Hangzhou Normal University Undergraduate Program in Data Science and Big Data Technology

(For International Students)

I. Training Goals

This major is oriented by the needs of the data industry and is guided by the technical methods of big data management and statistical analysis. It strives to achieve the objectives as follows:

Goal 1: Good Chinese language skills and fully understanding the Chinese culture, policies, and regulations;

Goal 2: Master the basic theory and basic knowledge of the major of data science and big data technology**;**

Goal 3: The ability of data collection, storage, processing, analysis, and display;

Goal 4: Be capable of using the knowledge and technology to solve practical problems in finance, engineering, and related fields;

Goal 5: Developing the ability to master new knowledge and new technology, problem-solving ability, communication ability, and team cooperation ability**;**

Goal 6: Be qualified to engage in big data research, big data analysis, big data application development, big data system development, big data visualization, and big data decision-making.

II. Graduate Outcomes

After the professional study, graduates should acquire the following knowledge, abilities, and qualities:

1. Engineering Knowledge: Have a solid knowledge foundation on natural science, data science and big data technology, and engineering knowledge, and be able to apply this knowledge comprehensively to solve complex engineering problems in the field of data science and big data industry.

2. Problem Analysis: Able to apply the basic principles of natural science and data science and big data technology to identify, express, and analyze complex engineering

problems in the field of data science and big data technology by literature research to obtain effective conclusions.

3. Design/Development Solutions: Able to comprehensively use theory and technical means to design solutions to complex engineering problems in the field of data science and big data technology, and design systems and units (components) that meet the needs of information acquisition, transmission, processing or use, etc. And be able to reflect the sense of innovation in the design process, considering social, health, safety, legal, cultural and environmental factors.

4. Investigation: Able to study complex engineering problems in the field of data science and big data technology based on scientific principles and adopting scientific methods, including designing experiments, analyzing and interpreting data, and obtaining reasonable and effective conclusions through information synthesis.

5. Modern tools Usage: be able to select, use and develop appropriate resources, modern engineering tools, and information technology tools for complex engineering problems in the field of data science and big data technology, including the prediction and simulation of data science and big data engineering problems, and be able to understand the limitation.

6. The Engineer and Society: Apply reasoning informed by contextual knowledge of data science and big data technology to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex data science and big data technology problems.

7. Environment and Sustainability: Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts.

8. Professional Ethics: Have humanities and social science literacy, a sense of social responsibility, be able to understand and abide by engineering ethics and norms in data science and big data engineering practice, and perform responsibilities.

9. Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.

10. Communication: Communicate effectively on complex data science and big data engineering activities 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. Have a certain international perspective, communicate and exchange in the

cross-cultural context.

11. Project Management: Have project management capabilities, understand the principles of data science and big data engineering practice project management and economic decision-making methods, and be able to apply in a multidisciplinary environment.

12. Lifelong Learning: have the consciousness of independent learning and lifelong learning, and have the ability to continuously learn and adapt to development.

III Relation matrix related to training goals, graduate outcomes, and curriculum system

1. Relation matrix between training objectives and graduate outcomes

Graduate Outcomes	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6
1		●	●			●
2		●	●			●
3		●	●			●
4		●	●			●
5		●	●			●
6			●			●
7	●		●	●		●
8	●			●		●
9				●	●	
10	●			●	●	
11			●	●	●	●
12	●			●	●	

Note: Mark with ● in the corresponding cells of the table.

2. Relation matrix between graduate outcomes and curriculum system

(Identified by the correlation degree, the correlation degree between the course and

a graduate outcome is qualitatively estimated according to the support strength of the course to the corresponding graduate outcome. H refers to the high correlation, M refers to the moderate correlation, and L refers to the low correlation.)

Course Type	Course Name	Graduate Outcomes											
		1	2	3	4	5	6	7	8	9	10	11	12
Compulsory Course of General Education	Starting Education Course						L		M		M		M
	Elementary Chinese I						L				H		M
	Elementary Chinese Listening and Speaking I						L				H		M
	Elementary Chinese Ⅱ						L				H		M
	Elementary Chinese Listening and Speaking Ⅱ						L				H		M
	Intermediate Chinese I						L				H		M
	Intermediate Chinese Listening and Speaking Ⅰ						L				H		M
	Intermediate Chinese Ⅱ						L				H		M
	Intermediate Chinese Listening and Speaking Ⅱ						L				H		M
	Enhanced Guidance on HSK						L				H		M
	Chinese Overview Ⅰ						M	L					
	Chinese Overview Ⅱ						M	L					
	Chinese Road and Chinese Model						M	L					
	Social Practice						M	H	M		M		
Basic Courses of the Discipline	Advanced Mathematics		M		M	M							
	Linear Algebra		M		M	M							
	Introduction to Computer Science	M			M		M		M				M
	Programming Fundamentals			H	M							M	
Core Major Courses	Discrete Mathematics	H		M	M								
	▲Database Principles	H		H	M		M						
	Object-Oriented Programming			M					H	H		M	
	Digital Logic		H	M									

