

# 计算机科学与技术专业教学培养方案

## 一、专业特色

华东理工大学计算机科学与技术专业是以计算机科学与技术学科为平台，以培养计算机创新能力为重点，面向系统，兼顾应用，软硬件结合，计算机科学与计算机工程并重的宽口径专业。本专业已入选 2019 年首批国家级一流本科专业建设点。专业师资力量雄厚，教学水平高，注重教育内容和方法改革，2009 年通过了全国工程教育专业认证，2012 年通过了全国工程教育专业认证延长有效期的申请，2015 年通过了第二轮工程教育专业认证，2019 年通过了第三轮工程教育专业认证。承担国家和省部级教改项目多项，主持国家双语示范课程 1 门、教育部-英特尔精品课程 2 门、上海市精品课程 5 门，获得国家教学成果二等奖 2 项，上海市教学成果特等奖、一等奖、二等奖多项。计算机科学与技术学科拥有一级博士、硕士学位授权点，科研成果丰硕，多年来一直承接国家自然科学基金、国家重点研发计划等国家级项目与课题，获得教育部、上海市科技奖项多项，在人工智能、软件工程、云计算和大数据等领域，形成了自己的研究特色。

本专业培养的学生以“基础理论扎实、知识结构完整、实践操作能力与交流能力强、应用设计和开发经验丰富、新知识接受能力强”的特点受到用人单位的欢迎。就业率高，就业质量位居上海市同类学科前列，多次被评为“就业工作先进集体”。学生在各种国际、国内竞赛中成绩突出，先后 3 次入围 ACM 程序设计竞赛国际总决赛。

## 二、培养目标

培养德、智、体、美、劳全面发展，遵守法律法规，具有良好的道德与修养，具有社会和环境意识，掌握数学与自然科学基础知识，掌握计算机科学与技术学科的基础理论、基本方法和专门知识，具备分析和解决本领域复杂工程问题的能力，具备较强的工程实践能力，具有良好的沟通交流能力和外语应用能力，具有创新意识、团队合作精神和国际化视野，能适应科学技术发展和社会需求的计算机科学与技术高级专门人才。

毕业后能从事计算机行业和领域的科学技术研究、系统设计、应用开发等工作，并可继续攻读计算机科学与技术及相关学科的硕士和博士学位。

要求五年以上的毕业生：能在工业界、学术界成功评估、分析、解决与专业职位相关的工程问题，适应独立和团队工作环境；能以重要的法律、伦理、社会、环境、网络安全和经济等方面宽广的系统视角管理与专业职位相关的多学科项目；在终身学习、专业发展和领导能力上表现出担当和进步，在计算机领域具有职场竞争力。

## 三、毕业要求及其指标点说明

本专业学生毕业时应当达到中国工程教育专业认证协会工程教育认证标准规定的的能力，即：

毕业要求	毕业要求指标点分解与说明
<b>1. 品德修养:</b> 尊重历史规律, 把握基本国情, 掌握科学的世界观和方法论, 践行社会主义核心价值观, 具有人文社会科学素养和社会责任感。	1.1 有正确的世界观和价值观, 尊重历史规律, 把握国家基本国情, 掌握科学的世界观与方法论, 践行社会主义核心价值观;
	1.2 在计算机科学与技术相关领域, 体现人文社会科学素养和社会责任感。
<b>2. 工程知识:</b> 能够将数学、自然科学、信息科学、工程基础和专业用于解决计算机科学与技术相关领域复杂工程问题。	2.1 能将数学、自然科学、工程科学的语言工具用于计算机领域复杂工程问题的表述;
	2.2 能针对具体的计算机领域对象建立数学模型并求解;
	2.3 能够将相关知识和数学模型方法用于推演、分析计算机领域复杂工程问题, 并比较与综合计算机专业工程问题解决方案。
<b>3. 问题分析:</b> 能够基于数学、自然科学、信息科学、工程科学的基本原理和跨学科知识, 通过文献研究、信息整合和批判性思维, 识别、表达、分析、质疑和评价计算机科学与技术相关领域复杂工程问题, 以获得有效结论。	3.1 能运用相关科学原理思考问题, 识别和判断工程问题的关键环节、步骤和参数;
	3.2 能运用相关科学原理和跨学科知识, 识别计算机领域复杂工程问题的关键环节, 并正确表达计算机领域复杂工程问题;
	3.3 能认识到解决问题有多种方案可选择, 会通过文献研究寻求可替代的解决方案;
	3.4 能运用基本原理, 借助文献研究, 分析过程的影响因素, 获得有效结论。
<b>4. 设计/开发解决方案:</b> 能在社会、法律、文化、伦理、健康、安全、环境和可持续性约束条件下, 提出计算机科学与技术相关领域复杂工程问题的解决方案, 设计系统、单元(部件)或工艺流程, 在解决方案的选择、设计、优化和实现环节中体现创新意识。	4.1 掌握计算机领域工程设计和产品开发全周期、全流程的基本设计/开发方法和技术, 了解影响设计目标和技术方案的各种因素;
	4.2 针对计算机领域复杂工程问题, 设计满足特定需求的系统、单元或流程的能力;
	4.3 在计算机领域设计环节中体现创新意识, 并综合考虑社会、健康、安全、法律、文化以及环境等因素的能力。
<b>5. 研究:</b> 能够基于科学原理并采用科学方法对计算机科学与技术相关领域复杂工程问题进行研究, 包括问题的提出与判断, 研究方案的设计与实施, 实验数据和相关信息分析与关联, 通过研究得到合理有效的结论。	5.1 通过文献研究或相关方法, 调研和分析计算机领域复杂工程问题的解决方案;
	5.2 能够根据计算机领域对象特征, 选择研究路线, 设计实验方案;
	5.3 能够根据实验方案构建计算机领域实验系统, 安全地开展实验, 科学地采集实验数据;
	5.4 能对实验结果进行分析和解释, 并通过信息综合得到合理有效的结论。

