Computer Science and Technology (Education and Training Plan for Outstanding Engineers)

(Grade 2022)

Course code: 080901

I. Cultivation Objectives

1. general cultivation objective

This program insists on making moral education a fundamental task and cultivates talents who are well-rounded in moral, intellectual, physical and aesthetic development, abide by professional ethics, have engineering literacy and innovation, master the basic principles, basic knowledge, professional techniques and methods of computer science and technology, and are able to engage in product requirement analysis, design and development, testing, operation and maintenance in computer-related fields and other industries that require information construction, especially in the field of embedded systems. They are capable of working in the field of computer science and technology and other industries requiring information technology construction, especially in the field of embedded systems, such as product requirement analysis, design and development, testing, operation and maintenance.

2. Objective of value guidance

This program achieves its value-led objectives through the combination of humanities and social science courses, general studies courses and specialized courses in Civic Education, which will take the spirit of the model worker as its value orientation and cultivate students with humanities and social science literacy, professional ethics and social responsibility, as well as innovation and entrepreneurship. During the implementation of education and teaching, the values of computer engineers and engineering ethics education will be incorporated into the process, so that students will be able to endure hardships, follow engineering ethics norms, have professionalism and consciously practice the core socialism values in the design process of computer software and hardware systems.

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

(1) have a cultural literacy in the humanities, a sense of social responsibility and professional ethics, and be able to integrate the impact of legal, environmental, social, cultural and sustainable development factors in their engineering practice.

(2) Ability to carry out work related to computer hardware and software systems, in particular embedded systems.

(3) Project management and presentation skills with the ability to understand and solve engineering problems related to computer hardware and software systems in a broad social context.

(4) A team player with the ability to communicate, coordinate, cooperate, compete and manage engineering projects, and the ability to communicate internationally with international counterparts using a foreign language.

(5) Be able to adapt to career development through lifelong learning and be competitive in the workplace in computer-related fields

II. Requirement for Graduation

1. Engineering Knowledge: the ability to apply mathematical, natural science, engineering fundamentals and expertise to complex engineering problems in computing.

1-1: Be able to apply the mathematical, natural science, engineering fundamentals and professional knowledge

necessary for the computing profession to formulate computer engineering problems.

1-2: Be able to develop mathematical models and program designs for specific objects.

1-3: Be able to apply relevant knowledge and mathematical models to the derivation and analysis of solutions to complex computer engineering problems.

1-4: Be able to apply relevant knowledge and mathematical modelling methods to the comparison and synthesis of computer engineering solutions.

2: Analysis of the Problem: The ability to apply basic principles of mathematics, natural science, and engineering science to identify, represent, and analyse complex engineering problems in the computing field through literature research in order to reach valid conclusions.

2-1: Be able to apply the basic principles of mathematics, natural science and engineering mathematics to identify and judge the key aspects of complex engineering problems in computer applications and to determine the main technical indicators.

2-2: be able to correctly represent complex engineering problems based on relevant scientific principles and mathematical modelling methods, construct prototype systems based on computational principles and analyse their soundness.

2-3: Be able to recognize that there are multiple options available for solving problems and will seek alternative and alternate solutions through literature research.

2-4: Be able to apply the basic principles of computer science and specialized application areas to analyse the factors influencing the process and obtain valid conclusions with the help of literature research.

3. Design/Develop of Solutions: The ability to design solutions to complex engineering problems in the computing field, to develop systems, modules or processes that 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: 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: Ability to complete the design of computer subsystems in response to specific needs.

3-3: Be able to design computer systems and demonstrate a sense of innovation in their design.

3-4: Ability to consider safety, health, legal, cultural and environmental constraints in the design.

4: Research: The ability to use scientific principles and methods to investigate complex engineering problems in computing, including designing experiments, analyzing and interpreting data, and synthesizing information to reach valid conclusions.

4-1: Be able to investigate and analyse solutions to complex computer engineering problems based on scientific principles from computer science and technology and related disciplines, through literature research or related methods.

4-2: Be able to choose a line of research and design a computerized experimental program based on the characteristics of the subject.

4-3: Be able to construct a computerized experimental system based on a computerized experimental program, to carry out experiments safely and to collect experimental data correctly.

4-4: Be able to analyse and interpret the results of computer experiments and synthesize information to reach

reasonable and valid conclusions.

5: Use of Modern Tools: The ability to develop, select and use appropriate techniques, resources, modern engineering tools and information technology tools for complex engineering problems in computing, including the prediction and simulation of complex engineering problems, and to understand their limitations.

5-1: Knowledge of the principles and methods of use of modern instruments, IT tools, engineering tools and simulation software commonly used in the computing profession and an understanding of their limitations.

