

Information and Computing Science

(Grade 2022)

Course code: 070102

I. Cultivation Objectives

1. General cultivation objective

This Program of Information and Computing Science cultivates students who have good overall development in moral, intellectual, physical, aesthetic and labour aspects, good scientific literacy, systematically master the basic theories and methods in the fields of mathematics, information and computer science, can skillfully apply mathematical knowledge and modern information technology for algorithm analysis and design, mathematical modeling, information processing and computation, and can engage in algorithm design, data analysis, scientific computing and system development and management in science and technology, education, information industry, finance and other sectors.

2. Objective of value guidance

With the objective of cultivating application-oriented talents to meet the development of society, taking the spirit of model workers and craftsmen as the value orientation, school-enterprise cooperation and course teaching as the carrier, this program focuses on cultivating students' innovative spirit and strong sense of social responsibility, establishing students' rigorous and meticulous professional ethics and quality, and enhancing students' sense of social responsibility, teamwork ability, lifelong learning ability and applied innovation spirit.

3. Five years after graduation, students in this programme should achieve the following objectives:

- (1) Have sustainable values and a sense of social responsibility and adhere to professional codes.
- (2) Have the skills in computing required to work in the field of information and computer science, with strong skills of algorithm design and data analysis.
- (3) Have the pursuit and ability of lifelong learning with an international perspective and the ability to adapt continuously to changing natural and social environments.
- (4) Have strong social interaction and teamwork skills, with certain leadership ability.
- (5) Have strong adaptability, co-ordination, resilience and innovation to shoulder the burden of society for decades to come.

II. Basic requirements

1. Morality and Ethics: Have good humanistic foundation, scientific spirit, professionalism and a sense of social responsibility, and positive attitude towards people. Master scientific worldview and methodology and practice core values of socialism.

1.1 Have humanities and social sciences literacy, understand national and social conditions, defend national interests and have a sense of responsibility to promote social progress.

1.2 Be familiar with the basic lines, guidelines and policies of the Party and the State, master the basic policies and relevant regulations on China's opening up to the outside world, and practise the core values of socialism.

1.3 Have a correct perspective on life and values and a good sense of moral and social responsibility.

1.4 Have a healthy physique and strong psychological profile that can keep up with the times and adapt to scientific and social developments and changes.

2. Professional knowledge: Have solid basic knowledge, professional knowledge and professional skills, master

the basic research methods of the profession, and understand the latest developments and development trends of the profession and related fields.

2.1 Have a solid foundation in mathematics and a firm understanding of the basic theory and applied methods of basic courses in mathematical analysis, higher algebra, discrete mathematics and programming; master the basic theory and applied techniques of information and computer science

2.2 Have systematic knowledge of the theoretical structure and knowledge system of Information and Computing Science.

2.3 Have knowledge of computers and modern information technology and the ability to use modern information technology and databases for literature review, Solicitation, data processing, model design, research analysis and thesis writing.

2.4 Be familiar with national guidelines, policies and corresponding laws and regulations for the development of the information Internet industry.

3. Ability to innovate: Have the ability to think logically and creatively, ability to identify, discern and evaluate phenomena and problems in the profession and related fields, and to form personal judgements and opinions.

3.1 Have the ability to think critically and professional sensitivity to identify, discern, question and evaluate phenomena and issues in the professional field and to express personal opinions.

3.2 Have creative consciousness and ability to respond to changing market conditions and to develop innovative ideas and practices.

4. Ability to use knowledge: Have the ability to solve problems related to the field of Information and Computing Science, ability to research and analyse complex problems in the field and propose corresponding countermeasures or solutions.

4.1 Have basic skills in the use of computers and the ability to analyse and apply data, with strong skills in algorithm design, algorithm analysis and programming.

4.2 Be able to investigate and analyse complex problems in mathematics, information science and fields related to data analysis and algorithm design.

4.3 Be able to propose appropriate responses or solutions to complex problems in their profession.

5. Scientific Research: Have preliminary scientific research skills.

5.1 Have preliminary training in scientific research and an understanding of new developments in the field of information science, big data and artificial intelligence.

5.2 Have ability to update knowledge, follow up technology and innovatively research.

6. Communication and Interaction: Have strong communication and presentation skills.

6.1 Be able to communicate effectively with peers, both orally and in writing, on issues relevant to the profession.

6.2 Be skilled in intercultural cooperation and communication.

7. Teamwork: Have good teamwork skills, ability to work harmoniously and collaboratively with team members and play an active role in team activities as a member or leader.

7.1 Be able to work proactively and cooperatively with team members and be able to work harmoniously and collaboratively with them and play an active role in team activities.