毕业要求	毕业要求指标点分解与说明
<b>6. 使用现代工具：</b> 能够针对计算机科学与技术相关领域复杂工程问题，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。	6.1 了解计算机领域常用的现代仪器、信息技术工具、工程工具和模拟软件的使用原理和方法，并理解其局限性；
	6.2 能够选择与使用恰当的仪器、信息资源、工程工具和专业模拟软件，对计算机领域复杂工程问题进行分析、计算与设计；
	6.3 能够针对计算机领域具体的对象，开发或选用满足特定需求的现代工具，模拟和预测专业问题，并能够分析其局限性。
<b>7. 工程与社会：</b> 理解工程活动与人类社会和自然环境之间的相互影响，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计算机科学与技术相关领域复杂工程问题的解决方案对健康、安全、环境、法律、文化以及社会可持续发展的影响，并理解应承担的责任。	7.1 了解计算机专业相关领域的技术标准体系、知识产权、产业政策和法律法规，理解不同社会文化对工程活动的影响；
	7.2 能分析和评价计算机领域专业工程实践对社会、健康、安全、法律、文化的影响，以及这些制约因素对项目实施的影响，并理解应承担的责任；
	7.3 能够站在环境保护和可持续发展的角度思考计算机领域专业工程实践的可持续性，评价产品周期中可能对人类和环境造成的损害和隐患。
<b>8. 职业规范：</b> 理解工程伦理，在工程实践中遵守工程职业道德和规范。	8.1 理解诚实公正、诚信守则的工程职业道德和规范，并能在计算机领域工程实践中自觉遵守；
	8.2 理解对公众的安全、健康和福祉，以及环境保护的社会责任，能够在计算机领域工程实践中自觉履行责任。
<b>9. 个人和团队：</b> 能够在多学科背景下的团队中承担个体、团队成员以及领导者的角色，具有营造协作和包容的环境，建立工作目标，组织任务实施，推进目标达成的能力。	9.1 能与其他学科的成员有效沟通，合作共事；
	9.2 能够在计算机领域团队中独立或合作开展工作；
	9.3 能够组织、协调和指挥计算机领域团队开展工作。
<b>10. 沟通：</b> 能够就计算机科学与技术相关领域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。	10.1 能就计算机科学与技术相关领域问题，与社会公众进行有效沟通与交流，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令；
	10.2 能就计算机科学与技术相关领域问题，与业界同行进行有效沟通与交流，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令；理解与业界同行和社会公众交流的差异性。

毕业要求	毕业要求指标点分解与说明
<b>11. 国际视野：</b> 关注国际工程领域的发展和动态，了解现代工程科技交叉融合的发展趋势，了解不同国家工程领域的相关准则，尊重不同文化的差异性，能够在跨文化背景下进行沟通和交流。	11.1 关注全球性问题，理解和尊重世界不同文化的差异性和多样性，了解计算机领域现代工程科技交叉融合的发展趋势以及领域相关准则；
	11.2 具备跨文化交流的语言和书面表达能力，能就计算机科学与技术相关领域专业问题，在跨文化背景下进行沟通和交流。
<b>12. 项目管理：</b> 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。	12.1 掌握计算机领域工程项目中涉及的管理与经济决策方法；
	12.2 理解计算机领域工程及产品全周期、全流程的成本构成中涉及的工程管理与经济决策问题；
	12.3 能在多学科环境下，运用工程管理与经济决策方法。
<b>13. 终身学习：</b> 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	13.1 自主学习和终身学习的意识；
	13.2 具有不断学习和适应发展的能力。

## 四、依托学科

计算机科学与技术

## 五、核心课程

计算机程序设计、离散数学、算法与数据结构、计算机组成原理、数据库原理、软件工程、操作系统、计算机网络。

## 六、学制与学位

学制四年，工学学士学位。

## 七、学分要求

本专业学生在学期间最低要求完成专业培养方案规定的 160 学分。其中，通识类课程最低 41 学分，学科基础类课程 26 学分，专业类课程最低 91 学分，创新创业类课程最低 2 学分。上述学分数分布完全达到或超过中国工程教育专业认证标准，即：

数学与自然科学类% =  $26/160 = 16.25\%$  (要求 15%，达到标准)

工程基础、专业基础及专业类% =  $56/160 = 35\%$  (要求 30%，达到标准)

工程实践与毕业设计(论文)% =  $36/160 = 22.50\%$  (要求 20%，达到标准)

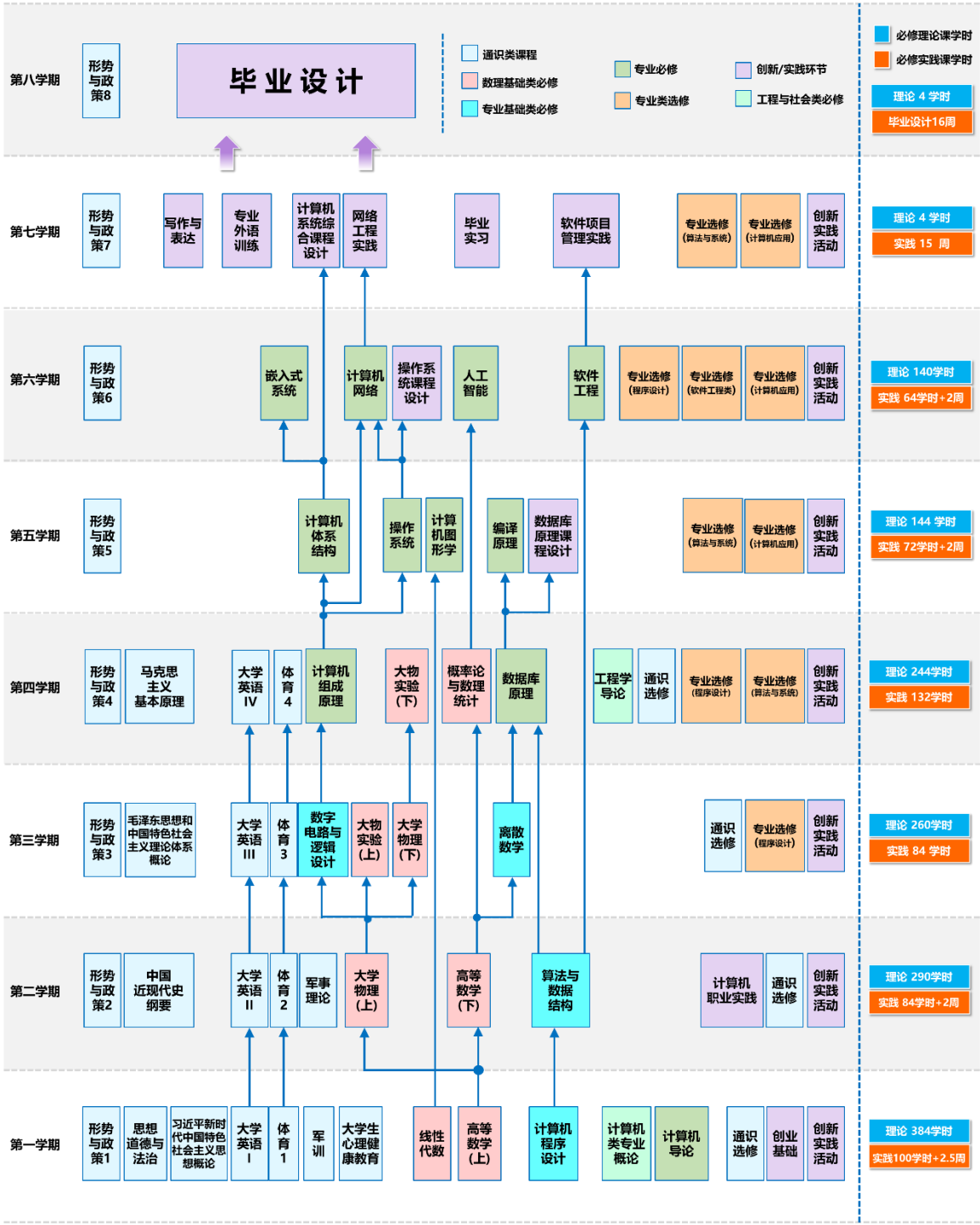
人文社会科学类% =  $26/160 = 16.25\%$  (要求 15%，达到标准)