Course Type	Course Name	Graduate Outcomes											
		1	2	3	4	5	6	7	8	9	10	11	12
	▲Operating System	H	H	H			H						
	▲Data Structure		M		H								
	▲Data Structure Projects		M		H								
	▲Algorithm Analysis and Design		H		H								
	▲Computer Principles	H		H									
	Computer Networks	H	H		M				M				
	Big Data Analysis	M	H	H	H								
	Application and Development of Big Data Technology	M	H	H				H					
	Mobile Application Development	M				H			M	M		M	
	Software Engineering			M			H			H	H	H	
	▲Data Mining	M	H		H								H
	Introduction to Cloud Computing			M			H	M					M
	Network and Information Security	M		M				H					
	Human-Computer Interaction and Virtual Reality			M	M	H							
	C++ Programming			M	H	H							
	Artificial Intelligence	M		M		H		H					H
Practice Programs and Graduate Design (Thesis)	Information Technology Practice								H		H		
	Internship1			M	M		H		H	H			
	▲Internship2			M	M	H	H	H				H	
	▲Thesis 1			H	M	M					H	H	H
	▲Thesis 1			M	H	M				H	H		H

IV Disciplinary basic courses and professional core courses

1. Disciplinary basic courses

Advanced Mathematics, Linear Algebra, Introduction to Computer Science, Programming Fundamentals

2. Professional core courses

Discrete Mathematics, Database Principles, Object-Oriented Programming, Digital Logic, Operating System, Data Structure, Data Structure Projects, Algorithm Analysis and Design, Computer Principles, Artificial Intelligence, Mobile Application Development, Software Engineering, C++ Programming, Computer Networks, Introduction to Cloud Computing, Network and Information Security, Human-Computer Interaction and Virtual Reality, Data Mining, Big Data Analysis, Application and Development of Big Data Technology

V Criteria for professional admission

1. Curriculum requirements for professional admission and the time for professional classification

Students can obtain admission to study in Data Science and Big Data Technology when meeting the condition that the courses, which are Introduction to Computer Science, Programming Fundamentals, and Linear Algebra, should be learned and achieve 9.5 credits.

Time for professional classification: At the end of the second semester.

2. Curriculum requirements for graduation

Bachelor's degree can be granted to students whose credits are no less than 56, which include 14 credits for basic courses of the discipline, 22credits for core major courses, and 20 credits for practice programs.

VI Length of Schooling, Degree and Credits Requirements for Graduation

1. Length of Schooling: The length of schooling is four years and no longer than six years.

2. Degree Conferred: A Bachelor Degree in Engineering in Computer Science.

3. The Graduation Credits: 160。

4. Pass HSK (Level 4) with a minimum score of 180。

VII Minimum credits for graduation

The minimum graduation credits for computer science and technology are 160, in which 40 credits are from general courses, 14 credits are from the basic courses of the discipline, 64 credits are from core major courses, and 42 credits are from practice programs.

Under the premise that the students have completed the credits of the general

education courses stipulated by the school, they have completed all the credits of the approved courses of the major, and the degree courses have met the corresponding requirements. As long as the total scores meet the graduation and degree requirements of the corresponding major, they can be granted graduation and corresponding degrees.

VIII The curriculum and distribution of credits

1. Curriculum Structure

The curriculum consists of general education courses and major courses. The general education courses are related to starting education, Chinese language, Chinese overview, Chinese road and pattern, and practical programs. And the major courses consist of basic courses and core major courses.