7.2 Be able to organize or lead team activities, boost member morale and lead team members to growth opportunities.

7.3 Have the ability to work in an international team.

8. International perspective: Have an international perspective and understanding. Have understanding of international developments, concern for global issues, understanding and respect for the differences and diversity of the world's different cultures.

8.1 Have a good command of English and the ability to read foreign language materials and literature in their field.

8.2 Have an international perspective and understanding, with a degree of international perspective and the ability to communicate and cooperate across cultures.

8.3 Understand that there are certain differences between cultures and be able to adapt to living and working in different cultural environments.

9. Learning and Development: Have a sense of lifelong learning and the ability to self-manage and learn independently, and the ability to adapt to social and personal sustainable development through continuous learning.

9.1 Recognize the need for continuous exploration and learning and have a sense of independent and lifelong learning.

9.2 Have a knowledge base for lifelong learning, an understanding of independent learning methods, and an understanding of ways to expand knowledge and competencies.

9.3 Develop the ability to update knowledge, follow up technology and innovate, using methods appropriate to personal or professional development needs.

III. Schooling System

Four years.

IV. Length of Study

Flexible study period, generally four years, the minimum length of flexibility is not less than three years, the longest not more than six years.

V. Requirements for Graduation and Degree Conferring

In order to graduate, students must complete the minimum number of credits required by the Instructive Cultivation Plan for each category of study and all the content required by the Extracurricular Class, with a total of 153 credits, and a Bachelor of Science degree if they meet the requirements for the award of a Bachelor's degree.

VI. Discipline

Mathematics, Computer Science.

VII. Core Courses

Mathematical Analysis, Advanced Algebra, Spatial Analytic Geometry, Fundamentals of Probability Theory, Numerical Analysis, Discrete Mathematics, Fundamentals of Programming (C), Data Structures and Algorithms (C), Analysis of Algorithm Design, Object Oriented Analysis and Design, Distributed Computing, Python Language Fundamentals, Data Mining, Optimization Methods, Mathematical Software.

VIII. Course Structure and Course Hours (excluding Extracurricular Class)

Category	Total Credit	%	Total Course Hours	Theory Learning	Practical Training
Public Fundamental Course	36.5	24	720	640	80
General Education	10	7	160	160	0
Professional Fundamental Course	43	28	688	650	38
Professional Course	33	22	528	436	92
Professional Practice	29.5	19	856	0	856
Total	152	100	2952	1886	1066
Theory:Practical	64: 36				

IX. Teaching schedule (1)

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hours	Theory Learning	Practical Training	Recommended semester
Public Fundamental Course	required	College of Marxism	b1080001	Basic Principles of Marxism	test	3	48	42	6	Autumn 1
	required	College of Marxism	b1080009	Ethics and the Rule of Law	non-test	3	48	42	6	Autumn 1
	required	College of Marxism	b1080006	Outline of Modern Chinese History	non-test	3	48	42	6	Spring 1
	required	College of Marxism	b1080004	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics I	test	3	48	42	6	Autumn 2
	required	College of Marxism	b1080007	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics II	test	2	32	28	4	Spring 2
	required	College of Marxism	----	Situation and Policy (Modules 1 to 4)	non-test	2	32	28	4	Autumn 1 to Spring 2
	required	College of Marxism	b1080008	Labour Education A	non-test	0.5	16	16		Spring 1
	required	College of Arts and Sciences	b1020018	Academic Chinese	non-test	2	32	32		Autumn 1
	required	College of Physical Education	----	Physical Education I to VI	non-test	3	160	160		Autumn 1 to Autumn 4
	required	Others	b1110003	Military skills	non-test	0.5	2W			Autumn 1
	required	College of Arts and Sciences	b1110002	Military theory	non-test	0.5	32	32		Spring 1
	required	Engineering Training	b1090001	Basic Engineering Training	non-test	2	32		32	Autumn 1
	required	Others	b1110004	Mental Health Education for University Students	non-test	2	32	16	16	Spring 1
	★ Academic English(Select 1 Module for 10 Credits)	Module A	b1020003	General English III	test	3	48	48		Autumn 1
			b1020004	General English IV	test	3	48	48		Spring 1
			b1020005	General Academic English A	test	2	32	32		Autumn 2
			---	English Knowledge Expansion	non-test	2	32	32		Spring 2
		Module B	b1020002	General English II	test	3	48	48		Autumn 1
			b1020003	General English III	test	3	48	48		Spring 1
			b1020006	General Academic English B	test	2	32	32		Autumn 2
			---	English Knowledge Expansion	non-test	2	32	32		Spring 2
		Module C	b1020001	General English I	test	4	64	64		Autumn 1
			b1020002	General English II	test	3	48	48		Spring 1
b1020003	General English III		test	3	48	48		Autumn 2		
★ Academic German	College of Arts and Sciences	b1020040	Academic German I	test	3	48	48		Autumn 1	
	College of Arts and Sciences	b1020041	Academic German II	test	3	48	48		Spring 1	
	College of Arts and Sciences	b1020042	Academic German III	test	4	64	64		Autumn 2	
★ Academic Japanese	College of Arts and Sciences	b1020077	Academic Japanese I	test	3	48	48		Autumn 1	
	College of Arts and Sciences	b1020078	Academic Japanese II	test	3	48	48		Spring 1	
	College of Arts and Sciences	b1020079	Academic Japanese III	test	4	64	64		Autumn 2	
Subtotal (Public Fundamental Course)						36.5	720	640	80	
General Education	selective	Art Education Center	b0-----	Aesthetic Education	non-test	2	32	32		Autumn, Spring
	selective	Each College	b0-----	Social Sciences and Humanistic Qualities	non-test	4	64	64		Autumn, Spring
				Natural Sciences and Technology Innovation	non-test	4	64	64		Autumn, Spring
Subtotal (General Education)						10	160	160		