学生修满学分并达到《大学生体质健康标准》、通过华东理工大学《大学英语》学位考试，方可毕业。符合学位授予要求者，授予工学学士学位。

## 八、课程体系

课程模块	课程类别		课程性质	课程门数	建议学分	开设学期
通识教育课程 (最低 41 学分)	通识必修	思政类	必修	6	17	1~8
		军事类	必修	2	2	1~2
		体育类	必修	4	4	1~4
		英语类	必修	4	6	1~4
	通识选修		选修	自选	最低 6 学分	1~8
	通识专项		必修/选修	自选	最低 6 学分	1~8
学科基础 教育课程 (26 学分)	数学基础类		必修	4	17	1~4
	物理基础类		必修	4	9	2~4
专业教育课程 (最低 91 学分)	专业必修	专业基础类	必修	4	14	1~3
		专业类	必修	11	31	1~6
		工程与社会类	必修	2	2.5	1~4
	专业选修	程序设计类	选修	3	8.5	3~6
		算法与系统类	选修	6	15.5	4~7
		软件工程类	选修	3	6.5	6
		计算机应用类	选修	4	9	5~7
	专业实践		必修	10	27	2~8
创新创业 教育课程 (最低 2 学分)	创新创业类课程		必修/选修	自选	最低 1 学分	1~6
	创新创业实践活动		必修/选修	自选	最低 1 学分	1~8

九、课程导图



[illegible]



课程模块	课程类别	课程编号	课程名称	课程英文名称	课程性质	考核方式	总学分	总学时	理论学时	实践学时	开课学期
学科基础教育课程 (26 学分)	数学类 (17 学分)	18593020	高等数学 (上)	Advanced Calculus I	必修	考试	5	80+24	80	24	1
		18588024	高等数学 (下)	Advanced Calculus II	必修	考试	6	96+24	96	24	2
		18584012	线性代数	Linear Algebra	必修	考试	3	48	48	0	1
		18579012	概率论与数理统计	Probability and Statistics	必修	考试	3	48	48	0	4
	物理类 (9 学分)	18645012	大学物理(上)	University Physics I	必修	考试	3	48	48		2
		18643016	大学物理(下)	University Physics II	必修	考试	4	64	64		3
		11147004	大学物理实验(上)	Physics Experiment of University	必修	考查	1	28	4	24	3
		11148004	大学物理实验(下)	Physics Experiment of University	必修	考查	1	32	0	32	4
专业教育课程 (91 学分)	专业基础类	12912012	*计算机程序设计	Computer Programming	必修	考试	3	64	32	32	1
		12976014	*算法与数据结构	Algorithm and Data Structures	必修	考试	3.5	64	48	16	2
		12932016	*离散数学	Discrete Mathematics	必修	考试	4	64	64		3
		13995014	数字电路与逻辑设计	Digital Circuits and Logic Design	必修	考试	3.5	64	48	16	3
	专业类	12915010	计算机导论	Introduction to Computer	必修	考试	2.5	40	40		1
		12970012	*数据库原理	Database Principles	必修	考试	3	64	32	32	4
		18314016	*计算机组成原理	Principles of Computer Organization	必修	考试	4	72	56	16	4
		12921008	计算机体系结构	Computer Architecture	必修	考试	2	36	28	8	5
		12924010	计算机图形学	Computer Graphics	必修	考试	2.5	48	32	16	5
		14147012	*操作系统	Operating Systems	必修	考试	3	56	40	16	5
		12889014	编译原理	Principle of Compilers	必修	考试	3.5	72	40	32	5
		12947012	*软件工程	Software Engineering	必修	考试	3	60	36	24	6
		12927012	*计算机网络	Computer Networks	必修	考试	3	56	40	16	6
		16309008	人工智能	Artificial Intelligence	必修	考试	2	36	28	8	6
		12938010	嵌入式系统	Embedded Systems	必修	考试	2.5	48	32	16	6
	工程与社会类	37260002	计算机类专业概论	Introduction to Computer Undergraduate Programs	必修	考查	0.5	8	8	0	1
		18313008	工程学导论	Introduction to Engineering	必修	考试	2	36	28	8	4



课程模块		课程类别	课程编号	课程名称	课程英文名称	课程性质	考核方式	总学分	总学时	理论学时	实践学时	开课学期
专业教育课程 (91 学分)	专业选修 (16.5 学分)	程序设计拓展类	14040012	面向对象程序设计	Object-oriented programming	选修	考查	3	56	40	16	3
			12881012	Java 程序设计及应用	Java Language Programming	选修	考查	3	56	40	16	4
			18749010	Python 与金融数据挖掘	Python and Financial Data Mining	选修	考查	2.5	48	32	16	6
		算法与系统拓展类	12911012	计算方法	Computational Method	选修	考查	3	56	40	16	4
			12975010	算法设计与分析	Algorithmic Design and Analysis	选修	考查	2.5	48	32	16	5
			12983014	微机原理及接口技术	Principle of Microcomputer and Interface Technology	选修	考查	3.5	64	48	16	5
			12989008	新型计算机网络	New Computer Networks	选修	考查	2	32	32		7
			18731008	自然语言处理与理解	Natural Language Processing and Understanding	选修	考查	2	32	32	0	5
			18389010	计算机视觉	computer vision	选修	考查	2.5	48	32	16	6
			软件工程拓展类	12963010	软件质量保证与测试	Software Quality Assurance and Testing	选修	考查	2.5	48	32	16
		12959008		软件项目管理	Software Project Management	选修	考查	2	36	28	8	6
		14445008		物联网技术基础	Internet of things technology	选修	考查	2	32	32	0	6
		计算机应用拓展类	18750008	电商金融	Electronic Commerce Finance	选修	考查	2	40	24	16	5
			13932010	数据挖掘	Data Mining	选修	考查	2.5	48	32	16	6
			37359008	区块链技术	Blockchain Technology	选修	考查	2	40	24	16	7
			18748010	金融信息安全	Financial Information Security	选修	考查	2.5	48	32	16	7
		专业实践 (27 学分)	专业实践	14826008	计算机职业实践	Computer Cognition	必修	考查	2	2 周		2 周
	14044008			数据库原理课程设计	Course Design of Database Principles	必修	考查	2	2 周		2 周	5
	12892008			操作系统课程设计	Course Design of Operating System	必修	考查	2	2 周		2 周	6
	12988004			写作与表达	Writing and Communication	必修	考查	1	1 周		1 周	7
	14045008			软件项目管理实践	Practice of Software Project Management	必修	考查	2	2 周		2 周	7
	12886012			毕业实习	Graduation Practice	必修	考查	3	3 周		3 周	7