5-2: Be able to select and use appropriate instruments, information resources, engineering tools and specialist simulation software to analyse, calculate and design complex computer engineering problems.

5-3: Be able to develop or select modern tools to meet specific needs, simulate and predict professional problems for specific audiences and be able to analyse their limitations.

6: Engineering and Society: The ability to undertake sound analysis based on background knowledge of engineering and to evaluate the social, health, safety, legal and cultural implications of computer engineering practices and solutions to complex engineering problems, and to understand the responsibilities involved.

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

6-2: Be able to analyse and evaluate the social, health, safety, legal and cultural implications of professional computing engineering practice and the impact of these constraints on the implementation of computing engineering projects, and understand the responsibilities to be assumed.

7: Environment and Sustainable Development: The ability to understand and evaluate the environmental and social sustainability implications of engineering practices that address complex engineering problems in computing applications.

7-1: Be able to understand and evaluate the dialectical relationship between solutions to complex computer engineering problems, professional engineering practice and environmental and social sustainability.

7-2: Be able to consider harmonious sustainable development with the environment and society in the solution of complex engineering problems by computer.

8: Professional Codes: Humanities, arts and social sciences, social responsibility, ability to understand and comply with engineering ethics and codes of practice and perform duties in the practice of computer 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: To 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 computer 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: Consciousnesses and ability to work in teams and to assume the role of individual, team member and leader in a multidisciplinary context.

9-1: The ability to exercise independently and to communicate effectively and work cooperatively with members

of other disciplines.

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

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

10: Communication: The ability to communicate effectively with industry peers and the public on complex engineering issues in the field of computer engineering, 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 professional computing issues, orally, in manuscripts and diagrams, respond to queries, and understand the differences in communication with industry peers and the public.

10-2: To be aware of international trends and research hotspots in the field of computer science and to understand and respect the differences and diversity of different cultures around the world.

10-3: Demonstrated verbal and written communication skills for intercultural communication and the ability to communicate and interact in a basic manner in an intercultural context regarding professional issues in computing.

11: Project Management: Understanding and knowledge of engineering management and economic decision-making methods in the field of computer engineering and their application in a multidisciplinary environment.

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

11-2: Understand computer engineering and the cost components of the full cycle and process of a product, and understand the engineering management and economic decision making issues involved.

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

12: Spirit and ability of lifelong learning: A sense of self-directed and lifelong learning, with the ability to learn continuously 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: Ability to learn independently, including the ability to understand technical issues, to summarize and to ask questions, etc.

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

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 instructive cultivation plan , and the total credits must reach 164 credits for graduation; those who meet the requirements for bachelor's degree can be conferred bachelor degree in engineering.

VI. Discipline

Computer Science and Technology.

VII. Core Courses

Discrete Mathematics, Fundamentals of Programming, Fundamentals of Computer Circuits, Data Structures and Algorithms, Principles of Computer Composition, Principles and Applications of Microprocessors, Introduction to Database Systems, Computer Networks, Operating Systems, Introduction to Software Engineering, Algorithm Design and Analysis, Computer Architecture, Principles of Compilation, Comprehensive Training in Innovative Project Design, Comprehensive Computer System Design.

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

Category	**Total Credit**	**%**	**Total Course Hours**	**Theory Learning**	**Practical Training**
Public Fundamental Course	57.5	35	1056	976	80
General Education	10	6	160	160	0
Engineering Fundamental Course	12	7	192	172	20
Professional Fundamental Course	21	13	336	278	58
Professional Course	29	18	464	345	119
Professional Practice	33.5	21	952	0	952
Total	163	100	3160	1931	1229
Theory: **Practical** (%)	61:39				

