Network Engineering

(Grade 2024)

Course code: 080903

I. Cultivation Objectives

1. General cultivation objective

This program insists on making moral education a fundamental task, cultivating high quality application-oriented talents who love the motherland, have comprehensive development of moral, intellectual, physical, aesthetic and labor, have engineering literacy and innovative spirit, systematically master the principles, technologies, platforms and tools in the field of computer networks, can apply network engineering methods to analyze and solve network problems faced by economic construction and social development, and can engage in planning, design, formation, development, management and maintenance of stable, reliable and secure network engineering technology.

2. Objective of value guidance

Through the combination of humanities and social science courses, general education and professional courses in ideological and political education, this program will realize its value-led objectives. It will take the spirit of the model worker and craftsman as its value orientation to cultivate craftsmanship and people with this spirit, and to cultivate students' humanities and social science literacy, professional ethics, psychological quality and a strong sense of social responsibility, as well as their sense of innovation and entrepreneurship. In the process of education and teaching, the values of engineers and engineering ethics will be taught through the spirit of craftsmanship, and students will be trained to develop a rigorous, meticulous and responsible working attitude, as well as the concept of meticulous work and perfection.

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

(1) Have a sense of social responsibility and professional ethics, and the ability to integrate the impact of legal, environmental, social, cultural and sustainable development factors into engineering practice.

(2) Have the ability to think in terms of computers and networks and to use advanced engineering methods, techniques and tools, and the ability to proficiently use the technical fundamentals, fundamental knowledge and to use knowledge related to Network Engineering to solve practical engineering problems.

(3) Have the ability to analyse, design, develop, manage and service systems in the field of network engineering applications, to practice network engineering and organize projects, and to grow into high-level talents in the field of network engineering with the quality and international competitiveness to adapt to technological progress and changes in social needs

(4) Have a healthy physical, mental, humanities and scientific literacy. Have team spirit and the ability to communicate, coordinate, cooperate, compete and to manage projects.

(5) Be able to communicate internationally with international counterparts using a foreign language. Be able to proactively adapt to the ever-changing domestic and international scientific and technological developments, develop the habit of independent and lifelong learning, and continuously increase knowledge base and enhance abilities.

II. Graduation requirements

Students in this program will study the basic knowledge of natural sciences and humanities and social sciences,

learn the basic theories and fundamental knowledge related to computer science and technology and Network Engineering, receive basic training in Network Engineering practice and project organization, and have the practical ability to design, plan, develop, operate and maintain network projects.

Students in this program should achieve the following objectives:

1. Engineering Knowledge: Ability to apply mathematical, natural science and engineering fundamentals and professional knowledge to complex Network Engineering problems in the computer field.

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

1-2: Be able to establish mathematical models for specific objects and solve them.

1-3: Be able to apply relevant knowledge and mathematical modelling to the analysis and optimization of solutions to complex Network Engineering problems.

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

2. Problem Analysis: Ability to apply fundamental principles of mathematics, natural and engineering sciences to identify, represent, and analyse complex Network Engineering problems through literature research in order to reach valid conclusions in the computer field.

2-1: Be able to apply the fundamental principles of mathematics, natural science and engineering mathematics to identify and diagnose critical problems in Network Engineering.

2-2: Be able to combine mathematical and engineering science perspectives with literature research to seek solutions to complex Network Engineering problems, analyse the influencing factors of the process and obtain valid conclusions.

2-3: Be able to recognize multiple solutions to complex engineering problems and seek solutions through literature research and other methods

2-4: Be able to apply the basic principles of network engineering application field, analyze related influencing factors, and obtain effective conclusions.

3. Design/development solutions: Ability to design solutions to complex engineering problems in the computer field, develop systems, modules or processes that meet specific needs, and demonstrate innovation in the design and development process, taking into account social, health, safety, legal, cultural and environmental factors.

3-1: Be able to conduct problem research in the area of Network Engineering and complete requirements analysis based on practical background. Be able to Perform program implementation for specific requirements and test and verify using testing methods.

3-2: Be able to conduct research on network engineering problems and complete requirement analysis based on the application background, as well as to complete network system application design according to the specific needs.

3-3: ,Be able to consider health, safety, law, culture and environment in design.

4. Research: Ability to research basic network problems and to use scientific principles and methods to investigate complex Network Engineering problems in the computer field, including designing experiments, analyzing and interpreting data, and synthesizing information to reach reasonable and valid conclusions.