课程模块		课程类别	课程编号	课程名称	课程英文名称	课程性质	考核方式	总学分	总学时	理论学时	实践学时	开课学期
专业教育课程 (91 学分)	专业实践 (27 学分)	专业实践	18312004	专业外语训练	English Essays in CS	必修	考查	1	1 周		1 周	7
			12928008	计算机系统综合课程设计	Course Design of computer system	必修	考查	2	2 周		2 周	7
			12981008	网络工程实践	Computer Networks Practice	必修	考查	2	2 周		2 周	7
			16405040	毕业设计(论文)	Graduation Project (Graduation Dissertation)	必修	考查	10	20 周		20 周	7-8
创新创业教育课程 (2 学分)	创新创业类课程(最低 1 学分)	12738004	创业基础	Fundamentals of Entrepreneurship	必修	考试	1	16	16			1
		13931004	大学生创业基础(MOOC)	Fundamentals of Entrepreneurship for University Students	必修	考试	1	16	16			1
		创新创业类选修课程					学生自主选择, 学分不限					1-6
	创新创业实践环节(最低 1 学分 <sup>△2</sup> )	大学生创新创业训练计划					按实际情况认定创新实践学分					1-8
		学科竞赛、双创竞赛										
		智能创新类实训项目										
		经教务处认定的创新实践活动										

注<sup>△1</sup>:《大学英语》采取分层次教学模式, 新生入学即参加英语分级考试。毕业前通过大学英语学位考试或同等水平认定者, 方可毕业, 具体参照《大学英语》课程教学实施方案。

注<sup>△2</sup>: 应届本科毕业生申请免试攻读研究生必须修满 2 个创新创业实践学分。

学期	课程模块	课程名称	课程性质	学分	总学时	理论学时	实践学时
第一学期	通识教育课程	思想道德与法治	必修	3	56	40	16
		习近平新时代中国特色社会主义思想概论	必修	3	48	48	
		形势与政策 1	必修	0.25	4	4	
		军训	必修	1	2.5 周		2.5 周
		体育(1)	必修	1	32	4	28
		大学英语I	必修	2	32	32	
		大学生心理健康教育	必修	2	32	32	
	学科基础教育课程	高等数学(上)	必修	5	80+24	80	24
		线性代数	必修	3	48	48	
	专业教育课程	*计算机程序设计	必修	3	64	32	32
		计算机类专业概论	必修	0.5	8	8	
		计算机导论	必修	2.5	40	40	
	创新创业教育课程	创业基础	必修 (2 选 1)	1	16	16	
		大学生创业基础(MOOC)					
	本学期合计必修 27.25 学分，建议修读 2-3 学分通识选修课程						
第二学期	通识教育课程	中国近现代史纲要	必修	3	56	40	16
		形势与政策 2	必修	0.25	4	4	
		军事理论	必修	1	18	18	
		体育(2)	必修	1	32	4	28
		大学英语II	必修	2	32	32	
	学科基础教育课程	高等数学(下)	必修	6	96+24	96	24
		大学物理(上)	必修	3	48	48	
	专业教育课程	*算法与数据结构	必修	3.5	64	48	16
		计算机职业实践	必修	2	2 周		2 周
	本学期合计必修 21.75 学分，建议修读 1-2 学分通识选修课程						
第三学期	通识教育课程	毛泽东思想和中国特色社会主义理论体系概论	必修	3	56	40	16
		形势与政策 3	必修	0.25	4	4	
		体育(3)	必修	1	32	4	28
		大学英语III	必修	2	32	32	
	学科基础教育课程	大学物理(下)	必修	4	64	64	
		大学物理实验(上)	必修	1	28	4	24
	专业教育课程	*离散数学	必修	4	64	64	
		数字电路与逻辑设计	必修	3.5	64	48	16
	本学期合计必修 18.75 学分，建议修读 1-2 学分通识选修课程						

学期	课程模块	课程名称	课程性质	学分	总学时	理论学时	实践学时
第四学期	通识教育课程	马克思主义基本原理	必修	3	56	40	16
		形势与政策 4	必修	0.25	4	4	
		体育(4)	必修	1	32	4	28
		大学英语 IV	必修	0	32	32	
	学科基础教育课程	概率论与数理统计	必修	3	48	48	
		大学物理实验(下)	必修	1	32		32
	专业教育课程	*数据库原理	必修	3	64	32	32
		*计算机组成原理	必修	4	72	56	16
		工程学导论	必修	2	36	28	8
	本学期合计必修 17.25 学分，建议修读 1-2 学分通识选修课程， 修读 0-2 学分专业选修课程						
第五学期	通识教育课程	形势与政策 5	必修	0.25	4	4	
	专业教育课程	计算机体系结构	必修	2	36	28	8
		计算机图形学	必修	2.5	48	32	16
		*操作系统	必修	3	56	40	16
		编译原理	必修	3.5	72	40	32
		数据库原理课程设计	必修	2	2 周		2 周
	本学期合计必修 13.25 学分，建议修读 2-4 学分专业选修课程						
第六学期	通识教育课程	形势与政策 6	必修	0.25	4	4	
	专业教育课程	*软件工程	必修	3	60	36	24
		*计算机网络	必修	3	56	40	16
		人工智能	必修	2	36	28	8
		嵌入式系统	必修	2.5	48	32	16
		操作系统课程设计	必修	2	2 周		2 周
	本学期合计必修 12.75 学分，建议修读 4-6 学分专业选修课程						
第七学期	通识教育课程	形势与政策 7	必修	0.25	4	4	
	专业教育课程	写作与表达	必修	1	1 周		1 周
		软件项目管理实践	必修	2	2 周		2 周
		毕业实习	必修	3	3 周		3 周
		专业外语训练	必修	1	1 周		1 周
		计算机系统综合课程设计	必修	2	2 周		2 周
		网络工程实践	必修	2	2 周		2 周
		毕业设计(论文)	必修	10	20 周		4 周
	本学期合计必修 11.25 学分(毕业设计学分不计入本学期学分)，建议修读 2-4 学分专业选修课程						
第八学期	通识教育课程	形势与政策 8	必修	0.25	4	4	
	专业教育课程	毕业设计(论文)(接第七学期)	必修	10	20 周		16 周
	本学期合计必修 10.25 学分						