Table 1： List of the Credit Allocation

Category	Curriculum type	Number of Courses	Credits		Practical Credits	
			Credits	Credit Ratios (%)	Practical Credits	Credit Ratios of Practical Programs (%)
General Education	Starting Education	1	1	0.6		
	Chinse Language Development	10	30	18.8		
	Chinese Overview	2	4	2.5		
	Chinese Road and Chinese Model	1	3	1.9		
	Social Practice	1	2	1.3		
Basic Courses of the Discipline	Required Courses	4	14	8.8	2	1.3
Core Major Courses	Required Courses	19	64	40	22.5	14.1
Practical Programs	Required Courses	5	42	26.3	42	26.3
Total		46	160	100	66.5	41.6

3. The curriculum and course arrangement

In the tables below, CPA refers to Courses for Professional Admission, CG refers to

Courses for Graduation, and SC refers to Supplementary Courses.

Table 2：Curriculum Setting and Credit Allocation for General Education

(1) General Educational Courses, 40 credits

Course ID	Course Name	Credits	In-class Hours		Semester	Notes
			Lecture Hours	Experimental (Training) Hours		
221163001	★始业教育类 Starting Education	1	16		First	
801035011	*初级汉语综合I Elementary Chinese I	4	64		First	
801036011	*初级汉语听说I Elementary Chinese Listening and Speaking I	4	64		First	
801037012	*初级汉语综合II Elementary Chinese II	4	64		Second	
801038012	*初级汉语听说II Elementary Chinese Listening and Speaking II	4	64		Second	
801039013	*中级汉语综合I Intermediate Chinese I	4	64		Third	
801040013	*中级汉语听说I Intermediate Chinese Listening and Speaking I	4	64		Third	
801041014	*中级汉语综合II Intermediate Chinese II	2	32		Fourth	
801042014	*中级汉语听说II Intermediate Chinese Listening and Speaking II	2	32		Fourth	
801050111	◆HSK 强化辅导 Enhanced Guidance on HSK	2	32		Fifth	
221116001	★*中国概况I Chinese Overview I	2	32		First	
221116002	★*中国概况II Chinese Overview II	2	32		Second	
221161001	*中国道路与中国模式类 Chinese Road and Chinese Model	3	48		Third	

Course ID	Course Name	Credits	In-class Hours		Semester	Notes
			Lecture Hours	Experimental (Training) Hours		
221162001	◆社会实践类 Social Practice Program	2	32		Seventh	

Table 3： Curriculum Setting and Credit Allocation for Major Courses

(1) Basic Courses of the discipline, 14 credits

Course ID	Course Name	Credits	In-class Hours		Semester	Notes		
			Lecture Hours	Experimental (Training) Hours		CPA	CG	SC
224111011	*高等数学 Advanced Mathematics	4.5	72	0	First		√	
224112011	*线性代数 Linear Algebra	2.5	40	0	First	√	√	
224113011	*计算机科学导论 Introduction to Computer Science	2	32	0	First	√	√	
224114111	*程序设计基础 Programming Fundamentals	5	48	32	First	√	√	

(2) Core Major Courses, 62 credits

Course ID	Course Name	Credits	In-class Hours		Semester	Notes		
			Lecture Hours	Experimental (Training) Hours		CPA	CG	SC
224121011	*离散数学 Discrete Mathematics	3	48	0	Second			
224122111	*▲数据库原理 Database Principles	4	48	16	Second		√	
224123111	*面向对象程序设计 Object-Oriented Programming	4	32	32	Second			

224124111	*数字逻辑 Digital Logic	4	64	0	Second			
224211121	*▲操作系统 Operating System	3	32	16	Third		√	
224212021	*▲数据结构 Data Structure	3	48	0	Third		√	
224213221	*▲数据结构实验 Data Structure Projects	2	0	32	Third		√	
224214121	*▲算法分析与设计 Algorithm Analysis and Design	3	48	0	Third		√	
224215021	*▲计算机原理 Computer Principles	3	48	0	Third		√	
224325131	人工智能 Artificial Intelligence	2	32	0	Fourth			
224221121	*计算机网络 Computer Networks	3	32	16	Fourth			
224224121	移动应用开发 Mobile Application Development	4	32	32	Fourth			
224314031	云计算概论 Introduction to Cloud Computing	1.5	18	6	Fifth			
224311131	软件工程 Software Engineering	3	24	24	Fifth			
224324131	C++编程 C++ Programming	2.5	20	20	Fifth			
224316131	*▲数据挖掘 Data Mining	4	32	32	Fifth		√	
224317131	大数据分析 Big Data Analysis	4	32	32	Fifth			
224326131	大数据技术应用与开发 Application and Development of Big Data Technology	5	40	40	Sixth			
224321031	网络与信息安全 Network and Information Security	3	24	24	Sixth			