(★Note: The first foreign language is 10 credits in total, including 3 languages: Academic English, Academic German and Academic Japanese, choose the appropriate language as required; when Academic English is chosen, please choose the appropriate module in Module A, B, C)

IX. Teaching schedule (2)

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hours	Theory Learning	Practical Training	Recommended Semester	
Professional Fundamental Course	required	College of Arts and Sciences	b2022019	Mathematical Analysis I	test	6	96	96		Autumn 1	
	required	College of Arts and Sciences	b2022140	Higher Algebra	test	4	64	64		Autumn 1	
	required	School of Computer and Information Engineering	b2022165	Fundamentals of Programming (C)	test	4	64	48	16	Autumn 1	
	required	School of Computer and Information Engineering	b2022166	Data Structures and Algorithms (C)	test	4	64	56	8	Spring 1	
	required	College of Arts and Sciences	b2022020	Mathematical Analysis II	test	6	96	96		Spring 1	
	required	College of Arts and Sciences	b2022145	Spatial Analytic Geometry	test	2	32	32		Spring 1	
	required	College of Arts and Sciences	b2022116	Fundamentals of Probability Theory	test	4	64	64		Spring 1	
	required	College of Arts and Sciences	b2022146	Ordinary differential equations	test	2	32	32		Autumn 2	
	required	School of Computer and Information Engineering	b2012106	Algorithm design and analysis	test	3	48	42	6	Autumn 2	
	required	School of Computer and Information Engineering	b2022143	Introduction to Database Systems	non-test	2	32	24	8	Spring 2	
required	College of Arts and Sciences	b2022147	Discrete Mathematics	test	4	64	64		Spring 2		
required	College of Arts and Sciences	b2022148	Mathematical modelling	non-test	2	32	32		Autumn 3		
Subtotal (Professional Fundamental Course)						43	688	650	38		
Professional Course	required	College of Arts and Sciences	b2012129	Operations Research	test	2	32	32		Autumn 2	
	required	School of Computer and Information Engineering	b2012170	Object Oriented Analysis and Design	test	3	48	32	16	Spring 2	
	required	College of Arts and Sciences	b2022149	Numerical analysis	test	4	64	38	12	Spring 2	
	required	College of Arts and Sciences	b2022138	Python Language Fundamentals	non-test	3	48	24	24	Spring 2	
	required	School of Computer and Information Engineering	b2012270	Distributed Computing	test	3	48	32	16	Autumn 3	
	required	College of Arts and Sciences	b2022152	Information Theory	non-test	2	32	32		Autumn 3	
	required	College of Arts and Sciences	b2022018	Data mining	non-test	3	48	32	16	Spring 3	
	required	School of Computer and Information Engineering	b2022169	Cloud Computing and Data Analytics	test	2	32	32		Spring 3	
	required	College of Arts and Sciences	b2022153	Combinatorial Mathematics and Graph Theory	test	2	32	32		Spring 3	
	required	College of Arts and Sciences	b2022170	Optimization methods	non-test	3	48	48		Autumn 4	
	Subtotal(Required Professional Course)						27	432	348	84	
	Select different courses in different modules for 6 credits	Module A	School of Computer and Information Engineering	b2012277	Network and Data Security	test	2	32	24	8	Autumn 3
				b2022136	Machine Learning	non-test	2	32	32		Autumn 4
			College of Arts and Sciences	b2022154	Mathematical Statistics	test	2	32	32		Spring 2
				b2022028	Applied time series analysis	test	2	32	32		Spring 3
				b2022157	Data Visualization Fundamentals	non-test	2	32	32		Spring 3
		Module B	College of Arts and Sciences	b2022159	Foundations of cybernetics	non-test	2	32	32		Autumn 4
				b1020098	Functions of complex variables	test	2	32	32		Spring 2
				b2022023	Statistical forecasting and decision making	test	2	32	32		Autumn 3
b2022160				Differential geometry	test	2	48	32		Autumn 4	
b2022161				Mathematical physics equations	test	2	32	32		Spring 3	
b2022162	Numerical solution of differential equations	non-test	2	32	24	8	Spring 3				
b2022163	Nonlinear programming theory	non-test	2	32	32		Autumn 4				
Subtotal (Selective Professional Course)						6	96	88	8		
Subtotal (Professional Course)						33	528	436	92		

