Software Engineering

(Grade 2023)

Course code: 080902

I. Cultivation Objectives

1. General cultivation objective

The program takes the fundamental task of establishing moral education to cultivate high quality application-oriented talents with comprehensive development of moral, intellectual, physical, aesthetic and labor, who have a solid foundation of computer theory, good software design and development ability, and can engage in system analysis, design, development, testing and operation and maintenance in the field of software engineering.

2. Objective of value guidance

The aim is to cultivate application-oriented engineering talents who can adapt to the development of society. In the process of education and teaching, the values of engineers and engineering professional ethics are taught to students, so as to cultivate students with good moral, humanistic, scientific and professional qualities, and to cultivate software talents with international perspective, social responsibility, practicality and honesty, team cooperation ability, lifelong learning ability, innovation spirit and hard-working.

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

(1) Have a sound personality, good scientific and cultural literacy, a sense of social responsibility and professional ethics, and the ability to integrate legal, environmental, social, cultural and sustainable development impacts in the practice of Software Engineering.

(2) Have a basic knowledge of Software Engineering, relevant mathematical and scientific fundamentals and engineering design principles, and have professionalism and good skills as a Software Engineer.

(3) Have knowledge of the standards, specifications and regulations related to Software Engineering, and have strong innovative practical skills and the ability to solve complex Software Engineering problems.

(4) Have good communication skills, teamwork and project management skills, able to communicate effectively with peers and clients domestic and international, and grow into the core player and high-level talent of the industry.

(5) Master autonomous and lifelong learning habits and abilities, be able to keep abreast of and follow up on domestic and international technology trends, and continuously improve their professionalism to meet future challenges.

II. Graduation requirements

1. engineering knowledge: Have the ability to apply mathematical, natural science and engineering fundamentals and expertise to complex engineering problems in software engineering.

1-1: Be able to apply the mathematical, natural science, and engineering foundations and expertise necessary for the Program of Software Engineering to formulate Software Engineering problems.

1-2: Be able to develop mathematical models and perform derivation, analysis, and solution for specific objects in a software system or process.

1-3: Be able to apply relevant knowledge and mathematical models required in the field of software engineering to the analysis, comparison and evaluation of solutions to complex Software Engineering problems.

2. Analysis of the Problem: Have the ability to apply basic principles of mathematics, natural science, and

engineering science to identify, represent, and analyze complex Software Engineering problems through literature research in order to reach valid conclusions.

2-1: Be able to apply the basic principles of mathematics, natural science and engineering science to identify and determine the key aspects of feasibility analysis, requirements acquisition, and requirements analysis of complex Software Engineering problems.

2-2: Be able to correctly represent, required modeling and solve complex Software Engineering problems based on relevant scientific principles and mathematical modelling methods.

2-3: Be able to analyze, compare, and evaluate complex software engineering problems to obtain valid conclusions through literature research .

3. Design/develop of solutions: Have the ability to design solutions to complex Software Engineering problems and develop systems, modules or processes to meet specific needs, and to demonstrate a sense of innovation in the design and development process, taking into account social, health, safety, legal, cultural and environmental considerations.

3-1: Have knowledge of basic design/development methods and techniques for the full cycle and process of engineering design and product development, and understanding of the factors that influence design objectives and technical solutions.

3-2: Have ability to complete requirements outline, detail design, coding and testing of software systems for specific requirements and demonstrate a sense of innovation in their design.

3-3: Have ability to consider safety, health, legal, intellectual property rights, cultural and environmental constraints in the design.

4. Research: Have the ability to apply scientific principles and methods to complex Software Engineering problems, including designing experiments, analyzing and interpreting data, and synthesizing information to reach valid conclusions.

4-1: Be able to investigate and analyse key issues and solutions in the design and development of software systems based on scientific principles of Software Engineering and related disciplines, through literature research or related methods.

4-2: Be able to choose a line of research and design an experimental program for a software system based on the characteristics of the object.

4-3: Be able to build experimental platforms and software development environments, carry out experiments safely and collect experimental data correctly according to the experimental protocol.

4-4: Be able to analyse and interpret experimental results and synthesize information to reach reasonable and valid conclusions.

5. Use of modern tools: Have the ability to develop, select and use appropriate techniques, resources, modern engineering tools and information technology tools for complex Software Engineering problems, including analysis, design, implementation, prediction, simulation and testing of complex Software Engineering problems, and to understand their limitations.

5-1: Have knowledge of information technology tools (modelling tools, development tools,Project Management tools, testing tools, etc.), environments and platforms commonly used in the field of Software Engineering, and the ability to understand the differences and areas of application of these tools, environments and platforms.

5-2: Be able to select and use appropriate tools and platforms for the analysis, design and implementation of complex

Software Engineering problems with specific requirements.