224322131	人机交互与虚拟现实 Human-Computer Interaction and Virtual Reality	3	32	16	Sixth			

Table 4．Curriculum Setting and Credit Allocation for Practical Programs

1. Practice Programs, 44 credits

Course ID	Course Name	Credits	In-class Hours		Semester	Notes		
			Lecture Hours	Experimental (Training) Hours		CPA	CG	SC
224125311	信息技术实践 Information Technology Practice	2		32	Second			
224411341	专业实习 1 Internship1	20		320	Seventh			
224411342	▲专业实习 2 Internship1	10		160	Eighth		√	
224412341	▲论文 1 Thesis 1	5		80	Seventh		√	
224412342	▲论文 2 Thesis 1	5		80	Eighth		√	

Note: 1. Annotation symbols: Degree Program▲, Bilingual Courses★, Independent Experimental (Training) program◆, Examination Class *.

2. In the table, the supplementary courses and the courses for admission and graduation are marked with the character √.

数据科学与大数据专业本科培养方案

（国际学生）

一、培养目标

本专业以数据产业需求为导向，以大数据管理、统计分析的技术方法为主线，着力培养具备较好的汉语语言能力，了解中国的国情、文化和政策法规【目标 1】，掌握数据科学与大数据技术专业的基本理论和基础知识【目标 2】，具有数据采集、存储、处理、分析与展示的基本能力【目标 3】，能够运用所学知识与技术在金融、工程及相关领域解决实际问题【目标 4】，具有良好的掌握新知识和新技术的能力、问题解决能力、沟通能力和团队合作能力【目标 5】，能够从事大数据研究、大数据分析、大数据应用开发、大数据系统开发、大数据可视化及大数据决策等工作的高素质应用型人才【目标 6】。

二、毕业要求

通过专业学习，毕业生应获得以下几方面的知识、能力和素质：

1. 工程知识：具有扎实的自然科学知识、数据科学与大数据专业知识和工程知识，并能够综合应用这 些知识解决数据科学与大数据技术领域的复杂工程问题。

2. 问题分析：能够应用自然科学和数据科学及大数据的基本原理，识别、表达、并通过文献研究分析数据科学与大数据领域复杂工程问题，以获得有效结论。

3. 设计/开发解决方案：能够综合运用理论和技术手段，设计针对数据科学与大数据领域复杂工程问 题的解决方案，设计满足信息获取、传输、处理或使用等需求的系统、单元（部件），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数据科学与大数据领域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：能够针对数据科学与大数据领域的复杂工程问题，选择、使用与开发合适的资源、现代工程工具和信息技术工具，包括对复杂计算机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：能够基于数据科学与大数据专业相关背景知识进行合理分析，评估专业工程实践和复杂数据科学与大数据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数据科学与大数据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，能够在数据科学与大数据工程实

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：能够就数据科学与大数据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。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：具有项目管理能力，能理解数据科学与大数据工程实践项目管理的原理与经济决策方法，并能够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。

三、“培养目标-毕业要求”和“毕业要求-课程体系”对应矩阵

（一）“培养目标-毕业要求”

	目标 1	目标 2	目标 3	目标 4	目标 5	目标 6
毕业要求 1		●	●			●
毕业要求 2		●	●			●
毕业要求 3		●	●			●
毕业要求 4		●	●			●
毕业要求 5		●	●			●
毕业要求 6			●			●
毕业要求 7	●		●	●		●
毕业要求 8	●			●		●
毕业要求 9				●	●	
毕业要求 10	●			●	●	
毕业要求 11			●	●	●	●
毕业要求 12	●			●	●	

注：在相应表栏中标注“●”。

（二）“毕业要求-课程体系”对应矩阵

（以关联度标识，课程与某个毕业要求的关联度根据该课程对相应毕业要求的支撑强度来定性估计，H：表示关联度高；M：表示关联度中；L：表示关联度低。）

课程性质	课程名称	毕业要求											
		1	2	3	4	5	6	7	8	9	10	11	12
思想教育必修课	始业教育类						L		M		M		M
	初级汉语综合I						L				H		M
	初级汉语听说I						L				H		M
	初级汉语综合II						L				H		M
	初级汉语听说II						L				H		M
	中级汉语综合I						L				H		M
	中级汉语听说I						L				H		M
	中级汉语综合II						L				H		M
	中级汉语听说II						L				H		M
	HSK 强化辅导						L				H		M
	中国概况I						M	L					
	中国概况II						M	L					
	中国道路与中国模式类						M	L					
	社会实践类						M	H	M		M		
学科基础平台课	高等数学		M		M	M							
	线性代数		M		M	M							
	计算机科学导论	M			M		M		M				M
	程序设计基础			H	M							M	
专业核心课	离散数学	H		M	M								
	▲数据库原理	H		H	M		M						
	面向对象程序设计			M					H	H		M	
	数字逻辑		H	M									
	▲操作系统	H	H	H			H						
	▲数据结构		M		H								
	▲数据结构实验		M		H								
	▲算法分析与设计		H		H								
	▲计算机原理	H		H									