## 十二、课程设置与毕业要求的关系矩阵

课程名称 \ 毕业要求	1. 品德修养	2. 工程知识	3. 问题分析	4. 设计/开发解决方案	5. 研究	6. 使用现代工具	7. 工程与社会	8. 职业规范	9. 个人和团队	10. 沟通	11. 国际视野	12. 项目管理	13. 终身学习
思想道德与法治	H												
中国近现代史纲要	H												
马克思主义基本原理	H												M
毛泽东思想和中国特色社会主义理论体系概论	H									M			
形势与政策	H						M						
习近平新时代中国特色社会主义思想概论	H										L		
军事理论	L												
军训	L												
体育	L												
大学英语	H									M	M		
创业基础									H	M			
大学生创业基础(MOOC)									H	M			
大学生心理健康教育									H				M
高等数学		H	M										
线性代数		H	M										
概率论与数理统计		H	M										
大学物理		H	M										
大学物理实验					L	M			M				
*计算机程序设计	M	H											M
计算机类专业概论							L	L			L		
计算机导论							H						M
*离散数学		M	H										
数字电路与逻辑设计		H				L							
*算法与数据结构			H		L								
*计算机组成原理	M					H							
计算机图形学						H							

课程名称 \ 毕业要求	1. 品德修养	2. 工程知识	3. 问题分析	4. 设计/开发解决方案	5. 研究	6. 使用现代工具	7. 工程与社会	8. 职业规范	9. 个人和团队	10. 沟通	11. 国际视野	12. 项目管理	13. 终身学习
工程学导论							H	H					
*数据库原理	M			H									
*软件工程				H								H	
计算机体系结构						H							
人工智能					H						M		
*操作系统		M			H								
*计算机网络	M				H								
编译原理			H										
嵌入式系统			H	H									
计算机职业实践							H	H					
数据库原理课程设计					M				H				
操作系统课程设计					M				H				
专业外语训练											H		M
写作与表达									M	H	M		
毕业实习							H	H					M
软件项目管理实践										M		H	
计算机系统综合课程设计						M			H				
网络工程实践				H			M						
毕业设计(毕业论文)				H				H		M	M	H	

注：1、H-高度相关；M-中等相关；L-弱相关；

2、课程名称前加“\*”者为该核心课程。

系主任： 李建华    教学副院长： 谭帅    院长： 钟伟民

# Computer Science and Technology

## I. Professional characteristics

The undergraduate major of Computer Science and Technology was established in 1985. In 2019, the major was selected as the national first-class undergraduate major construction site.

The subject of Computer Science and Technology has distinctive characteristics in artificial intelligence and machine learning, trusted software and systems, knowledge graphs and big data mining, high performance and group evolution computing. Specific advantages and features include: (1) The original machine olfaction online perception analysis technology and intelligent instruments, which have greatly improved the intelligence level of the national bio-fermentation, petrochemical, food, and other industries; (2) The developed high-confidence software, which has dramatically increased the complex software system development efficiency and maintainability; (3) The big data application platform established in multiple industries are widely used in precision medicine, smart finance, smart city and other fields in Shanghai, and has produced good social and economic benefits.

## II. Educational Objectives

The objective of Computer Science and Technology is to cultivate professionals with a solid foundation and a wide range of knowledge, good physical and mental conditions and intelligence quality, to fulfill the development of computer science and technology, and possess research and innovation abilities and desire for international competition. Students are requested to be proficient in the field of Computer Science and Computer Engineering. Moreover, proficiency in engineering practice and the development of hardware and software are also obligations. Students are requested to apply fundamental knowledge of computer science and engineering in creative manners to solve practical industrial challenges, together with sufficient cross-cultural knowledge and eligible international communication skills. The graduates of computer science and technology are versatile in dealing with various professional experiences and have the capability of lifelong learning.

## III. Educational Requirement

Upon graduation, students of this major are requested to meet the abilities required by the Criteria for Engineering Education Accreditation of the China Engineering Education Accreditation Association (CEEAA):



Graduation Requirements	Decomposition and explanation of graduation requirements
<b>1. Moral Cultivation:</b> respect the laws of history, grasp the primary conditions, master the worldview and methodology of science, humanities, and social science, and sense of social responsibility.	1.1 Have a correct worldview and values, respect the laws of history, grasp the primary national conditions of the country, and master a scientific world outlook and methodology.
	1.2 Demonstrate humanities and social science literacy and a sense of social responsibility in computer science and technology-related fields.
<b>2. Engineering Knowledge:</b> Apply knowledge of mathematics, natural science, engineering fundamentals and engineering specialization respectively to the solution of complex engineering problems in computer science and technology.	2.1 Apply tools of mathematics, natural sciences, and engineering sciences to express complex engineering problems in the computer field;
	2.2 Set up mathematical models for specific computer domain objects, and solve them;
	2.3 Apply relevant knowledge and mathematical model methods to derive and analyze complex engineering problems in the computer field, and compare and synthesize professional computer engineering problem solutions.
<b>3. Problem Analysis:</b> Identify, formulate, research literature and analyze complex engineering problems in computer science and technology reaching substantiated conclusions by use of first principles of mathematics, natural sciences and engineering sciences.	3.1 Apply relevant scientific principles to solve problems, identify and judge the essential links, steps, and parameters of engineering problems;
	3.2 Apply relevant scientific principles and interdisciplinary knowledge to identify the critical parts of complex engineering problems and correctly express complex engineering problems in the computer field;
	3.3 Find out that there are many options for solving problems and seek alternative solutions through literature research;
	3.4 Use first principles, use literature research, analyze the influencing factors of the process, and obtain effective conclusions.
<b>4. Design/development of solutions:</b> Design solutions for complex engineering problems in computer science and technology and design systems, components or processes that meet specified needs with appropriate consideration for societal, public health and safety, legal, cultural, and environmental considerations.	4.1 Grasp the basic design/development methods and technologies of the entire cycle and process of engineering design and product development in the computer field, and understand various factors that affect design goals and technical solutions;
	4.2 Design systems, units, or processes that meet specific needs for complex engineering problems in the computer field;
	4.3 Reflect innovative consciousness in the design of the computer field and comprehensively consider social, health, safety, legal, cultural, and environmental considerations.