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	School of Marxism	b1080001	Basic Principles of Marxism	test	3	48	42	6	Spring 1
	required	School of Marxism	b1080009	Ethics and the Rule of Law	non-test	3	48	42	6	Spring 1
	required	School of Marxism	b1080006	Outline of Modern Chinese History	non-test	3	48	42	6	Autumn 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 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 2
	required	School of Marxism	-----	Situation and Policy (Modules 1 to 4)	non-test	2	32	28	4	Autumn 1 to Spring
	required	School of Marxism	b1080008	Labour Education A	non-test	0.5	16	16		Autumn 2
	required	College of Arts and Sciences	b1020112	Advanced MathematicsD1	test	5	80	80		Autumn 1
	required	College of Arts and Sciences	b1020113	Advanced MathematicsD2	test	5	80	80		Spring 1
	required	College of Arts and Sciences	b1020108	Linear Algebra	test	3	48	48		Autumn 2
	required	College of Arts and Sciences	b1020114	Probability Theory and Mathematical Statistics	test	3	48	48		Autumn 2
	required	College of Arts and Sciences	b1020018	Academic Chinese	non-test	2	32	32		Autumn 1
	required	College of Arts and Sciences	b1020063	Academic Physics A (Module 2)	test	3	48	48		Spring 1
	required	College of Arts and Sciences	b1020065	Academic Physics B	test	2	32	32		Autumn 2
	required	College of Arts and Sciences	b1020111	Academic Physics C	non-test	2	32	0	32	Autumn 2
	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		Autumn 2
	required	College of Arts and Sciences	b1020003	General English III	test	3	48	48		Autumn 1
	required	College of Arts and Sciences	b1020004	General English IV	test	3	48	48		Spring 1
	required	College of Arts and Sciences	b1020005	General Academic English A	test	2	32	32		Autumn 2
	required	College of Arts and Sciences	---	English Knowledge Expansion	non-test	2	32	32		Spring 2
	required	Others	b1110004	Mental Health Education for University Students	non-test	2	32	16	16	Spring 1
				Subtotal (Public Fundamental Course)		**57.5**	**1056**	**976**	**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**	**0**	

IX. teaching schedule (2)

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hours	Theory Learning	Practical Training	Recommended semester
Engineering Fundamental Course	required	School of Computer and Information Engineering	b2012018jk	Fundamentals of Programming	test	4	64	48	16	Autumn 1
	required	College of Arts and Sciences	b2022147	Discrete Mathematics	test	4	64	64	0	Autumn 1
	required	School of Computer and Information Engineering	b2012242jk	Fundamentals of Computer Circuits	test	4	64	60	4	Spring 1
Subtotal (Engineering Fundamental Course)						**12**	**192**	**172**	**20**	
Professional Fundamental Course	required	School of Computer and Information Engineering	b2012178jk	Introduction to Computer Science and Technology	non-test	1	16	16	0	Autumn 1
	required	School of Computer and Information Engineering	b2012906jk	Data Structures and Algorithms	test	4	64	56	8	Spring 1
	required	School of Computer and Information Engineering	b2012290jk	Principles of Computer Composition	test	4	64	56	8	Autumn 2
	required	School of Computer and Information Engineering	b2012258jk	Introduction to Database Systems	test	3	48	39	9	Autumn 2
	required	School of Computer and Information Engineering	b2012045jk	Computer networks	test	3	48	39	9	Spring 2
	required	School of Computer and Information Engineering	b2012239jk	Operating systems	test	3	48	39	9	Spring 2
	required	School of Computer and Information Engineering	b2012907jk	Introduction to Artificial Intelligence	test	3	48	33	15	Spring 2
Subtotal (Professional Fundamental Course)						**21**	**336**	**278**	**58**	
Professional Course	required	School of Computer and Information Engineering	b2012120jk	Microprocessor Principles and Applications	test	4	64	56	8	Spring 2
	required	School of Computer and Information Engineering	b2012171jk	Introduction to Software Engineering	test	3	48	48	0	Autumn 3
	required	School of Computer and Information Engineering	b2012106jk	Algorithm design and analysis	test	3	48	24	24	Autumn 3
	required	School of Computer and Information Engineering	b2012043jk	Computer Architecture	test	3	48	42	6	Autumn 3
	required	School of Computer and Information Engineering	b2012015jk	Compilation principles	test	3	48	39	9	Autumn 3
	required	School of Computer and Information Engineering	b2012908jk	New computer technology	non-test	1	16	16	0	Spring 3
	Subtotal (Required Professional Course)					**17**	**272**	**225**	**47**	
	select different courses in different modules for 12 credits	Modules A	b2012910jk	Parallel computing	test	3	48	30	18	Spring 3
			b2012911jk	Embedded OS Application Development	test	3	48	30	18	Spring 3
			b2012909jk	Embedded System Design	non-test	3	48	30	18	Spring 3
			b2012019jk	Sensor and computer interface technology	non-test	3	48	30	18	Spring 3
		Module B	b2012920jk	Object Oriented Analysis and Design	test	3	48	30	18	Spring 3
			b2012913jk	Client Server Software Development Technology	test	3	48	30	18	Spring 3
			b2012914jk	Web Programming	non-test	3	48	30	18	Spring 3
			b2012915jk	Software Testing Technology	non-test	3	48	30	18	Spring 3
		Module C	b2012918jk	Big Data Technology	test	3	48	30	18	Spring 3
			b2012919jk	Machine Learning	test	3	48	30	18	Spring 3
			b2012916jk	Fundamentals of IoT technology	non-test	3	48	30	18	Spring 3
			b2012917jk	Cloud Computing Technology	non-test	3	48	30	18	Spring 3
	Subtotal (Selective Professional Course)					**12**	**192**	**120**	**72**	
Subtotal (Professional course)						**29**	**464**	**345**	**119**	