课程性质	课程名称	毕业要求											
		1	2	3	4	5	6	7	8	9	10	11	12
	计算机网络	H	H		M				M				
	大数据分析	M	H	H	H								
	大数据技术应用与开发	M	H	H				H					
	移动应用开发	M				H			M	M		M	
	软件工程			M			H			H	H	H	
	▲数据挖掘	M	H		H								H
	云计算概论			M			H	M					M
	网络与信息安全	M		M				H					
	人机交互与虚拟现实			M	M	H							
	C++编程			M	H	H							
	人工智能	M		M		H		H					H
实践环节、毕业论文（设计）和其他	信息技术实践								H		H		
	专业实习 1			M	M		H		H	H			
	▲专业实习 2			M	M	H	H	H				H	
	▲论文 1			H	M	M					H	H	H
	▲论文 2			M	H	M				H	H		H

四、学科基础平台课程和专业核心课程

(一) 学科基础平台课程

高等数学、线性代数、计算机科学导论、程序设计基础

（二）专业核心课程

离散数学、数据库原理、面向对象程序设计、数字逻辑、操作系统、数据结构、数据结构实验、算法分析与设计、计算机原理、人工智能、移动应用开发、软件工程、C++编程、计算机网络、云计算概论、网络与信息安全、人机交互与虚拟现实、数据挖掘、大数据分析、大数据技术应用与开发

五、专业准入和准出标准

（一）准入课程要求及分流时间

学生修满下列课程：计算机科学导论（2 学分）、程序设计基础（5 学分）、线性代数（2.5 学分）。获得 9.5 学分，准许进入数据科学与大数据专业进行学习。

分流时间：第二学期期末。

（二）准出课程要求

学生获得学士学位的最低课程要求是 56 学分，包含所有专业类基础平台课程 14 学分，专业核心课程 22 学分，实践环节 20 学分。

六、学制和学位

1．学制：学制为 4 年，最长不超过 6 年；

2．授予学位：授予计算机工学学位；

3．本专业毕业学分要求：160。

4．通过中国汉语水平考试（HSK）新四级考试（180 分）。

七、最低毕业学分及课内学时

本专业最低毕业学分为 160 学分。其中思想教育课程 40 学分，学科基础平台课程 14 学分，专业核心课程 64 学分，实践环节 42 学分。

学生在修完学校规定的通识教育课程学分的前提下，修完专业所有准出课程学分，学位课程达到相应要求的前提下，总学分数只要达到相应专业的毕业及学位要求，即可准予毕业，并授予相应学位。

八、课程结构、课程设置及学分分配

（一）课程结构

课程结构由思想教育课程和专业课程组成。思想教育课程包括始业教育类、汉语能力类、中国概况类、中国道路与中国模式类和社会实践类课程；专业课程包括学科基础平台课程和专业核心课程。

表 1 课程结构比例表

课程类型	修习类型	课程门数	学分		实践学分	
			学分数	学分比例 (%)	实践学分数	实践学分比例 (%)
思想教育课程	始业教育类	1	1	0.6		
	汉语能力培养	10	30	18.8		
	中国概况类	2	4	2.5		
	中国道路与中国模式类	1	3	1.9		
	社会实践类	1	2	1.3		
学科基础平台课程	必修课	4	14	8.8	2	1.3
专业核心课程	必修课	19	64	40	22.5	14.1
实践环节	必修课	5	42	26.3	42	26.3
合计		41	160	100	66.5	41.6