4-1: Be able to research and analyse solutions to complex engineering problems in the field of Network Engineering through literature research or related methods based on scientific principles of network engineering and related fields.

4-2: Be able to choose research route and design experimental scheme of the network system according to the characteristics of the objects in the field of network engineering.

4-3: Be able to construct network system according to network engineering scheme, carry out experiment safely and collect experimental data correctly.

4-4: Be able to analyze and interpret the experimental results of network system, and get reasonable and effective conclusions through information synthesis.

5． Use modern network technology: Ability to develop, select and use appropriate techniques, resources, modern engineering tools and IT tools for complex Network Engineering problems in the computer field, including the prediction and simulation of complex Network Engineering problems, and to understand their limitations.

5-1: Be able to understand the principles and methods of network design analysis instruments, information technology tools, engineering tools, and simulation software commonly used by network engineering professionals, and understand their limitations

5-2: Be able to select and use appropriate network design analysis instruments, information technology tools, engineering tools and simulation software to analyse, calculate and design complex Network Engineering problems.

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

6. Engineering and Society: Ability to perform sound analysis based on background knowledge of Network Engineering, to evaluate the social, health, safety, legal and cultural impacts of professional Network Engineering practices and solutions to complex engineering problems, and to understand the responsibilities involved.

6-1: Be able to understand technical standards system, intellectual property rights, industrial policies and laws and regulations in the field of Network Engineering, and understand the impact of different social cultures on network engineering activities

6-2: Be able to analyse and evaluate the social, health, safety, legal and cultural impacts of Network Engineering practice and meet the relevant requirements above in practice, as well as the impact of these constraints on the implementation of network engineering projects, and understand the responsibilities to be assumed.

7. Environment and Sustainability: Ability to understand and evaluate the environmental, social and sustainable impact of engineering practice on complex engineering problems in the computer field.

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

7-2: Be able to take full account of harmonious and sustainable development with the environment and society in the solution of complex Network Engineering problems.

8. Professional Code: Have humanities, art and social science literacy, social responsibility, and be able to understand and comply with engineering professional ethics and codes and fulfill responsibilities in network engineering practice

8-1: Have a humanities and social sciences literacy that takes into account economic, environmental, legal, engineering ethical and other constraints during the practice of engineering in the field of Network Engineering.

8-2: Have a sense of social responsibility and an understanding of the relevant professional ethics and codes of practice in the field of Network Engineering, and be conscious of their responsibilities in the practice of engineering.

8-3: Be able to understand the social responsibility of network engineers for the safety, health and development of the public, as well as environmental protection, and be able to consciously fulfill their responsibilities in engineering practice.

9. Individuals and Teams: Have the awareness and ability to work in a team and be able to assume the role of individual, team member and leader in a multidisciplinary team.

9-1: Be a team player who is able to communicate positively and effectively with other members of the team.

9-2: Have ability to perform competently as an individual, team member and team leader under the background of multi-network engineering.

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

10. Communication: Ability to interact effectively with industry peers and the public on complex Network Engineering issues in the computer engineering field, including writing reports and design briefs, presenting statements, and express or responding clearly to instructions. Have An international perspective and the ability to communicate and interact in a cross-cultural context.

10-1: Be able to write reports and design submissions, present correctly, express clearly or respond clearly to instructions on complex network engineering problems.

10-2: Be able to understand the international development trends and research hotspots in the field of network engineering, and understand and respect the differences and diversity of different cultures in the world.

10-3: Have cross-cultural communication skills in speaking and writting, and be able to carry out basic communication and exchange in a cross-cultural context for network engineering professional problems.

11. Project Management: Ability to understand and master engineering management principles and economic decision-making methods in the field of computer engineering, and their application in a multidisciplinary environment.

11-1: Be able to understand the economic decision-making method of network engineering projects, master the design process and management method of network engineering projects and products, be able to analyze the economic and social benefits of network engineering projects in a multidisciplinary environment, and judge their comprehensive benefits;

11-2: Be able to understand the cost composition of the whole cycle and process of design and operation and maintenance in the field of network engineering, 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 of network engineering project solutions in a multidisciplinary environment.

12. Lifelong learning: Have a sense of independent and lifelong learning and the ability to learn and adapt to development on an ongoing basis.

12-1: Have positive values and a sense of independent and lifelong learning.

12-2: Have the ability of independent learning, including the ability to understand technical problems, the ability to summarize and the ability to ask questions

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 type of course and all the content required by the Extracurricular Class, with a total of 167 credits, and will be awarded a Bachelor of Engineering degree if they meet the requirements for the award of a Bachelor's degree.

