Instructive Cultivation Plan for the Program of Data Science and Big Data Technology

(Grade 2021)

Course code: 080910T

1. Orientation

The program of data science and big data technology is based in Shanghai, facing the Yangtze River Delta region and the whole country, serving the regional economic and social development. It adheres to the direction of school running, adheres to market demand and employment orientation, scientifically builds application capabilities, and cultivate students' scientific computing capabilities, data analysis ability, processing and application capabilities, practical and innovative capabilities. This program is based on the application background of the school, develops in a dislocation with other colleges, and is positioned at the training of industrial big data application talents.

2. Cultivation Objective

1. General Objective

The program of data science and big data technology cultivates comprehensive senior application-oriented technical talents in the field of big data technology and engineering with comprehensive development of morality, intelligence, physical fitness, beauty and labor. The graduates will be of sound character, have scientific humanistic spirit, innovation and entrepreneurial spirit and good professional ethics, and have the ability of independent learning and critical thinking. Graduates will master the basic theories and basic knowledge of computer science and technology, software engineering, big data technology and other related disciplines required by big data science and technology, and will master the core ecological technology and basic skills in the field of big data technology. Through the study of this course, students will be able to serve industrial big data and related industries, be competent for big data engineering development, big data analysis and processing, management and maintenance of big data systems, etc.

2. Cultivation Value

With the objective of cultivating applied engineering and technical talents that adapt to social development, this program will cultivate students to obtain the ability to develop, analyze and process big data in the implementation of professional courses, especially practical courses, be able to manage and maintain big data systems, possess an international vision, the ability of cultural integration, political awareness, overall situation awareness, core awareness, awareness of parity, and equal stress on integrity and ability.

3. Five-Year Goal after Graduation:

Training objective 1: Graduates should master the multidisciplinary comprehensive knowledge required in the field of data science and big data technology, and obtain the ability to analyze and solve comprehensive engineering problems related to data science and big data technology by completing phased comprehensive practical projects with increasing difficulty and degree of integration.

Training objective 2: Have good communication skills, teamwork skills, and be able to serve as team leaders; have a sense of social responsibility and engineering ethics, understand and respect laws and regulations related to data science and big data technology industries.

Training objective 3: Have an innovative spirit and an international vision; master at least one

foreign language, have a basic understanding of the international situation of data science and big data technology and related fields, and be able to communicate and exchange in a cross-cultural context; acquire engineering innovation awareness and ability by completing innovative practical courses.

Training objective 4: Graduates should be able to understand the basic principles of data science and big data technology application project management, be able to use data science and big data technology methods to model, analyze, design and apply application engineering problems, and be able to analyze optimization model through experimental results. Meanwhile, they shall be able to engage in product development, technology application, analysis, decision-making, maintenance, etc. in professional fields related to big data technology.

Training objective 5: Graduates should have the consciousness and ability of autonomous learning and lifelong learning, and be able to adapt to changes in scientific and technological progress and social and economic development needs. Through innovative practical projects and corporate internships, students will learn about and understand the characteristics of rapid knowledge updates, new technologies and new methods in the field of data science and big data technology, and establish stable career goals.

3. Requirement for Graduation

1. Engineering knowledge: Have a solid natural science foundation, master the basic theories and application methods of advanced mathematics, engineering mathematics, college physics and other basic courses; be able to use mathematics, natural sciences, engineering foundations and professional knowledge to solve big data analysis, processing and other issues.

2. Problem analysis: Be able to apply the basic principles of mathematics, natural sciences and engineering sciences to identify, express, and analyze data science and big data technical problems through literature research, and can obtain effective conclusions.

3. Design/development solutions: Be able to design solutions for data analysis and processing problems, design systems, units (components) or data analysis and application processes that meet specific needs, and be able to reflect the sense of innovation in the design process, and consider social, health, safety, legal, cultural and environmental factors.