Graduation Requirements	Decomposition and explanation of graduation requirements
<b>5. Investigation:</b> Conduct investigations of complex problems in computer science and technology using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.	5.1 Investigate and analyze solutions to complex engineering problems in the computer field through literature research or related methods;
	5.2 Choose research routes and experimental design programs according to the characteristics of objects in the computer field;
	5.3 Construct the experimental system in the computer field according to the practical plan, carry out experiments safely, and collect empirical data scientifically;
	5.4 Analyze and interpret experimental results and obtain reasonable and effective conclusions through information synthesis.
<b>6. Modern Tool Usage:</b> Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems in computer science and technology, with an understanding of the limitations.	6.1 Understand the principles and methods of using modern instruments, information technology tools, engineering tools, and simulation software commonly used in the computer field, and understand their limitations;
	6.2 Choose and use appropriate instruments, information resources, engineering tools, and professional simulation software to analyze, calculate and design complex engineering problems in the computer field;
	6.3 develop or choose modern tools that meet specific needs for specific objects in the computer field, simulate and predict professional problems, and analyze their limitations.
<b>7. The Engineering and Society:</b> Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues, the sustainable development of society and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems.	7.1 Understand the technical standards, intellectual property rights, industrial policies and laws and regulations in the computer-related fields, and understand the impact of different social cultures on engineering activities;
	7.2 Analyze and assess the impact of professional engineering practices in the computer field on society, health, safety, law, and culture, the effect of these constraints on project implementation, and understand the responsibilities that should be undertaken.
	7.3 Think about the sustainability of professional engineering practices in the computer field from environmental protection and sustainable development, and evaluate the damage and hidden dangers that may be caused to humans and the environment during the product cycle.
<b>8. Professional Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.	8.1 Understand the engineering ethics and norms of honesty, fairness, and integrity codes, and consciously abide by them in engineering practice in the computer field;
	8.2 Understand the social responsibility for the safety, health, and well-being of the public and environmental protection, and consciously perform duties in the engineering practice of the computer field.

Graduation Requirements	Decomposition and explanation of graduation requirements
<b>9. Individuals and Team Work:</b> Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings, create a collaborative and inclusive environment, establish work goals, organize task implementation, and promote goals.	9.1 Communicate effectively with members of other disciplines and work together;
	9.2 Work independently or cooperatively in a computer field team;
	9.3 Organize, coordinate, and direct the work of a team in the computer field.
<b>10. Communication:</b> Communicate effectively on complex engineering activities in computer science and technology 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, and give and receive clear instructions.	10.1 Accurately express opinions on professional issues in the computer field, verbally, manuscripts, charts, etc., respond to queries, in communication with the engineering community;
	10.2 Accurately express opinions on professional issues in the computer field, verbally, manuscripts, charts, etc., respond to queries, in communication with society at large, and understand the differences in communication with industry peers and the public.
<b>11. International Perspective:</b> Track the development and dynamics of the international engineering field, understand the development trend of modern engineering technology cross-integration, understand the relevant standards in the engineering field of different countries, respect the differences of different cultures, and be able to communicate and exchange in the cross-cultural context.	11.1 Pay attention to global issues, understand, and respect the differences and diversity of different cultures in the world, and understand the development trend of the intersection of modern engineering and technology in the computer field and related disciplines in the field;
	11.2 Have the language and written expression skills for cross-cultural communication and communicate and communicate on professional issues related to computer science and technology in a cross-cultural context.
<b>12 . Project Management :</b> Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as	12.1 Master the management and economic decision-making methods involved in engineering projects in the computer field;
	12.2 Understand the engineering management and economic decision-making issues involved in the cost composition of the entire cycle and the entire process of engineering and product in the computer field;

Graduation Requirements	Decomposition and explanation of graduation requirements
a member and leader in a team, to manage projects and in multidisciplinary environments.	12.3 Apply engineering management and economic decision-making methods in a multi-disciplinary environment.
<b>13. Lifelong Learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	13.1 Can have the consciousness of independent learning and lifelong learning;
	13.2 Can continuously learn and adapt to development.

## IV. Academic Discipline

Computer Science and Technology

## V. Core Courses

Computer Programming, Discrete Mathematics, Algorithm and Data Structures, Principles of Computer Organization, Database Principles, Software Engineering, Operating Systems, Computer Networks

## VI. Graduation Criterion and Degree

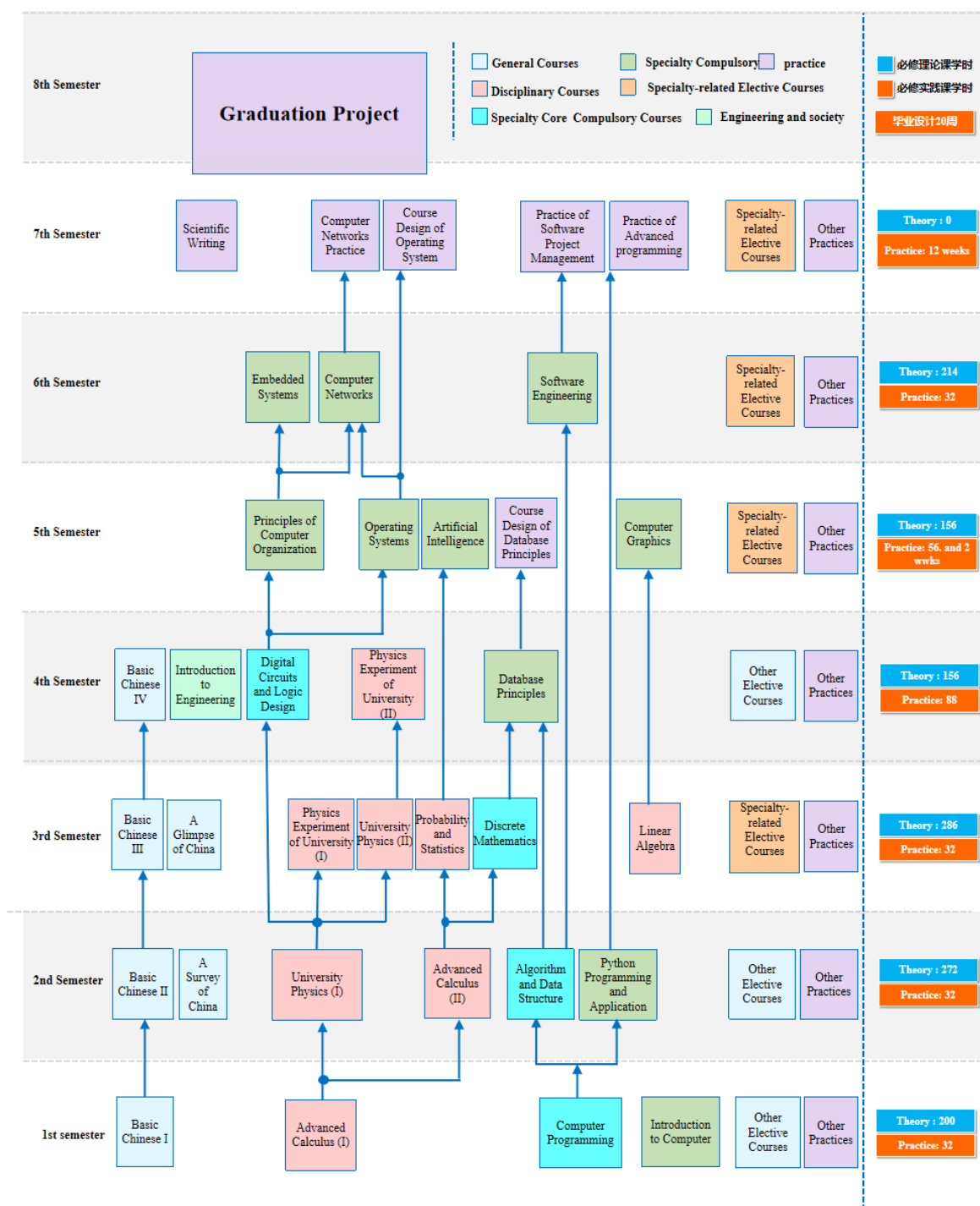
1. Graduation Credit Required: 120. General Courses 16 credits, Disciplinary Courses 23 credits, Specialty Courses 57 credits, Practical Activities and Training Courses 24credits.
2. Meeting the needs of undergraduate physical criteria.
3. Upon graduation, students must hold an HSK4 certificate or above.
4. Duration: 4 years.
5. Degree Conferred: Bachelor of Engineering.

