the valid conclusion.

№3.设计/开发解决方案：具有新软件技术应用和开发的基本能力和创新意识，以及能够处理复杂软件系统与社会和自然和谐的基本能力；

№3. Design/development schema: With basic ability of using and developing novel software techniques and consciousness of creation, and the ability of handling the harmonious among complex software system, society and nature;

№4.研究：能够基于科学原理并采用科学方法对与软件相关的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。

№4. Research: Being able to research complex engineering problems related with software on the base of scientific principles and scientific methods, including designing experiments, analyzing and explaining data, and getting valid conclusions by integrating information.

№5.使用现代工具：熟练掌握最新编程和管理工具，能够针对与软件相关复杂工程问题，开发、选择与使用恰当的技术、资源、现代开发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。

№5. Using modern tools: Expertly using the state-of-the-art programming and management tools, aiming at complex engineering problems that related with software, being able to develop, choose and use proper technologies, resources, modern developing tools and information technical tools, and also being able to predict and simulate the complex engineering problems and understand the limitations.

№6.工程与社会：熟悉软件领域技术标准，以及相关行业的政策、法律和法规，能够基于工程相关背景知识进行合理分析，评价软件专业工程实践和复杂软件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。

№6. Engineering and society: Familiar with technique standers of Software Engineering and policy, laws and statutes in related industries, being able to analyze problems based on the engineering background knowledge, and assess the impacts of software engineering practices and solutions to the complex software engineering problems on society, health, safety, law and culture, and understand the corresponding responsibilities.

№7.环境和可持续发展：具有良好的软件项目质量控制和计算机安全意识，注重环境保护、生态平衡和可持续发展。

№7. Environment and sustainable development: With strong consciousness on quality control of software project and computer security, paying attention to environment protection, ecological balance and sustainable development.

№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。

№8. Professional norms: Possessing: Possessing humanities and Social Sciences literacy and sense of social responsibility, understanding and compliance of engineering ethics and standards, and performing of the duties.

№9.个人和团队：能够在软件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。

№9. Individual and team: Being able to assume the different roles as individual, team member and team leader in the team with software discipline background.

№10.沟通：能够就与软件相关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。尤其是能熟练运用英语与外籍同行进行沟通，包括良好的听说写能力。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。

№10. Communication: Being able to effectively communicate with industry peers and the public about the complex engineering problems related with software, including writing reports and designing documents, stating, expressing or responding to command clearly. Especially proficiency in communication with foreign colleagues in English effectively, which requires the proficiency in listening, speaking and writing. With international view and basic ability of cross culture communication.

№11.项目管理：掌握与现代软件开发相关的工程能力和管理能力。具有良好的软件项目组织管理能力、较强的交流沟通和团队合作能力，具备一定的领袖潜质。

№11. Having related abilities of developing modern software. Project management: With good ability of software project management, strong communication skills, team-working ability and leader capability.

№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。

№12. Lifelong learning: With the conscious of autonomic learning and lifelong learning, and abilities of learning continuously and adapting to development.

## 专业简介：

软件学院是2001年教育部批准成立的首批国家示范性软件学院，学院秉承“新机制运作，新模式培养；强化工程训练，密切企业合作，实现国际接轨；造就基础好、能力强、英语优、协作好的复合型软件研究与开发人才”的办学思路，立足培养高水平国际化软件精英人才。学院拥有“国家软件人才培养创新模式实验区”、教育部首批“卓越工程师教育计划”试点专业、“国家工程实践教学教育中心”和教育部“本科综合改革”试点专业，以及广东省“软件人才培养模式创新试验区”和广东省“本科专业综合改革”试点专业等。2011年开设软件工程（卓越班）。

本培养方案注重工程化人才培养，通过教学模式创新、突出实践环节和引入企业项目实训等方式，强化创新精神和创新能力培养。在校本科生近年多次在ACM、全国软件创新设计大赛、中国机

器人大赛、挑战杯、微软创新杯等大赛获金奖。软件学院积极开展国际交流和校企，与 IBM、微软、Intel、苹果、谷歌、北京触控、花旗软件等众多知名企业和国外高校建立了深层次合作关系。