4. Research: Be able to research big data analysis and processing problems based on scientific principles and by using scientific methods, including designing experiments, analyzing and interpreting data, and obtaining reasonable and effective conclusions through information synthesis and data visualization techniques.

5. Using modern tools: Be able to develop, select and use appropriate technologies, resources, modern engineering tools and information technology tools for big data analysis, processing and application problems, including prediction, modeling and simulation of big data analysis and processing problems, and be able to understand the limitations.

6. Engineering and society: Be able to conduct reasonable analysis based on the background knowledge of data science and big data technology, and evaluate the impact of big data engineering practices and complex data analysis, processing and application problem solutions on society, health, safety, law and culture, and understand the responsibility.

7. Environment and sustainable development: Be able to understand and evaluate the impact of professional engineering practices in the field of data science and big data technology on the sustainable development of the environment and society.

8. Professional standards: Have humanities and social science literacy and a sense of social responsibility, and be able to understand and abide by engineering professional ethics and standards in the practice of data science and big data technology, and always perform

responsibilities.

9. Individuals and teams: Be able to assume the roles of individuals, team members and leaders in a team with a multidisciplinary background.

10. Communication: Be able to effectively communicate and exchange with industry colleagues and the public on complex data science and big data technology issues, including writing reports and design manuscripts, presentations, clear expressions or response instructions, and have a certain international perspective, be able to communicate and exchange in a cross-cultural context.

11. Project management: Understand and master the principles of data engineering management and economic decision-making methods, and can apply them in a multi-disciplinary environment.

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

4. Schooling System

Four-year undergraduate education

5. Length of Study

Generally four years. The length of schooling can be flexible from no less than three years to no longer than six years.

6. Requirements for Graduation and Degree Conferring

Students of this program must complete the minimum credits required for each category of courses and complete all the content specified in extracurricular class according to the requirements of the instructional training plan, and the total credits must reach 154 credits for graduation; those who meet the requirements for bachelor's degree can be conferred bachelor degree in engineering.

7. Discipline

Software engineering, computer science and technology

8. Core Courses

1. Probability Theory and Mathematical Statistics

Through the teaching of this course, students will have a preliminary grasp of the basic theories and methods of dealing with random phenomena, and can apply them to solve some simple practical engineering problems. This course will cultivate students' ability to analyze problems and solve practical problems by using probability and statistics methods. The teaching content includes the basic concepts of probability theory, random variables and their distribution, the numerical characteristics of random variables, the law of large numbers and the central limit theorem, samples and sampling distribution, parameter estimation, hypothesis testing, etc., thus laying the necessary foundation for subsequent study of related professional courses.

2. Foundations of Statistics

The contents of statistics science are divided into descriptive statistics and mathematical statistics. The part of descriptive statistics enables students to understand the general process and methods of statistical investigation and sorting; understand the concepts and functions of statistics; master the common methods of descriptive statistics, such as statistical chart method, comprehensive index method, and index calculation. The part of mathematical statistics is inferential statistics based on

probability theory. Through learning, students will obtain a deep grasp of the most basic theoretical knowledge of inferential statistics, such as statistics, sampling distribution, parameter estimation, hypothesis testing, etc. Through the study of this course, students will be able to initially engage in statistical investigation and research on big data problems in various scenarios according to specific tasks and conditions, and can conduct a quantitative analysis on the basis of qualitative analysis, thus laying a foundation for other professional courses.

3. Foundation of Programming Design (Java-Data)

This course mainly teaches the basic concepts and basic techniques of programming. Taking structured programming language as an example, this course requires students to be more proficient in its grammar and semantics and master the basic methods of structured programming. The knowledge points of this course include data types, control structures, functions, arrays, files, operating mechanisms and preliminary debugging. Through the study of this course, students will master some common programming design skills, master programming techniques of top-down refinement, cultivate good programming habits and styles, and be able to master the basic process of computer programming operations, as well as the basic methods of eliminating grammatical and semantic errors.