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	b4012005jk	Programming and Practice	non-test	2	48		48	Summer 1
	required	School of Computer and Information Engineering	b4012050jk	Data Structures and Algorithms Course Placement	non-test	2	48		48	Summer 1
	required	School of Computer and Information Engineering	b4012911jk	Computer Composition Course Placement	non-test	2	48		48	Spring 2
	required	School of Computer and Information Engineering	b4012912jk	Database Systems Course Placement	non-test	2	48		48	Summer 2
	required	School of Computer and Information Engineering	b4012110jk	Microprocessor Applications Course Design	non-test	2	48		48	Summer 2
	required	School of Computer and Information Engineering	b4012173jk	Comprehensive training in innovative project design	non-test	3	72		72	Autumn 3
	required	School of Computer and Information Engineering	b4000013jk	Innovation and Entrepreneurship in Computer Science and Technology	non-test	2	48		48	Spring 3
	required	School of Computer and Information Engineering	b4012186	Labour Education B	non-test	0.5	16		16	Spring 3
	required	School of Computer and Information Engineering	b4012913jk	Integrated Computer System Design (1)	non-test	4	96		96	Autumn 4
	required	School of Computer and Information Engineering	b4012914jk	Integrated Computer System Design (2)	non-test	4	96		96	Autumn 4
	required	School of Computer and Information Engineering	b4012129jk	Computer Science and Technology Graduation Internship and Graduation Design (Thesis)	non-test	6	288		288	Spring 4
	Subtotal(Required Professional Practice)					**29.5**	**856**		**856**	
	select different courses in different modules for 4 credits	Module A	b4012086jk	Smart Terminal Application System Project Design	non-test	2	48		48	Summer 3
			b4012083jk	Intelligent testing project design	non-test	2	48		48	Summer 3
		Module B	b4012915jk	Software Development Technology Course Design	non-test	2	48		48	Summer 3
			b4012901jk	Software Testing Technology Internship	non-test	2	48		48	Summer 3
		Module C	b4012903jk	Practice for Cloud Computing and Big Data Technology	non-test	2	48		48	Summer 3
			b4012906jk	Database and Information Systems Project Design	non-test	2	48		48	Summer 3
	Subtotal(Selective Professional Practice)					**4**	**96**		**96**	
Subtotal(Professional Practice)						**33.5**	**952**		**952**	
Extracurricular Class	required	Others	b5110001	**Extracurricular Class**	non-Test	**1**	-	-	-	Autumn, Spring, Summer
Total						**164**	**3160**	**1931**	**1229**	

Description of Selective Professional Course and Selective Practice:

The Professional Course is divided into modules according to different competencies and students must take one of the modules and achieve the required credits for that module. Practical elective courses must be taken in accordance with the corresponding professional elective modules.

(1)Module A: Embedded and Architecture

In-depth knowledge of computer architecture, parallel processing and embedded systems

(2)Module B: Application Design Development and Testing

In-depth knowledge of object-oriented software analysis and design, Java web application development and testing

(3)Module C: Internet of Things and Cloud Computing

In-depth knowledge of IoT, cloud computing, big data and deep learning

X. Prerequisite for Course Study

No.	Course Name	Prerequisite Course
1	Data Structures and Algorithms	Discrete Mathematics, Fundamentals of Programming
2	Fundamentals of Computer Circuits	Higher Mathematics D1
3	Principles of Computer Composition	Fundamentals of Computer Circuits
4	Operating systems	Discrete Mathematics, Fundamentals of Programming, Data Structures and Algorithms
5	Computer networks	Data Structures and Algorithms, Principles of Computer Composition
6	Introduction to Database Systems	Fundamentals of Programming, Discrete Mathematics, Data Structures and Algorithms
7	Microprocessor Principles and Applications	Fundamentals of Programming, Fundamentals of Computer Circuits, Principles of Computer Composition
8	Introduction to Software Engineering	Fundamentals of Programming, Data Structures and Algorithms
9	Algorithm design and analysis	Discrete Mathematics, Fundamentals of Programming, Data Structures and Algorithms
10	Computer Architecture	Computer networks, principles of computer composition
11	Compilation principles	Discrete Mathematics, Data Structures and Algorithms, Algorithm Design and Analysis
12	Comprehensive training in innovative project design	Programming and Practice, Microprocessor Applications Course Design
13	Integrated Computer System Design (1)	Comprehensive training in innovative project design

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.