本专业设立了大数据处理、嵌入式系统与软件、数字媒体、移动计算与软件等 4 个特色专业方向，每个方向由 4 门专业课和 1 门实训课构成，本科生可以在三年级选修其中一个方向。

### **Program Profile:**

The School of Software Engineering is a first batch of “National Demonstrative School of Software Engineering” approved by the Ministry of Education in 2001. The key thoughts of running the school adhere to “new operating mechanisms and new educating schemas; with strong engineering trainings, with strong school-enterprise cooperation and in lining with international standards; fostering interdisciplinary talents of software research and development with a solid foundation of knowledge, strong practical skills, good English abilities and teamwork capabilities”. The school has a “National Innovative Software Engineering Education Development Center”, a first batch of “Education and Training Programs of Excellent Engineers” development program by the Ministry of Education, a “National Engineering Practice Education Center”, a “Undergraduate Curriculum Reform” development program by the Ministry of Education, and “Provincial Innovative Software Engineering Education Center” of Guangdong, and a “Undergraduate Curriculum Reform” development program by Guangdong province.

The school’s education programs emphasize the training of practical engineering skills and foster innovative spirits and abilities, by reforming educating schemas, strengthening practice trainings, introducing enterprise practice projects, and other means. The school’s undergraduates won a lot of gold awards in many competitions, including “ACM” International Collegiate Programming Contest, National Software Innovation Design Competition, “RobCup” National Robot Competition, “Challenge Cup” National College Student Curricular Academic Science and Technology Works Competition, and Microsoft Imagine Cup, etc. The school actively carries out international exchanges and school-enterprise cooperation, have built deep partnerships with IBM, Microsoft, Intel, Apple, Google, Beijing Chukong Technology, Citicorp Software and Technology and many other well-established enterprises and top-level foreign universities.

The Software Engineering major sets up five distinguishing professional programs, including Process of Big Data, Embedded System and Software, Digital Multimedia, Mobile Computing and Software, with each program consists of four Subject Area Course(s) and one production-level practice project. Undergraduate students are required to select one of the six programs in their third year to gain their Bachelor of Engineering degrees.

### **专业特色:**

本专业立足培养高端特色软件人才，培养体系在工科基本课程基础上，设立了专业基础、软件工程基础、特色专业方向 3 个课程群，其中特色方向包括大数据处理、嵌入式系统与软件、数字媒

体、移动计算与软件等 4 个课程群，同时加大了实践环节比例，双语教学和校企合作课程覆盖面广，重点培养学生解决复杂软件系统和软件项目设计、管理的能力，培养学生具备创新思维、管理技巧和领导潜质。四大特色专业方向课程群符合目前软件行业战略发展趋势，学生创新能力强，就业质量高。

### **Program Features:**

The Software Engineering major takes hold in cultivating high-end talents of software research and development. It is based on the basic courses of engineering, and there are three course clusters which are specialty basis, software engineering basis and featured specialty direction. It contains four featured specialties which are Process of Big Data, Embedded System and Software, Digital Multimedia, and Mobile Computing and Software. The Software Engineering major enhances the process of student learning in enterprise, and the major curriculum has a wide coverage of Chinese-English courses and school-enterprise co-courses, and it focuses on training the abilities of students on handling complex software system, software project design and management, so that students can possess creative thinking, management skill and Leadership potential. The four distinguishing professional programs is closely in line with the current software industry strategy development trends. These has led to the students' high innovation abilities and a high quality of employment.

**授予学位：**工学学士学位

**Degree Conferred:** Bachelor of Engineering

### **主干课程：**

计算机与软件工程概论、离散数学、数字逻辑、计算机组成与体系结构、数据结构与算法、操作系统、编译技术、计算机网络、数据库系统、软件分析设计与建模、软件项目管理、软件测试与维护。

### **Main Courses:**

Introduction to Computer and Software Engineering, Discrete Mathematics, Digital Circuits and Logic Design, Computer Organization & Architecture, Data Structure and Algorithms, Operating System, Principle of Compiler, Computer Network, Database System, Analysis Design and Modeling of Software Requirement, Software Project Management, Software Testing and maintenance