5-3: Be able to simulate and test systems, predict professional problems and be able to understand their limitations by selecting and using appropriate tools and platforms for complex software engineering problems with specific needs.

6. Engineering and Society: Be able to undertake sound analysis based on background knowledge of Software Engineering and evaluate the social, health, safety, legal and cultural impacts of engineering practices and solutions to complex Software Engineering problems, and understand the responsibilities involved.

6-1: Understand the technical standards system, intellectual property rights, industrial policies and laws and regulations in areas related to the Program of Software Engineering, and understand the impact of different social cultures on Software Engineering activities.

6-2: Be able to analyse and evaluate the social, health, safety, legal and cultural implications of software engineering practices and solutions to complex Software Engineering problems based on real-world application scenarios, and the impact of these constraints on project implementation, and understand the responsibilities to be taken.

7. Environment and Sustainable Development: Have the ability to understand and evaluate the environmental and social sustainability implications of engineering practices for complex Software Engineering problems.

7-1: Be able to understand the concept, connotation and significance of environmental protection and sustainability, and know the guidelines, policies, laws and regulations on environmental protection and social sustainability involved in software engineering practice.

7-2: Be able to evaluate the impact of this engineering practice on the environment and social sustainability for a real software project.

8. Professional Codes: Have humanistic, artistic, social and scientific literacy and social responsibility. Understand and comply with engineering ethics and codes of practice and perform duties in the practice of software engineering.

8-1: Have correct values, a progressive aesthetic, an understanding of the relationship between the individual and society, and an understanding of the Chinese national context.

8-2: Understand the engineering ethics and codes of ethics of honesty and fairness and integrity, with the spirit of the workforce as a value, and to be able to observe them consciously in the practice of computer engineering.

8-3: Understand the social responsibility of software engineers for the safety, health and well-being of the public, and for environmental protection, and be able to exercise conscious responsibility in engineering practice.

9. Individual and team: Have consciousnesses and ability to work in teams and to assume the role of individual, team member and leader in a multidisciplinary context.

9-1: Have a sense of teamwork and be clear about his or her position with the ability to understand the responsibilities and roles of different team roles, to communicate effectively with members of other disciplines, and to manage the relationship between individuals and team members.

9-2: Be able to find the place in a team, integrate successfully into the team and work independently or collaboratively.

9-3: Be able to manage, organize, coordinate and direct the work of a team.

10. Communication: Have the ability to communicate effectively with industry peers and the public on complex Software Engineering issues, including writing reports and design briefs, presenting statements, articulating or responding to instructions, and having an international perspective and the ability to communicate and interact in a cross-cultural context.

10-1: Be able to express their thoughts and wishes effectively on the Program of Software Engineering issues, verbally, in writing, graphically, and be able to write standardized software engineering documents.

10-2: Have basic foreign language skills in listening, speaking, reading and writing, be aware of international development trends and research hotspots in the field of the Program of Software Engineering and to understand and respect the differences and diversity of different cultures around the world.

10-3: Demonstrated verbal and written intercultural communication skills and the ability to communicate in a basic intercultural context regarding the Program of Software Engineering issues.

11. Project Management: Have understanding and knowledge of project management and economic decision-making methods in the field of Software Engineering and their application in a multidisciplinary environment.

11-1: Understand economic decision-making methods for software projects, understand the design process and management methods for software projects and products, and be able to analyse the economic and social benefits of software projects in a multidisciplinary environment, and analyse and judge their overall benefits.

11-2: Understand Software Engineering and the cost components of the full cycle and process of a product, and understand the Project Management and economic decision making issues involved.

11-3: Be able to apply project management and economic decision-making methods in the design and development of software project solutions in a multidisciplinary environment (including simulation).

12. Spirit and ability of lifelong learning: Have a sense of independent and lifelong learning, with the ability to learn and adapt to development.

12-1: Be able to recognize the need for self-directed and lifelong learning in the wider context of social development.

12-2: Be able to learn independently and acquire methods and skills for continuous learning and adaptation to development.

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

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 166 credits, and a Bachelor's degree in Software Engineering if they meet the requirements for the award of a Bachelor's degree.

VI. Discipline

Software Engineering

VII. Core Courses

Fundamentals of Programming, Discrete Mathematics, Data Structures and Algorithms, Introduction to Database Systems, Java Programming, Introduction to Software Engineering, Algorithm Design and Analysis, Software Quality Assurance and Testing, Object Oriented Analysis and Design, Software Project Management, Non-Relational Database Practicum, Software Design and Development I, II, III.