4. Data structure and algorithm (Java-Data)

This course mainly teaches data construction methods and algorithms for operating these data structures. The focus of this course is on various typical data structures and their storage structures, related algorithms and basic spatiotemporal analysis, including linear tables and their derived structures (stacks, queues, strings and multidimensional arrays), trees and graphs, and typical algorithms for search and internal sorting. The focus is to enable students to further master more standardized algorithm design skills and improve their logic thinking skills on the basis of the existing programming capabilities.

5. Database system

Through the study of this course, students will systematically master the basic principles and basic techniques of database systems. On the basis of mastering the basic concepts of the database system, students are required to be able to use SQL language to perform database operations on a certain database management system; to master the database design methods and procedures, and to have the basic ability to design database models and develop database application systems.

6. Design and analysis of algorithm

This course introduces common non-numerical algorithm design strategies in computer programming, with a certain depth and breadth. The course mainly teaches the concepts of time and space complexity of algorithms and their analysis methods, and teaches typical algorithms such as greedy method, divide-and-conquer method, backtracking method, dynamic programming, branch and bound, etc. from the perspective of complexity analysis. Through the study of this course, students will master algorithms for solving some of the actual problems appeared in computer applications, master the basic principles and techniques of common algorithm design and analysis; have the ability to design and implement algorithms for given actual problems, and be able to evaluate algorithms.

7. Machine learning

Through the study of this course, students will learn about the basic theories, basic technologies and related mathematical tools of machine learning and data mining, understand the development trend of machine learning, and understand the latest progress and achievements of machine learning technology. At the same time, students will have a more comprehensive understanding of various issues and methodology related to machine learning. Related topics of this course include: supervised learning algorithms (parametric and non-parametric algorithms, support vector

machines, kernel functions, and neural networks), unsupervised learning algorithms (dimensionality reduction, recommendation systems, and deep learning). This course emphasizes on training students' hands-on ability, while encouraging students to continuously improve models and codes to improve the efficiency of machine learning algorithms, master important theories and technologies, understand the characteristics, installation, use and development techniques of mainstream machine learning systems, and be able to use typical mining tool.

8. Cloud Computing and Data Center

Cloud Computing is the product of the development and integration of many traditional computer technologies such as Distributed Computing, Parallel Computing, Grid Computing, and Virtualization. This course aims to enable students to understand the origin, concepts, principles, and implementation technologies of cloud computing, be familiar with the main products and tools that support cloud computing, master the technical principles and application methods of open source projects in cloud computing, understand cloud computing research hotspots and application fields, and understand the development trends and prospects of cloud computing.

9. Distributed Computing

Students mainly learn the relevant principles and technologies of big data processing, and build the corresponding big data processing and computing platform framework according to actual needs. Through the study of this course, students will master the technology of big data collection, transmission, processing and application, understand the Hadoop distributed system infrastructure, and master HDFS and MapReduce technologies; understand HBase, NoSQL and other related big data technologies, combine with actual engineering applications, build a corresponding distributed computing platform, and cultivate their practical skills.

10. Neural Networks and Deep Learning

This course mainly introduces commonly used neural network algorithms and the basic knowledge related to cutting-edge deep learning algorithms, including common feedforward neural network algorithm (BP), convolutional neural network algorithm (CNN), recurrent neural network algorithm (RNN), etc. The course will cite cases and applications, such as image and speech recognition, natural language processing, intelligent robots (perception and control), text understanding (web search and spam filtering), computer vision, medical informatics and other fields. The core of this course is to enable students to understand cutting-edge deep learning algorithms and be able to use the existing deep learning algorithm framework for neural network model training and relatively complex data processing.

9. Practical Training (Related courses)

Program design and practice, data structure and algorithm course practice, database system practice, machine learning technology course practice, big data open source software development course design, industrial big data project practice, massive data preprocessing course design, graduation practice and graduation design (thesis) of data science and big data technology program, etc.