### **特色课程：**

### **Featured Course:**

**全英语教学课程：**基于机器人编程的计算机导论、高级程序设计语言、数据挖掘、人工智能、数字逻辑、计算机网络、计算思维

**Courses Taught in English:** Introduction to Computer Science with Robotics Experiments, Advanced Language Program Design, Data mining, Artificial Intelligence, Digital Circuits and Logic Design, Computer Network

**双语教学课程:** 计算机和软件工程概论、数字逻辑、离散数学、计算机组成与体系结构、数据结构与算法、操作系统、编译技术、计算机网络、数据库系统、软件分析设计与建模、软件体系结构、Java 语言程序设计、软件项目管理、软件测试与维护、算法分析与设计、软件工程经济学、图像处理基础、人工智能、机器学习、数据挖掘、机器视觉、机器人编程基础、物联网基础与应用、嵌入式软件优化技术、计算机图形学、计算机视觉、3D 游戏引擎架构设计基础、自然语言处理、IOS 系统平台应用开发、Android 程序设计与开发、智能人机交互技术、WEB 服务与面向服务的体系结构、并行程序设计、Java EE 架构与应用、电子商务、信息系统安全、区块链技术与应用、云计算应用与开发

**Bilingual Courses:** Introduction to Software Engineering, Digital Circuits and Logic Design, Discrete Mathematics, Computer Organization & Architecture, Data Structure and Algorithms, Operating System, Principle of Compiler, Computer Network, Database System, Analysis Design and Modeling of Software Requirement, Software Architecture, Programming in Java, Software Project Management, Software Testing and maintenance, Algorithm Analysis and design, Economic of Software Engineering, Fundamentals of Image Processing, Artificial Intelligence, Machine Learning, Data mining, Machine Vision, Basics Programming of Robot, Foundation and Application of Internet of Things, Embedded Software Optimization Technology, Computer Graphics, Computer Vision, Foundation of 3D Game Engine Architecture Design, Natural Language Processing, Developing apps for iOS, Android Programming and Development, Intelligent Human-Machine Interact, Web Services and SOA, Parallel Program Design, Java EE Distributed Architecture, Electronic Commerce, Information system security, Block chain technology and application, Cloud computing application and development

**研究型课程:** 图像处理基础、人工智能、机器学习、数据挖掘、机器视觉、机器人编程基础、物联网基础与应用、嵌入式软件优化技术、计算机图形学、计算机视觉、3D 游戏引擎架构设计基础、自然语言处理、IOS 系统平台应用开发、Android 程序设计与开发、智能人机交互技术、WEB 服务与面向服务的体系结构、并行程序设计、电子商务、信息系统安全、区块链技术与应用、云计算应用与开发

**Research Courses:** Fundamentals of Image Processing, Artificial Intelligence, Machine Learning, Data mining, Machine Vision, Basics Programming of Robot, Foundation and Application of Internet of Things, Embedded Software Optimization Technology, Computer Graphics, Computer Vision, Foundation of 3D Game Engine Architecture Design, Natural Language Processing, Developing apps for iOS, Programming and Development, Intelligent Human-Machine Interact, Web Services and SOA, Parallel Program Design, Electronic Commerce, Information system security, Block chain technology and application, Cloud computing application and development



	选修 Elective	0	0	
专业领域课 Specialty-related Courses	必修 Compulsory	7.0	128	
	选修 Elective	29.5	352	部分课程为集中实践课，不计入总学时
合计 Total		147.0	2300	
集中实践教学环节（周） Practice Training (Weeks)	必修	32.0	48周	
毕业学分要求 Credits Required for Graduation	147.0+32.0=179.0			

备注：硕士阶段课程修读要求及毕业资格按照学生修读的硕士专业培养方案执行，并在校内导师和企业导师指导下修读课程和企业实习；学生本科阶段在取得专业教学计划规定学分的同时，还必须第二课堂取得 2 个人文素质教育学分和 4 个创新能力培养学分。