VI. Discipline

Computer Science and Technology.

VII. Core Courses

Discrete Mathematics, Fundamentals of Programming, Data Structures and Algorithms, Principles of Computer Composition, Computer Networks, Wireless Network Technology, Internet Protocol Analysis, Routing and Switching Technology, Network Security, Computer Networks Course Practice, Routing and Switching Technology Course Design, Integrated Design of Network Application Systems.

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

Category	Total Credit	%	Total Course Hours	Theory Learning	Practical Training
Public Fundamental Course	60.5	36	1104	1014	90
General Education	10	6	160	160	0
Engineering Fundamental Course	11	7	176	152	24
Professional Fundamental Course	30	18	480	384	96
Professional Course	25	15	400	275	125
Professional Practice	29.5	18	856	0	856
Total	166	100	3176	1985	1191
Theory: **Practical** (%)	62:38				

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	b1080010	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics	test	3	48	42	6	Spring 2
	required	School of Marxism	b1080011	Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	test	3	48	42	6	Autumn 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	0	Autumn 2
	required	School of Mathematics, Physics and Statistics	b1020112	Advanced MathematicsD1	test	5	80	80	0	Autumn 1
	required	School of Mathematics, Physics and Statistics	b1020113	Advanced MathematicsD2	test	5	80	80	0	Spring 1
	required	School of Mathematics, Physics and Statistics	b1020108	Linear Algebra	test	3	48	48	0	Spring 1
	required	School of Mathematics, Physics and Statistics	b1020114	Probability Theory and Mathematical Statistics	test	3	48	48	0	Autumn 2
	required	School of Foreign Language and Cultural Communication	b1020018	Academic Chinese	non-test	2	32	32	0	Spring 1
	required	School of Mathematics, Physics and Statistics	b1020063	Academic Physics A (Module 2)	test	3	48	48	0	Spring 1
	required	School of Mathematics, Physics and Statistics	b1020065	Academic Physics B	test	2	32	32	0	Autumn 2
	required	School of Mathematics, Physics and Statistics	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	0	Autumn 1 to
	required	Others	b1110003	Military skills	non-test	0.5	2W	0	0	Autumn 1
	required	Others	b1110002	Military theory	non-test	0.5	32	32	0	Autumn 2
	required	Others	b1110004	Mental Health Education for University Students	non-test	2	32	16	16	Spring 1

	required	School of Computer and Information Engineering	b1012001	Artificial Intelligence Application and Practice	non-test	1	16	8	8	Autumn 1
	required	School of Resources and Environment	b1012002	Green, Low-carbon and Ecological Civilization	non-test	1	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	School of Foreign Language and Cultural Communication	b1020040	Academic German I	test	3	48	48		Autumn 1
		School of Foreign Language and Cultural Communication	b1020041	Academic German II	test	3	48	48		Spring 1
		School of Foreign Language and Cultural Communication	b1020042	Academic German III	test	4	64	64		Autumn 2
	★ Academic Japanese	School of Foreign Language and Cultural Communication	b1020077	Academic Japanese I	test	3	48	48		Autumn 1
		School of Foreign Language and Cultural Communication	b1020078	Academic Japanese II	test	3	48	48		Spring 1
		School of Foreign Language and Cultural Communication	b1020079	Academic Japanese III	test	4	64	64		Autumn 2
	subtotal (Public Fundamental Course)					**60.5**	**1104**	**1014**	**90**	
General Education	selective	Art Education Center	b0-----	Aesthetic Education	non-test	2	32	32	0	Autumn, Spring
	selective	Each College	b0-----	Social Sciences and Humanistic Qualities	non-test	4	64	64	0	Autumn, Spring
				Natural Sciences and Technology Innovation	non-test	4	64	64	0	Autumn, Spring
Subtotal (General Education)						**10**	**160**	**160**	**0**	