## VII. Courses system

Course Module	Course Type	Properties	Counts	Credits	Semester
General Courses (minimum: 16 credits)	General Courses	Compulsory	16	16	1~4
Disciplinary Courses (minimum: 23 credits)	Basic Mathematics	Compulsory	4	15	1~3
	Basic Physics	Compulsory	4	8	2~4
Specialty Courses (minimum: 81 credits)	Specialty	Compulsory	17	44	1~6
		Elective	9	13	3~7
	Practice of Specialty	Compulsory	7	24	5~8

## VIII. Course Map

“Computer Science and Technology” --Course Map



## IX. Courses Design

Course Module	Course Type	ID	Course Title	Properties	Assessment method	Credits	Total	Theory Hours	Practical Hours	Semester
General Courses (16 credits)	General Courses	49024012	Basic Chinese I	Compulsory	Exam	3	48	48		1
		49023012	Basic Chinese II	Compulsory	Exam	3	48	48		2
		49025012	Basic Chinese III	Compulsory	Exam	3	48	48		3
		49022012	Basic Chinese IV	Compulsory	Exam	3	48	48		4
		14884008	A Survey of China	Compulsory	Exam	2	32	32		2
		14319008	A Glimpse of China	Compulsory	Term Paper	2	32	32		3
Disciplinary Courses (23 credits)	Mathematics (15 credits)	08112450	Advanced Calculus (I)	Compulsory	Exam	5	80	80		1
		08112640	Advanced Calculus (II)	Compulsory	Exam	4	64	64		2
		11127012	Linear Algebra	Compulsory	Exam	3	48	48		3
		11059012	Probability and Statistics	Compulsory	Exam	3	48	48		3
	Physics (8 credits)	14937012	University Physics (I)	Compulsory	Exam	3	48	48		2
		14936012	University Physics (II)	Compulsory	Exam	3	48	48		3
		14939004	Physics Experiment of University (I)	Compulsory	Test	1	32		32	3
		14938004	Physics Experiment of University (II)	Compulsory	Test	1	32		32	4
Specialty Courses (81 学分)	Specialty Core Compulsory	14885012	*Computer Programming	Compulsory	Exam	3	64	32	32	1
		14904014	*Algorithm and Data Structures	Compulsory	Exam	3.5	64	48	16	2
		14905014	Digital Circuits and Logic	Compulsory	Exam	3.5	64	48	16	4

Course Module		Course Type	ID	Course Title	Properties	Assessment method	Credits	Total	Theory Hours	Practical Hours	Semester
	Core Courses (44 credits)	Courses		Design							
			14906016	*Discrete Mathematics	Compulsory	Exam	4	64	64		3
		Specialty	14892010	Introduction to Computer	Compulsory	Exam	2.5	40	40		1
			46121010	Python Programming and Application	Compulsory	Exam	2.5	48	32	16	2
			18519016	*Principles of Computer Organization	Compulsory	Exam	4	72	56	16	5
			14902010	Computer Graphics	Compulsory	Exam	2.5	48	32	16	5
			14901012	*Database Principles	Compulsory	Exam	3	64	32	32	4
			14900012	*Software Engineering	Compulsory	Exam	3	60	36	24	6
			16056008	Artificial Intelligence	Compulsory	Exam	2	36	28	8	5
			14897012	*Operating Systems	Compulsory	Exam	3	56	40	16	5
			14896012	*Computer Networks	Compulsory	Exam	3	56	40	16	6
			14908010	Embedded Systems	Compulsory	Exam	2.5	48	32	16	6
		Engineering and society	18518008	Introduction to Engineering	Compulsory	Exam	2	36	28	8	4
	Elective Courses (13学分)	Specialty-related Elective Courses	14918012	Object-oriented Programming	Elective	Test	3	56	40	16	3
			14894008	Digital Signal Processing	Elective	Test	2	32	32		5
			14917008	Algorithm Design and Analysis	Elective	Test	2	32	32		5
			14916008	Image processing	Elective	Test	2	32	32		6
			14915008	Machine Learning Algorithm	Elective	Test	2	32	32		6
			14913008	Audio Signal Analysis and Retrieval	Elective	Test	2	32	32		6