## 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
2300	1788	512	1892	408	179	139.5	39.5	43	123	13	19

### 三、专业教学计划表 (Teaching 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	上机 Computer-ai ded Class Hours	实验 Lab Hours	实践 Practice Hours				
公共基础课 General Basic Courses	143091	中国近现代史纲要 Skeleton of Chinese Modern History	必修课 C	(32) 24				2.0	1	№8	
	144001	大学英语 (一) College English(1)		64				4.0	1	№10	
	152001	体育 (一) Physical Education (1)		32			32	1.0	1	№12	
	140195	数学分析 (一) Mathematics Analysis(1)		80				5.0	1	№1,2	
	140197	线性代数 Linear Algebra		48				3.0	1	№1,2	
	155011	高级语言程序设计 (C++) (上) Advanced Language Program Design in C++ I		64	16			3.5	1	№1,5	
	130009	工程制图 Engineering Drawing		48				3.0	1	№1,2,5	
	143093	思想道德修养与法律基础 Cultivation of Thought and Morals & Fundamental of Law		(40) (36)				2.5	2	№8	
	144002	大学英语 (二) College English(2)		64				4.0	2	№10	
	152002	体育 (二) Physical Education (2)		32			32	1.0	2	№12	
	106001	军事理论 Military Principle		(16)				1.0	2	№9	
	140196	数学分析 (二) Mathematics Analysis(2)		112				7.0	2	№1,2	
	141005	大学物理III (一) General Physics (1)		64				4.0	2	№1,2	
	141007	大学物理实验 (一) Physics Experiment(1)		32		32		1.0	2	№1,2	
	140019	概率论与数理统计 Probability & Mathematical Statistics		48				3.0	2	№1,2	
	155012	高级语言程序设计 (C++) (下) Advanced Language Program Design in C++ II		32	8			2.0	2	№1,5	
	152003	体育 (三) Physical Education (3)		32			32	1.0	3	№12	
	143090	马克思主义基本原理 Fundamentals of Marxism Principle		(40) 36				2.5	3	№8	
	141006	大学物理III (二) General Physics (2)		64				4.0	3	№1,2	
	141008	大学物理实验 (二) Physics Experiment(2)		32		32		1.0	3	№1,2	
	143106	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		(80) 48				5.0	4	№8	
	152004	体育 (四) Physical Education (4)		32				1.0	4	№12	
	143094	形势与政策 Analysis of the Situation & Policy		(128)				2.0	1-8	№8	
		人文科学领域 Humanities		96	通识课 E				6.0		№8
		社会科学领域 Social Science		64					4.0		№8

<b>合 计</b> Total				1148	24	64	128	73.5		
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### 三、专业教学计划表（续）（Teaching 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 Credit s	开课 学期 Semeste r	毕业 要求 Student Outcomes
				总学时 Class Hours	上机 Computer -aided Class Hours	实 验 Lab Hour s	实 践 Practi ce			
学科基础课 Disciplinary Basic Courses	155290	计算机与软件工程概论 Introduction to Computer & Software Engineering	必 C	32				2.0	1	№1
	135003	电路与电子技术 Electric Circuit and Electronics	必 C	64				4.0	2	№2,3
	155172	数字逻辑 Digital Circuits and Logic Design	必 C	48		16		2.5	2	№2,3
	155320	C++程序开发实训 C++ program development Training	必 C	5周				5.0	2*	№2,3,5,9, 11
	135037	电路与电子技术实验 Experiment of Electric Circuit and Electronics	必 C	32		32		1.0	3	№1,2,3
	155231	离散数学 Discrete Mathematics	必 C	64				4.0	3	№1,2
	155141	计算机组成与体系结构 Computer Organization & Architecture	必 C	64	16			3.5	3	№2,3,4
	155016	数据结构 Data Structure	必 C	64	16			3.5	3	№3,4
	155189	操作系统 Operating System	必 C	64	16			3.5	3	№3,4,5
	155174	编译技术 Principle of Compiler	必 C	48	16			2.5	4	№3,4,5
	155021	计算机网络 Computer Network	必 C	64	16			3.5	4	№3,4,5
	155147	数据库系统 Database System	必 C	64	16			3.5	4	№3,4,5
	155321	软件分析设计与建模 Analysis Design and Modeling of Software Requirement	必 C	64	16			3.5	4	№2,3,5
	155319	数据库开发实训** Database Experiment and Training	选 E	5周				5.0	4*	№2,3,5,9, 11
	155349	软件开发综合实训** Software Development and Comprehensive Training	选 E	5周				5.0	4*	№2,3,5,9, 11
		<b>合 计</b> Total	必 C	672	112	48		37.0		
专业领域课 Specialty Courses	155381	软件工程学科前沿研讨 Frontiers of Software Engineering	选 E	32				2.0	1	№3,7,12
	155172	基于机器人编程的计算机科学导论 Introduction to Computer Science with Robotics Experiments	选 E	32		16		1.5	1	№1,2,3,5,10
	155058	Java 语言程序设计 Programming in Java	选 E	40	16			2.0	3	№1,5
	155315	软件项目管理 Software Project Management	必	64	16			3.5	5	№2,3,5,6,7,11
	155324	软件测试与维护 Software Testing and maintenance	必	64	16			3.5	5	№5,6,7
	155306	软件体系结构 Software Architecture	选 E	64	16			3.5	5	№2,3,4,5,6,7
	155344	算法设计与分析 Algorithm design and analysis	选 E	48	16			2.5	5	№1,2,3,4,5