10. Course Structure and Course Hours (excluding extracurricular class)

Category	Total Credit	%	Total Course Hours	Theory Learning	Practical Training
General Education	50.5	33	960	896	64
Basic Course	26	17	416	342	74
Professional Course	30	20	480	344	136
Practical Training	36.5	24	880	32	848
General Course	10	6	160	160	0
Total	**153**	**100**	**2896**	**1774**	**1122**
Theory : Practice （%）	61：39				

11. Teaching Schedule (1)

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hour	Theory Learning	Practical Training	Semester
General Education	Required	School of Marxism	b1080001	Basic principles of Marxism	test	3	48	42	6	Spring semester 1
	Required	School of Marxism	b1080003	Ideological and moral cultivation and legal foundation	non-test	3	48	42	6	Spring semester 1
	Required	School of Marxism	b1080006	Outline of Chinese Modern History	non-test	3	48	42	6	Autumn semester 1
	Required	School of Marxism	b1080004	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics I	test	3	48	42	6	Autumn semester 2
	Required	School of Marxism	b1080007	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics II	test	2	32	28	4	Spring semester 2
	Required	School of Marxism	-----	Situation and Policy (Module 1～4)	non-test	2	32	28	4	Autumn semester 1～Spring semester 2
	Required	School of Marxism	b1080008	Labor Education A	non-test	0.5	16	16		Autumn semester 2
	Required	College of Arts and Sciences	b1020080	Advanced Mathematics A1	test	4	64	64		Autumn semester 1
	Required	College of Arts and Sciences	b1020081	Advanced Mathematics A2	test	4	64	64		Spring semester 1
	Required	College of Arts and Sciences	b1020012	Linear algebra	test	2	32	32		Autumn semester 1
	Required	College of Arts and Sciences	b1020013	Probability Theory and Mathematical Statistics	test	2	32	32		Spring semester 1
	Required	College of Arts and Sciences	b1020018	College Chinese	non-test	2	32	32		Spring semester 1
	Required	College of Arts and Sciences	b1020063	College Physics A(Module 2)	test	3	48	48		Spring semester 1
	Required	College of Arts and Sciences	b1020065	College Physics B	test	2	32	32		Autumn semester 2
	Required	College of Arts and Sciences	b1020066	College Physics C	non-test	1	32		32	Autumn semester 2
	Required	Department of Physical Education	-----	Physical Education I～VI	non-test	3	160	160		Autumn semester 1～Autumn semester 4
	Required	Others	b1110003	Military skills	non-test	0.5	2W			Autumn semester 1
	Required	College of Arts and Sciences	b1110002	Military theory	non-test	0.5	32	32		Autumn semester 2
	★English (Selective 1 Module 10 credits)	Module A	b1020003	General English III	test	3	48	48		Autumn semester 1
			b1020004	General English IV	test	3	48	48		Spring semester 1
			b1020005	General Academic English A	test	2	32	32		Autumn semester 2
			---	English development	non-test	2	32	32		Spring semester 2
		Module B	b1020002	General English II	test	3	48	48		Autumn semester 1
			b1020003	General English III	test	3	48	48		Spring semester 1
			b1020006	General Academic English B	test	2	32	32		Autumn semester 2
			---	English development	non-test	2	32	32		Spring semester 2
		Module C	b1020001	General English I	test	4	64	64		Autumn semester 1
			b1020002	General English II	test	3	48	48		Spring semester 1
			b1020003	General English III	test	3	48	48		Autumn semester 2
	★German	College of Arts and Sciences	b1020040	German I	test	3	48	48		Autumn semester 1