（二）课程设置与学分分配

表 2 思想教育课程设置与学分分配

1．思想教育必修课程 40 学分

课程代码	课 程 名 称	课程学分	课内学时		建议修读年级学期	备注
			理论课	实验(训)课		课外学时
221163001	★始业教育类 Starting Education	1	16		一秋	
801035011	*初级汉语综合I Elementary Chinese I	4	64		一秋	
801036011	*初级汉语听说I Elementary Chinese Listening and Speaking I	4	64		一秋	
801037012	*初级汉语综合II Elementary Chinese II	4	64		一春	
801038012	*初级汉语听说II Elementary Chinese Listening and Speaking II	4	64		一春	
801039013	*中级汉语综合I Intermediate Chinese I	4	64		二秋	
801040013	*中级汉语听说I Intermediate Chinese Listening and Speaking I	4	64		二秋	
801041014	*中级汉语综合II Intermediate Chinese II	2	32		二春	
801042014	*中级汉语听说II Intermediate Chinese Listening and Speaking II	2	32		二春	
801050111	◆HSK 强化辅导 Enhanced Guidance on HSK	2	32		三秋	
221116001	★*中国概况I Chinese Overview I	2	32		一秋	
221116002	★*中国概况II Chinese Overview II	2	32		一春	
221161001	*中国道路与中国模式类 Chinese Road and Chinese Model	3	48		二秋	
221162001	◆社会实践类 Social Practice Program	2	32		四秋	

表 3 专业课程设置与学分分配

1．学科基础平台课程　14 学分

课程代码	课 程 名 称	课程学分	课内学时		建议修读学期	备注		
			理论课	实验(训)课		准入课程	准出课程	副修课程
224111011	*高等数学 Advanced Mathematics	4.5	72	0	一秋		√	
224112011	*线性代数 Linear Algebra	2.5	40	0	一秋	√	√	
224113011	*计算机科学导论 Introduction to Computer Science	2	32	0	一秋	√	√	
224114111	*程序设计基础 Programming Fundamentals	5	48	32	一秋	√	√	

2．专业核心课程　64 学分

课程代码	课 程 名 称	课程学分	课内学时		建议修读学期	备注		
			理论课	实验(训)课		准入课程	准出课程	副修课程
224121011	*离散数学 Discrete Mathematics	3	48	0	一春			
224122111	▲*数据库原理 Database Principles	4	48	16	一春		√	
224123111	*面向对象程序设计 Object-Oriented Programming	4	32	32	一春			
224124111	*数字逻辑 Digital Logic	4	64	0	一春			
224211121	▲*操作系统 Operating System	3	32	16	二秋		√	
224212021	▲*数据结构	3	48	0	二秋		√	

课程代码	课 程 名 称	课程学分	课内学时		建议修读学期	备注		
			理论课	实验(训)课		准入课程	准出课程	副修课程
	Data Structure							
224213221	▲*数据结构实验 Data Structure Projects	2	0	32	二秋		√	
224214121	▲*算法分析与设计 Algorithm Analysis and Design	3	48	0	二秋		√	
224215021	▲*计算机原理 Computer Principles	3	48	0	二秋		√	
224325131	人工智能 Artificial Intelligence	2	32	0	二春			
224221121	*计算机网络 Computer Networks	3	32	16	二春			
224224121	移动应用开发 Mobile Application Development	4	32	32	二春			
224314031	云计算概论 Introduction to Cloud Computing	1.5	18	6	三秋			
224311131	软件工程 Software Engineering	3	24	24	三秋			
224324131	C++编程 C++ Programming	2.5	20	20	三秋			
224316131	▲*数据挖掘 Data Mining	4	32	32	三秋		√	
224317131	大数据分析 Big Data Analysis	4	32	32	三秋			
224326131	大数据技术应用与开发 Application and Development of Big Data Technology	5	40	40	三春			
224321031	网络与信息安全 Network and Information Security	3	24	24	三春			
224322131	人机交互与虚拟现实 Human-Computer Interaction and Virtual Reality	3	32	16	三春			

表 4．实践环节设置与学分分配

2. 实践环节 42 学分

课程代码	课 程 名 称	课程学分	课内学时		建议修读年级学期	备注		
			理论课	实验(践)课		准入课程	准出课程	副修课程
224125311	信息技术实践 Information Technology Practice	2		32	一春			
224411341	专业实习 1 Internship1	20		320	四秋			
224411342	▲专业实习 2 Internship1	10		160	四春		√	
224412341	▲论文 1 Thesis 1	5		80	四秋		√	
224412342	▲论文 2 Thesis 1	5		80	四春		√	

注：1. 课程标注说明：学位课程▲；双语课程★，单独开设实验（训）课程◆；考试课程 *。

2. 准入准出课程和副修课程在表格中打√。