155382	软件工程经济学 Software Engineering Economics	选 E	48	16			2.5	6	№1,2
155391	图像处理基础 Fundamentals of Image Processing	选 E	48	16			2.5	5	№1,2,3,4,5
155326	人工智能 <sup>1(1)</sup> Artificial Intelligence	选 E	48	16			2.5	5	№1,2,3,4,5
155387	机器学习 <sup>1(2)</sup> Machine Learning	选 E	48	16			2.5	5	№1,2,3,4,5
155165	数据挖掘 <sup>1(3)</sup> Data mining	选 E	40	16			2	5	№1,2,3,4,5
155392	机器视觉 <sup>1(4)</sup> Machine Vision	选 E	32				2.0	6	№1,2,3,4,5
155393	大数据开发实训 <sup>1(5)</sup> Large data development training	选 E	6周				6.0	6*	№1,2,3,4,5,9,11
155394	机器人编程基础 <sup>2(1)</sup> Basics Programming of Robot	选 E	48	16			2.5	5	№1,2,3,4,5
155395	物联网基础与应用 <sup>2(2)</sup> Foundation and Application of Internet of Things	选 E	48	16			2.5	5	№1,2,3,4,6,7
155396	嵌入式软件优化技术 <sup>2(3)</sup> Embedded Software Optimization Technology	选 E	48	16			2.5	6	№1,2,3,4,5
155352	嵌入式软件项目实训 <sup>2(4)</sup> Embedded software project training	选 E	6周			6周	6.0	6*	№1,2,3,4,5,9,11
155152	计算机图形学 <sup>3(1)</sup> Computer Graphics	选 E	48	16			2.5	5	№1,2,3,4,5
155336	计算机视觉 <sup>3(2)</sup> computer vision	选 E	48			16	2.5	6	№1,2,3,4,5
155341	3D游戏引擎架构设计基础 <sup>3(3)</sup> Foundation of 3D Game Engine Architecture Design	选 E	48	16			2.5	6	№1,2,3,4,5
155397	自然语言处理 <sup>3(4)</sup> Natural Language Processing	选 E	48	16			2.5	6	№1,2,3,4,5
155345	数字媒体开发实训 <sup>3(5)</sup> Digital Media development Training	选 E	6周			6周	6.0	6*	№1,2,3,4,5,9,11
155398	iOS平台应用开发 <sup>4(1)</sup> Developing apps for iOS	选 E	48	16			2.5	5	№2,3,4,5
155389	Android程序设计与开发 <sup>4(2)</sup> Android Programming and Development	选 E	48	16			2.5	5	№2,3,4,5
155342	智能人机交互 <sup>4(3)</sup> Intelligent human-machine interact	选 E	48	16			2.5	5	№1,2,3,4,5
155346	移动计算及软件开发实训 <sup>4(4)</sup> Development Technical Training of Mobile Computing and software	选 E	6周			6周	6.0	6*	№1,2,3,4,5,9,11
155327	WEB服务与面向服务的体系结构 Web Services and SOA	选 E	48	16			2.5	5	№2,3,4,5
155374	并行程序设计 Designing of parallel program	选 E	40		16		2.0	6	№2,3,4,5
155334	Java EE分布式架构 Java EE Distributed Architecture	选 E	32				2.0	6	№2,3,4,5
155160	电子商务 Electronic Commerce	选 E	40	16			2.0	6	№1,2,3,5
145042	信息系统安全 Information system security	选 E	32	16			1.5	6	№2,3,4,5,6,8
155377	计算思维 Computational thinking	选 E	32	8			2.0	4	№2,3,4
155399	区块链技术与应用 Block chain technology and application	选 E	32	16			1.5	4	№2,3,4,5