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hour	Theory Learning	Practical Training	Semester
		College of Arts and Sciences	b1020041	German II	test	3	48	48		Spring semester 1
		College of Arts and Sciences	b1020042	German III	test	4	64	64		Autumn semester 2
	★Japanese	College of Arts and Sciences	b1020077	Japanese I	test	3	48	48		Autumn semester 1
		College of Arts and Sciences	b1020078	Japanese II	test	3	48	48		Spring semester 1
		College of Arts and Sciences	b1020079	Japanese III	test	4	64	64		Autumn semester 2
Sub-total (General Education)						**50.5**	**960**	**896**	**64**	
General Course	Required	Art Education Center	b0-----	Aesthetic Education	non-test	2	32	32		Autumn, Spring
	Selective	Each College	b0-----	Social Science and Humanities Literacy	non-test	4	64	64		Autumn, Spring
				Natural Science and Technological Innovation	non-test	4	64	64		Autumn, Spring
Sub-total (General Course)						**10**	**160**	**160**		

(★Note: The first foreign language has a total of 10 credits, including College English, German, and Japanese. Choose the appropriate language according to your needs; among them, if you choose College English, please choose the appropriate module in module ABC)

11. Teaching Schedule (2)

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hour	Theory Learning	Practical Training	Semester
Basic Course	Required	School of Computer and Information Engineering	b2012238	Introduction to Data Science and Big Data Technology	Non-test	2	32	20	12	Autumn semester 1
	Required	School of Computer and Information Engineering	b2012282	Foundation of Programming Design (Java-Data)	Test	5	80	64	16	Autumn semester 1
	Required	School of Computer and Information Engineering	b2012295	Data structure and algorithm (Java-Data)	Test	3	48	48		Spring semester 1
	Required	College of Arts and Sciences	b1020099	Discrete mathematics	Test	3	48	48		Spring semester 1
	Required	School of Computer and Information Engineering	b2012264	Foundations of Statistics	Test	3	48	40	8	Autumn semester 2
	Required	School of Computer and Information Engineering	b2012258	Introduction to Database System	Test	3	48	42	6	Autumn semester 2
	Required	School of Computer and Information Engineering	b2012106	Design and analysis of algorithm	Test	3	48	32	16	Autumn semester 2
	Required	School of Computer and Information Engineering	b2012058	Object-oriented analysis and design	Test	2	32	24	8	Spring semester 2
	Required	School of Computer and Information Engineering	b2012265	Java Web development	Test	2	32	24	8	Spring semester 3
Sub-total (Basic Course)						**26**	**416**	**342**	**74**	
Professional Course	Required	School of Computer and Information Engineering	b2012266	Python data processing programming (English teaching)	Test	3	48	32	16	Autumn semester 2
	Required	School of Computer and Information Engineering	b2012045	Computer network	Test	3	48	48	0	Autumn semester 2
	Required	School of Computer and	b2012159	Operations Research	Test	2	32	32		Spring semester 2

	Information Engineering								
Required	School of Computer and Information Engineering	b2012267	Machine learning	Test	3	48	32	16	Spring semester 2
Required	School of Computer and Information Engineering	b2012268	Linux operating system application	Non-test	3	48	24	24	Spring semester 2
Required	School of Computer and Information Engineering	b2012085	Data visualization	Non-test	2	32	16	16	Spring semester 2
Required	School of Computer and Information Engineering	b2012269	Cloud Computing and Data Center	Test	3	48	32	16	Autumn semester 3
Required	School of Computer and Information Engineering	b2012270	Distributed Computing	Test	3	48	32	16	Spring semester 3
Required	School of Computer and Information Engineering	b2012271	Distributed database	Test	2	32	24	8	Spring semester 3
Sub-total (required professional courses)					**24**	**384**	**272**	**112**	
★Selective by module 6 credits	Module A	b2012110	Application and development of statistical software	Non-test	2	32	24	8	Autumn semester 3
		b2012272	Neural network and deep learning	Non-test	2	32	24	8	Autumn semester 3
		b2012273	Text mining and parsing	Non-test	2	32	24	8	Spring semester 3
		b2012274	Big data analysis and memory computing	Test	2	32	16	16	Spring semester 3
	Module B	b2012275	Industrial Big Data Foundation	Test	2	32	24	8	Spring semester 2
		b2012276	Industrial data collection technology	Test	2	32	32		Autumn semester 3
		b2012135	Mobile internet technology	Non-test	2	32	20	12	Spring semester 3
		b2012277	Network and data security	Test	2	32	24	8	Autumn semester 4
	Module C	b2012278	Introduction to Cloud Services	Test	2	32	24	8	Autumn semester 3
		b2012279	Cloud system environment deployment	Non-test	2	32	16	16	Spring semester 3
		b2012280	Cloud host management	Test	2	32	24	8	Spring semester 3