IX. Teaching schedule (3)

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hours	Theory Learning	Practical Training	Recommended semester
Professional Practice	required	School of Computer and Information Engineering	b4022064	Programming Practice (C)	non-test	2	48		48	Summer 1
	required	School of Computer and Information Engineering	b4022065	Data Structures Course Placement (C)	non-test	2	48		48	Summer 1
	required	College of Arts and Sciences	b4022066	Maths software	test	3	72		72	Summer 2
	required	College of Arts and Sciences	b4022057	Database technology and applications	non-test	3	72		72	Summer 2
	required	College of Arts and Sciences	b4022048	R Language Fundamentals	non-test	2	48		48	Spring 3
	required	College of Arts and Sciences	b4020002	Labour Education B	non-test	0.5	16		16	Spring 3
	required	College of Arts and Sciences	b4022062	Mathematical Modelling Practice	non-test	2	48		48	Spring 3
	required	College of Arts and Sciences	b4022053	Python Language and Artificial Intelligence Applications	non-test	3	72		72	Summer 3
	required	College of Arts and Sciences	b4022051	R Advanced	non-test	2	48		48	Summer 3
	required	College of Arts and Sciences	b4022061	Big Data Analytics Cases and Practices	non-test	2	48		48	Autumn 4
	required	College of Arts and Sciences	b4000044	Program of Information and Computing Science Innovation and Entrepreneurship	non-test	2	48		48	Autumn 4
	required	College of Arts and Sciences	b4022063	Information and Computing Science Graduation Internship and Graduation Design (Thesis)	non-test	6	288		288	Spring 4
Subtotal (Professional Practice)						29.5	856		856	
Extracurricular Class	required	Others	b5110001	Extracurricular Class	non-test	1	-	-	-	Autumn, Spring, Summer
Total						153	2952	181886	1066	

Description of Selective Professional Course:

Selective Professional Courses are divided into modules according to different competency requirements, and students must take one of the modules and achieve the required credits for that module.

- Module A** (Big Data Analysis and Mining): focuses on algorithm design, data analysis, mathematical modelling and applications in addition to integrated basic competencies.
- Module B** (Numerical Calculation and Optimization): focuses on Optimization and Operations, Information Calculation, etc. in addition to integrated basic competencies.

X. Prerequisite for Course Study

No.	Course Name	Prerequisite Course	No.	Course Name	Prerequisite Course
1	Mathematical Analysis II	Mathematical Analysis I	13	Information Theory	Data Structures and Algorithms Fundamentals of Programming
2	Data Structures and Algorithms	Fundamentals of Programming	14	Mathematical Statistics	Mathematical Analysis, Fundamentals of Probability Theory
3	Fundamentals of Probability Theory	Mathematical analysis	15	Distributed Computing	Object Oriented Analysis and Design Data Structures and Algorithms
4	Discrete Mathematics	Mathematical analysis	16	Network and Data Security	Fundamentals of Programming Data Structures and Algorithms
5	Ordinary differential equations	Mathematical analysis Higher Algebra	17	Cloud Computing and Data Analytics	Fundamentals of Programming Database Fundamentals and Applications
6	Operations Research	Mathematical analysis Higher Algebra	18	Machine Learning	Python Language Fundamentals Data mining
7	Numerical analysis	Mathematical analysis Ordinary differential equations	19	Data mining	Algorithm design and analysis Data Structures and Algorithms
8	Mathematical modelling	Ordinary Differential Equations, Operations Research Fundamentals of Probability Theory	20	Maths software	Fundamentals of Programming
9	Database Fundamentals and Applications	Fundamentals of Programming	21	Functions of complex variables	Mathematical analysis
10	Algorithm design and analysis	Fundamentals of Programming Introduction to Database Systems Data Structures and Algorithms	22	Optimization methods	Ordinary differential equations Operations Research
11	Object Oriented Analysis and Design	Fundamentals of Programming	23	Machine Learning	Python Language Fundamentals Data mining
12	Combinatorial Mathematics and Graph Theory	Mathematical Analysis, Higher Algebra Operations Research	24	R Advanced	R Language Basics

XI. Credit of 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.