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

Category	Total Credit	%	Total Course Hours	Theory Learning	Practical Training
Public Fundamental Course	58.5	36	1072	990	82
General Education	10	6	160	160	0
Engineering Fundamental Course	10	5	160	151	9
Professional Fundamental Course	31	19	496	401	95
Professional Course	26	16	416	277	139
Professional Practice	29.5	18	856	0	856
Total	165	100	3160	1979	1181
Theory: **Practical** (%)	63:37				

IX. Teaching schedule (1)

Provided by	Course Code	Course Name	Assessment	Credit	Course Hours	Theory Learning	P T
...ol of Marxism	b1080001	Basic Principles of Marxism	test	3	48	42	
...ol of Marxism	b1080009	Ethics and the Rule of Law	non-test	3	48	42	
...ol of Marxism	b1080006	Outline of Modern Chinese History	non-test	3	48	42	
...ol of Marxism	b1080010	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics	test	3	48	42	
...ol of Marxism	b1080011	Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	test	3	48	42	
...ol of Marxism	-----	Situation and Policy (Modules 1 to 4)	non-test	2	32	28	
...ol of Marxism	b1080008	Labour Education A	non-test	0.5	16	16	
...ol of Mathematics, Physics ...Statistics	b1020112	Advanced Mathematics D1	test	5	80	80	
...ol of Mathematics, Physics ...Statistics	b1020113	Advanced Mathematics D2	test	5	80	80	
...ol of Mathematics, Physics ...Statistics	b1020012	Linear Algebra	test	3	48	48	
...ol of Mathematics, Physics ...Statistics	b1020114	Probability Theory and Mathematical Statistics	test	3	48	48	
...ol of Foreign Language ...Cultural Communication	b1020018	Academic Chinese	non-test	2	32	32	
...ol of Mathematics, Physics ...Statistics	b1020063	Academic Physics A (Module 2)	test	3	48	48	
...ol of Mathematics, Physics ...Statistics	b1020065	Academic Physics B	test	2	32	32	
...ol of Mathematics, Physics ...Statistics	b1020111	Academic Physics C	non-test	2	32		
...ege of Physical Education	-----	Physical Education I to VI	non-test	3	160	160	
...rs	b1110003	Military skills	non-test	0.5	2W		
...rs	b1110002	Military theory	non-test	0.5	32	32	
...rs	b1110004	Mental Health Education for University Students	non-test	2	32	16	
Module A	b1020003	General English III	test	3	48	48	
Module A	b1020004	General English IV	test	3	48	48	
Module A	b1020005	General Academic English A	test	2	32	32	
Module A	---	English Knowledge Expansion	non-test	2	32	32	
Module B	b1020002	General English II	test	3	48	48	
Module B	b1020003	General English III	test	3	48	48	
Module B	b1020006	General Academic English B	test	2	32	32	
Module B	---	English Knowledge Expansion	non-test	2	32	32	
Module C	b1020001	General English I	test	4	64	64	
Module C	b1020002	General English II	test	3	48	48	
Module C	b1020003	General English III	test	3	48	48	
...ol of Foreign Language ...Cultural Communication	b1020040	Academic German I	test	3	48	48	
...ol of Foreign Language ...Cultural Communication	b1020041	Academic German II	test	3	48	48	
...ol of Foreign Language ...Cultural Communication	b1020042	Academic German III	test	4	64	64	
...ol of Foreign Language ...Cultural Communication	b1020077	Academic Japanese I	test	3	48	48	
...ol of Foreign Language ...Cultural Communication	b1020078	Academic Japanese II	test	3	48	48	
...ol of Foreign Language ...Cultural Communication	b1020079	Academic Japanese III	test	4	64	64	
Subtotal (Public Fundamental Course)				**58.5**	**1072**	**990**	
...Education Center	b0-----	Aesthetic Education	non-test	2	32	32	
...College	b0-----	Social Sciences and Humanistic Qualities	non-test	4	64	64	
...College	b0-----	Natural Sciences and Technology Innovation	non-test	4	64	64	
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)

...pe	Provided by	Course Code	Course Name	Assessment	Credit	Course Hours	Theory Learning
...ired	School of Mathematics, Physics and Statistics	b2022147	Discrete Mathematics	test	4	64	64
...ired	School of Computer and Information Engineering	b2012045	Computer networks	test	3	48	39

Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hours	Theory Learning
ired	School of Computer and Information Engineering	b2090006	Fundamentals of Circuit Analysis	non-test	2	32	32
ired	School of Computer and Information Engineering	b2012241	Engineering Ethics	non-test	1	16	16
			Subtotal (Engineering Fundamental Course)		**10**	**160**	**151**
ired	School of Computer and Information Engineering	b2012179	Introduction to the Program of Software Engineering	non-test	1	16	16
ired	School of Computer and Information Engineering	b2012018	Fundamentals of Programming	test	4	64	48
ired	School of Computer and Information Engineering	b2012231	Data Structures and Algorithms	test	4	64	56
ired	School of Computer and Information Engineering	b2012258	Introduction to Database Systems	test	3	48	39
ired	School of Computer and Information Engineering	b2012106	Algorithm design and analysis	test	3	48	36
ired	School of Computer and Information Engineering	b2012171	Introduction to Software Engineering	test	3	48	48
ired	School of Computer and Information Engineering	b2012290	Principles of Computer Composition	test	4	64	56
ired	School of Computer and Information Engineering	b2012329	Introduction to Artificial Intelligence	test	3	48	33
ired	School of Computer and Information Engineering	b2012170	Object Oriented Analysis and Design	test	3	48	30
ired	School of Computer and Information Engineering	b2012239	Operating systems	test	3	48	39
			subtotal (Professional Fundamental Course)		**31**	**496**	**401**
ired	School of Computer and Information Engineering	b2012259	Web front-end development skills	test	2	32	22
ired	School of Computer and Information Engineering	b2012006	Java Programming	test	2	32	20
ired	School of Computer and Information Engineering	b2012330	Database design and application development	non-test	3	48	32
ired	School of Computer and Information Engineering	b2012075	Software Quality Assurance and Testing	test	2	32	20
ired	School of Computer and Information Engineering	b2012331	Compilation principles	test	3	48	39
ired	School of Computer and Information Engineering	b2012074	Software Project Management	test	2	32	24
ired	School of Computer and Information Engineering	b2012358	Design Pattern	non-test	2	32	20
			Subtotal (Required Professional Course)		**16**	**256**	**177**
ect rrent rses 2 ules 10 dits	Module A	b2012357	Web Development Technology	test	2	32	20
		b2012359	Web Technology Architecture and Applications	non-test	3	48	30
	Module B	b2012303	Intelligent interaction technology	test	2	32	20
		b2012140	Mobile Terminal Software Development	non-test	3	48	30
	Module C	b2012332	Data analysis and applications	non-test	2	32	20
		b2012267	Machine Learning	test	3	48	32
			Subtotal (Selective Professional Course)		**10**	**160**	**100**
			Subtotal (Professional course)		**26**	**416**	**277**

IX. Teaching schedule (3)

pe	Provided by	Course Code	Course Name	Assessment	Credit	Course Hours	Theory Learning
ired	School of Computer and Information Engineering	b4012005	Programming and Practice	non-test	2	48	
ired	School of Computer and Information Engineering	b4012051	Data Structures and Algorithms Course Placement	non-test	3	72	
ired	School of Computer and Information Engineering	b4012054	Database Systems Course Placement	non-test	2	48	
ired	School of Computer and Information Engineering	b4012154	Software Design and Development I	non-test	1	24	
ired	School of Computer and Information Engineering	b4012155	Software Design and Development II	non-test	2	48	
ired	School of Computer and Information Engineering	b4012187	Non-relational database internships	non-test	2	48	
ired	School of Computer and Information Engineering	b4012186	Labour Education B	non-test	0.5	16	
ired	School of Computer and Information Engineering	b4012048	Software Quality Assurance and Testing Internship	non-test	2	48	
ired	School of Computer and Information Engineering	b4000014	the Program of Software Engineering Innovation and Entrepreneurship	non-test	2	48	
ired	School of Computer and Information Engineering	b4012201	Software Design and Development III	non-test	3	72	
ired	School of Computer and Information Engineering	b4012130	Software Engineering Graduation Internship and Graduation Design (Thesis)	non-test	6	288	
			Subtotal(Required Professional Practice)		**25.5**	**760**	
ect rrent es in rrent ules 4	Module A	b4012158	Website Architecture Project	non-test	2	48	
	Module B	b4012203	Mobile terminal development projects	non-test	2	48	
	Module C	b4012202	Intelligent Analytics Application Project	non-test	2	48	

lits			Subtotal(Selective Professional Practice)		4	96	
			Subtotal(Professional Practice)		29.5	856	
ired	Others	b5110001	Extracurricular Class	non-test	1	-	-
			Total		166	3160	1979

★ Description of Selective Professional Course and Selective Practice:

Description of selective modules: Please select any 2 modules; professional practice modules must be taken in accordance with the corresponding professional course modules.

1) Module A: Web Application Development

Focuses on in-depth knowledge of Web front-end development technologies, Java Web site development and web framework principles.

2) Module B: Mobile Application Development

Focuses on in-depth knowledge of web front-end development technologies, human-computer interaction technologies and mobile terminal application development.

3) Module C: Intelligent Analysis and Applications

Focuses on in-depth knowledge of Python Programming, data analysis and applications, machine learning and more.

X. 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.