			b2012281	Server cluster design	Non-test	2	32	16	16	Spring semester 3
	Sub-total (professional module courses)					**6**	**96**	**72**	**24**	
Sub-total (professional courses)						**30**	**480**	**344**	**136**	

11. Teaching Schedule (3)

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hour	Theory Learning	Practical Training	Semester
Practical Training	Required	School of Computer and Information Engineering	b4000019	Data science and big data technology professional innovation and entrepreneurship	Non-test	2	48	32	16	Spring semester 3
	Required	Engineering Training Center	b4090002	Basic engineering training B	Non-test	2	48		48	Autumn semester 1
	Required	School of Computer and Information Engineering	b4012183	Program design and practice(Java-Data)	Non-test	2	48		48	Spring semester 1
	Required	School of Computer and Information Engineering	b4012184	Data structure and algorithm course practice(Java-Data)	Non-test	3	72		72	Summer semester 1
	Required	School of Computer and Information Engineering	b4012161	Database system practice	Non-test	2	48		48	Summer semester 2
	Required	School of Computer and Information Engineering	b4012162	massive data preprocessing course design	Non-test	2	48		48	Spring semester 3
	Required	School of Computer and Information Engineering	b4012163	Machine learning technology course internship	Non-test	3	72		72	Summer semester 3
	Required	School of Computer and Information Engineering	b4012189	Web development project practice	Non-test	2	48		48	Autumn semester 4
	Required	School of Computer and Information Engineering	b4012165	Big data open source software development course design	Non-test	2	48		48	Autumn semester 4
	Required	School of Computer and Information	b4012186	Labor Education B	Non-test	0.5	16		16	Spring semester 3

		Engineering								
	Required	School of Computer and Information Engineering	b4012134	graduation practice and graduation design (thesis) of data science and big data technology program	Non-test	12	288		288	Spring semester 4
	Sub-total (Practical Training)					**32.5**	**784**	**32**	**752**	
	★Selective by module 4 credits	Module A	b4012166	Data visualization practice	Non-test	2	48		48	Summer semester 2
			b4012167	Large-scale database technology and application course design	Non-test	2	48		48	Autumn semester 4
		Module B	b4012168	Big data and domain modeling practice	Non-test	2	48		48	Autumn semester 4
			b4012169	Industrial data collection technology design and practice	Non-test	2	48		48	Summer semester 3
		Module C	b4012170	Cloud computing network practice	Non-test	2	48		48	Summer semester 3
			b4012171	Cloud computing development practice	Non-test	2	48		48	Autumn semester 4
	Sub-total (Practical module training)					**4**	**96**		**96**	
Sub-total (Professional practical)						**36.5**	**880**	**32**	**848**	
Extracurricular Class	Required	Others	b5110001	Extracurricular Class	Non-test	1	-	-	-	Autumn, spring, summer
Total						**154**	**2896**	**1774**	**1122**	

★1. Guidance for selecting professional module and practical module:

Professional courses are divided into modules according to different ability requirements. Students must select one of the modules and obtain the required credits for that module. Professional practice modules must be selected according to the corresponding professional course modules.

1. Module A: Big Data Analysis and Processing

Pay attention to in-depth study of Hadoop/Spark development, Distributed Computing, Distributed database, Machine learning, Neural network and deep learning and other big data analysis and processing related technologies, and cultivate comprehensive technical talents the ability to perform distributed big data processing, data mining and so on.