155400	云计算应用与开发 Cloud computing application and development	选 E	32	16			1.5	4	№2,3,4,5
155338	Java EE 软件开发项目实训 Java EE software development training	选 E	6周			6周	6.0	6*	№1,2,3,4,5,9,11
155362	企业软件项目实训 Enterprise software project Training	选 E	6周			6周	6.0	6*	№1,2,3,4,5,9,10,11
120003	创新研究训练 Train on creativity	选 E	32				2.0		№4,12
120004	创新研究实践 I Practice on creative I	选 E	32				2.0		№4,12
120005	创新研究实践 II Practice on creative II	选 E	32				2.0		№4,12
120006	创业实践 Practice on Entrepreneurship	选 E	32				2.0		№4,12
<b>合 计 Total</b>		必 C	128	32			7.0		
		选 E	与集中实践教学环节中选修课一起修读最低要求 29.5 学分（按方向修读） minimum elective course credits required:29.5						

备注：1. 带有上标如<sup>1(1)</sup>的课程为专业方向领域课程群，其中括号外的数字表示方向领域课程群的编号（注：1 为大数据处理方向；2 为嵌入式系统与软件方向；3 为数字媒体方向；4 为移动计算与软件方向），括号内的数字为对应方向领域课程群所包含的方向课的序号，学生必须至少修满一个方向领域课程群所包含的所有方向课；2. 带“\*”为14周后开课；3. 带“\*\*”为二选一，且必选一门；4. 实训类课程不在本栏内统计，计入集中实践教学环节；5. 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。

#### 四、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			
106002	军训 Military Training	必	3周		3.0	1	№12
143197	马克思主义理论与实践 Marxism Theory and Practice	必	2周		2.0	假期	№8
155357	数字系统创意设计 Digital system creative design	选	3周		3.0	1	№2,3
155320	C++程序开发实训 C++ program development Training	必	5周		5.0	2*	№2,3,5,9,11
141073	电子工艺实习 II Practice of Electronic	必	2周		2.0	4	№1,2,3
155319	数据库开发实训** Database development Training	选	5周		5.0	4*	№2,3,5,9,11
155349	软件开发综合实训** Software development and comprehensive training	选	5周		5.0	4*	№2,3,5,9,11
155393	大数据开发实训 <sup>1(5)</sup> Large data development training	选	6周		6.0	6*	№1,2,3,4,5,9,11

155352	嵌入式软件项目实训 <sup>2(4)</sup> Embedded software project training	选	6 周		6.0	6*	№1,2,3,4,5,9,11
155345	数字媒体开发实训 <sup>3(5)</sup> Digital Media development Training	选	6 周		6.0	6*	№1,2,3,4,5,9,11
155346	移动计算及软件开发实训 <sup>4(4)</sup> Development Technical Training of Mobile Computing and software	选	6 周		6.0	6*	№1,2,3,4,5,9,11
155338	Java EE 软件开发项目实训 Java EE software development training	选	6 周		6.0	6 周	№1,2,3,4,5,9,11
155362	企业软件项目实训 Enterprise software project Training	选	6 周		6.0	6*	№1,2,3,4,5,9,10,11
155075	毕业实习 Practice on Diploma Project	必	16 周		5.0	7	№1,2,3,4,5,9,10,11
155076	毕业设计 Diploma Project	必	15 周		15.0	8	№1,2,3,4,5,9,10,11
<b>合 计</b> <b>Total</b>		必 C	48		32.0		
		选 E	与专业领域课中选修课一起修读最低要求 29.5 学分 (按方向修读)				

## 五、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或广东省创新创业训练计划或 SRP（学生研究计划）或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。

## 5.“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.