Course Module		Course Type	ID	Course Title	Properties	Assessment method	Credits	Total	Theory Hours	Practical Hours	Semester
			14912008	Wireless Communications Principles and Practice	Elective	Test	2	32	32		6
			14914008	Pattern recognition	Elective	Test	2	32	32		6
			14911004	Intelligent Hardware-reconfigurable CPU for Image Processing	Elective	Test	1	16	16		7
	Practical Activities (24 credits)	Practical Activities for Specialty	14889008	Course Design of Database Principles	Compulsory	Term Paper	2	2 weeks		2 weeks	5
			14888008	Course Design of Operating System	Compulsory	Term Paper	2	2 weeks		2 weeks	7
			46119008	Scientific Writing	Compulsory	Term Paper	2	2 weeks		2 weeks	7
			46120016	Practice of Advanced programming	Compulsory	Term Paper	4	4 weeks		4 weeks	7
			14910008	Practice of Software Project Management	Compulsory	Term Paper	2	2 weeks		2 weeks	7
			14920008	Computer Networks Practice	Compulsory	Term Paper	2	2 weeks		2 weeks	7
			16404040	Graduation Project (Graduation Dissertation)	Compulsory	Paper	10	20 weeks		20 weeks	7-8
Innovation and Entrepreneurship Practice Innovation and Entrepreneurship Practice		Obtain innovation practice credits based on actual conditions, such as participating in various large-scale innovations, competitions, etc.									1-8

Note: Fresh graduates applying for exemption from examinations for postgraduate studies must complete two innovation and entrepreneurship practice credits.

## X. Courses Arrangement by Semester

Semester	Course Module	Course Title	Properties	Credits	Total	Theory Hours	Practical Hours
1st semester	General Courses	Basic Chinese I	Compulsory	3	48	48	
	Disciplinary Courses	Advanced Calculus (I)	Compulsory	5	80	80	
	Specialty Course	* Computer Programming	Compulsory	3	64	32	32
		Introduction to Computer	Compulsory	2.5	40	40	
	Total: 13.5 credits						
2nd Semester	General Courses	Basic Chinese II	Compulsory	3	48	48	
		A Survey of China	Compulsory	2	32	32	
	Disciplinary Courses	Advanced Calculus (II)	Compulsory	4	64	64	
		University Physics (I)	Compulsory	3	48	48	
	Specialty Course	Python Programming and Application	Compulsory	2.5	48	32	16
		Algorithm and Data Structures	Compulsory	3.5	64	48	16
	Total: 18 credits						
3rd Semester	General Courses	Basic Chinese III	Compulsory	3	48	48	
		A Glimpse of China	Compulsory	2	32	32	
	Disciplinary Courses	University Physics (II)	Compulsory	3	48	48	
		Linear Algebra	Compulsory	3	48	48	
		Probability and Statistics	Compulsory	3	48	48	
		Physics Experiment of University (I)	Compulsory	1	32		32
	Specialty Course	* Discrete Mathematics	Compulsory	4	64	64	
	Total: 19 credits, suggest to study 1-3 credits selected courses.						
4th Semester	Disciplinary Courses	Basic Chinese IV	Compulsory	3	48	48	
		Physics Experiment of University (II)	Compulsory	1	32		32
	Specialty Course	Digital Circuits and Logic Design	Compulsory	3.5	64	48	16
		Introduction to	Compulsory	2	36	28	8

		Engineering					
		*Database Principles	Compulsory	3	64	32	32
	Total:12.5credits, suggest to study 3-4 credits selected courses.						
5th Semester	Specialty Course	*Principles of Computer Organization	Compulsory	4	72	56	16
		Artificial Intelligence	Compulsory	2	36	28	8
		Computer Graphics	Compulsory	2.5	48	32	16
		*Operating Systems	Compulsory	3	56	40	16
		Course Design of Database Principles	Compulsory	2	2weeks		2weeks
	Total:13.5 credits, suggest to study 3-4 credits selected courses.						
6th Semester	Specialty Course	Embedded Systems	Compulsory	2.5	48	48	8
		*Software Engineering	Compulsory	3	60	36	24
		*Computer Networks	Compulsory	3	56	40	16
	Total:8.5 credits, suggest to study 3-6 credits selected courses.						
7th Semester	Specialty Course	Scientific Writing	Compulsory	2	2weeks		2weeks
		Practice of Software Project Management	Compulsory	2	2weeks		2weeks
		Course Design of Operating System	Compulsory	2	2weeks		2weeks
		Practice of Advanced programming	Compulsory	4	4weeks		4weeks
		Computer Networks Practice	Compulsory	2	2weeks		2weeks
		Graduation Project (Graduation Dissertation)	Compulsory	10	20 weeks		4 weeks
	Total:12 credits, suggest to study some credits selected courses. (The credits of the graduation project are not counted in the current semester)						
8th Semester	Specialty Course	Graduation Project (Graduation Dissertation)	Compulsory	10	20 weeks		16 weeks
	Total:10 credits						

## The Relationship Matrix Between Course and Graduation Requirements

Graduation Requirements Course Title	1. Moral Cultivation	2. Engineering Knowledge	3. Problem Analysis	4. Design/ Development Solutions	5. Research	6. Use Modern Tools	7. Engineering and Society	8. Professional Norms	9. Individuals and Teams	10. Communication	11. International Perspective	12. Project Management	13. Life-long Learning
Basic Chinese	H												M
A Glimpse of China	H												M
A Survey of China	H										L		
Advanced Calculus		H	M										
Linear Algebra		H	M										
Probability and Statistics		H	M										
University Physics		H	M										
Physics Experiment of University					L	M			M				
*Computer Programming	M	H											M
Introduction to Computer							H						M
*Discrete Mathematics		M	H										
Python Programming and Application		H							M				M
Digital Circuits and Logic Design		H				L							
*Algorithm and Data Structures			H		L								
*Principles of Computer Organization	M					H							
Computer Graphics						H							
Introduction to Engineering							H	H					

Graduation Requirements  Course Title	1. Moral Cultivat ion	2. Engineer ing Knowled ge	3. Problem Analysis	4. Design /Develop Solutio ns	5. Research	6. Use Modern Tools	7. Engineer ing and Society	8. Professi onal Norms	9. Individu als and Teams	10. Communi cation	11. Internati onal Perspecti ve	12. Project Manage ment	13. Life-lon g Learning
*Database Principles	M			H									
*Software Engineering				H								H	
Artificial Intelligence					H						M		
*Operating Systems		M			H								
*Computer Networks	M				H								
Embedded Systems			H	H									
Course Design of Database Principles					M				H				
Course Design of Operating System					M				H				
Scientific Writing											H		M
Graduation internship							H	H					M
Practice of Software Project Management										M		H	
Practice of Advanced programming						M			H				
Computer Networks Practice				H			M						
Graduation Project (Graduation Dissertation)				H				H		M	M	H	

Note: 1、H-strong correlation; M-medium correlation; L-weak correlation;

2、Those with "\*" in front of the course name are the core courses.

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