2. Module B: Industrial Data Processing

Pay attention to in-depth study of industrial data collection and pre-processing, mobile internet technology, industrial big data analysis and other related technologies, and cultivate comprehensive technical talents with capabilities in industrial data collection, industrial data cleaning and pre-processing, industrial data analysis, etc., and the ability to perform industrial big data analysis and process in specific fields.

3. Module C: Cloud Computing Development

Pay attention to in-depth study of python development, cloud service concepts, cloud service architecture design, cloud computing and cloud development and other knowledge, cultivate technical talents with the ability to develop python development, cloud computing and cloud development, and the ability to perform cloud computing-related operations, maintenance and development.

2. Professional Certificates can be gained after learning following courses：

Students obtained the CCF CSP exam qualification certificate, Huawei big data certification, CDH big data certification, CPDA certification or AWS big data

certification can apply for exemption from data structure and algorithm practice, data structure and algorithm, design and analysis of algorithm, data science and big data technology professional innovation and entrepreneurship (choose one) courses and obtain corresponding credits.

12. Prerequisite for Course Study

No.	Course Name	Prerequisite Course	No.	Course Name	Prerequisite Course
1	College Physics ABC	Advanced Mathematics	20	Text mining and parsing	Data visualization practice
2	Probability Theory and Mathematical Statistics	Advanced Mathematics	21	Cloud Computing and Data Center	Python data processing programming
3	Discrete mathematics	Linear algebra	22	Database system practice	Database system
4	Operations Research	Foundations of Statistics	23	Machine learning technology course internship	Machine learning
5	Program design and practice(Java-Data)	Foundation of Programming Design (Java-Data)	24	Big data and domain modeling	Operations Research Machine learning
6	Data structure and algorithm (Java-Data)	Foundation of Programming Design (Java-Data)	25	Neural network and deep learning	Machine learning
7	Data structure and algorithm course practice(Java-Data)	Data structure and algorithm (Java-Data)	26	Linux operating system application	Data structure and algorithm course practice
8	Foundations of Statistics	Probability Theory and Mathematical Statistics	27	Big data analysis and memory computing	Python data processing programming (English teaching)
9	Design and analysis of algorithm	Data structure and algorithm (Java-Data)	28	Python data processing programming (English teaching)	Big data analysis and memory computing
10	Data visualization practice	Data visualization	29	Network and data security	Mobile internet technology
11	Big data and domain modeling	Data structure and algorithm (Java-Data) Database system practice Operations Research	30	Big data open source software development course design	Neural network and deep learning
12	Distributed database	Database system	31	Object-oriented analysis and design	Design and analysis of algorithm
13	massive data preprocessing course design	Cloud Computing and Data Center	32	Industrial data collection technology	Industrial Big Data Foundation
14	Distributed Computing	Cloud Computing and Data Center	33	Cloud system environment deployment	Introduction to Cloud Services
15	Machine learning	Foundations of Statistics	34	Cloud host management	Introduction to Cloud Services
16	Introduction to Cloud Services	Python data processing programming (English teaching)	35	Mobile internet technology	Computer network
17	Cloud computing network practice	Cloud host management Server cluster design	36	Cloud computing development practice	Cloud system environment deployment Cloud computing network practice
18	Server cluster design	Introduction to Cloud Services	37	Industrial big data project practice	Big data analysis and memory computing Industrial Big Data Foundation Distributed Computing
19	Large-scale database technology and application course design	massive data preprocessing course design			

13. Extracurricular Class

Through taking extracurricular classes, students are encouraged to take part in academic lectures, social practice activities, campus cultural and sports activities, innovative and entrepreneurial activities, voluntary activities, etc. to improve their social adaptability and enhance the

competitiveness in the job market. Details are specified in Students' Manual.