(★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
Engineering Fundamental Course	required	School of Computer and Information Engineering	b2012180	Introduction to the Program of Network Engineering	non-test	1	16	16	0	Autumn 1
	required	School of Computer and Information Engineering	b2012018	Fundamentals of Programming	test	4	64	48	16	Autumn 1
	required	School of Computer and Information Engineering	b2012231	Data Structures and Algorithms	test	4	64	56	8	Spring 1
	required	Engineering Training	b2090006	Fundamentals of Circuit Analysis	test	2	32	32	0	Autumn 1
				Subtotal (Engineering Fundamental Course)		**11**	**176**	**152**	**24**	
Professional Fundamental Course	required	School of Computer and Information Engineering	b2012290	Principles of Computer Composition	test	4	64	56	8	Autumn 2
	required	School of Computer and Information Engineering	b2012045	Computer networks	test	3	48	39	9	Autumn 2
	required	School of Computer and Information Engineering	b2012239	Operating systems	test	3	48	39	9	Spring 2
	required	School of Computer and Information Engineering	b2012258	Introduction to Database Systems	test	3	48	39	9	Autumn 2
	required	School of Mathematics, Physics and Statistics	b2022147	Discrete Mathematics	test	4	64	64	0	Spring 2
	required	School of Computer and Information Engineering	b2012196	Wireless network technology	test	2	32	24	8	Spring 2
	required	School of Computer and Information Engineering	b2012211	Internet Protocol Analysis	test	2	32	24	8	Spring 2
	required	School of Computer and Information Engineering	b2012212	Routing and switching technology	test	3	48	33	15	Spring 2
	required	School of Computer and Information Engineering	b2012113	Network Programming Basics	test	3	48	33	15	Spring 2
	required	School of Computer and Information Engineering	b2012112	Network Security	test	3	48	33	15	Spring 2
				Subtotal (Professional Fundamental Course)		**30**	**480**	**384**	**96**	
Professional Course	required	School of Computer and Information Engineering	b2012213	Internet Thinking and Innovation	non-test	2	32	28	4	Autumn 2
	required	School of Computer and Information Engineering	b2012157	Integrated cabling works	non-test	2	32	20	12	Autumn 3
	required	School of Computer and Information Engineering	b2012214	Wireless Sensor Networks and IoT Technologies	test	2	32	22	10	Autumn 3
	required	School of Computer and Information Engineering	b2012334	Software Defined Networking	test	2	32	24	8	Autumn 3
	required	School of Computer and Information Engineering	b2012241	Engineering Ethics	non-test	1	16	16	0	Autumn 3
	required	School of Computer and Information Engineering	b2012114	Network Storage and Virtualisation Technology	test	2	32	26	6	Spring 3
	required	School of Computer and Information Engineering	b2012390	Cloud Computing and Cloud Security（AI+）	test	2	32	16	16	Spring 3
	required	School of Computer and Information Engineering	b2012329	Introduction to Artificial Intelligence	test	3	48	33	15	Spring 3
				Subtotal(Required Professional Course)		**16**	**256**	**185**	**71**	
	select different courses in different modules for 9 credits	Module A	b2012215	Internet Big Data Application Technology	test	2	32	26	6	Autumn 3
			b2012216	Service Oriented Architecture Design	non-test	2	32	24	8	Autumn 3
			b2012217	Advanced Network Programming	test	3	48	24	24	Spring 3
			b2012218	Mobile Internet Development Technology	non-test	2	32	16	16	Spring 3
		Module B	b2012391	Network Attack and Defense Technology（AI+）	test	3	48	30	18	Autumn 3
			b20123912	Applied Cryptography（AI+）	non-test	2	32	22	10	Autumn 3
			b2012335	Mobile Security Technology	non-test	2	32	16	16	Spring 3
			b2012117	Network Management	non-test	2	32	24	8	Spring 3

	Subtotal (Selective Professional Course)		**9**	**144**	**90**	**54**	
Subtotal (Professional Course)			**25**	**400**	**275**	**125**	

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	Engineering Training	b4090002	Basic Engineering Training B	non-test	2	48		48	Autumn 1
	required	School of Computer and Information Engineering	b4012005	Programming and Practice	non-test	2	48		48	Summer 1
	required	School of Computer and Information Engineering	b4012050	Data Structures and Algorithms Course Placement	non-test	2	48		48	Summer 1
	required	School of Computer and Information Engineering	b4012054	Database Systems Course Placement	non-test	2	48		48	Summer 2
	required	School of Computer and Information Engineering	b4012030	Computer Networking Course Placement	non-test	2	48		48	Summer 2
	required	School of Computer and Information Engineering	b4012212	Routing and Switching Technology Course Design	non-test	3	72		72	Autumn 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	b4000017	the Program of Network Engineering Innovation and Entrepreneurship	non-test	2	48		48	Summer 3
	required	School of Computer and Information Engineering	b4012106	Integrated design of web application systems	non-test	2	48		48	Autumn 4
	required	School of Computer and Information Engineering	b4012133	Network Engineering Graduation Internship and Graduation Design (Thesis)	non-test	6	288		288	Spring 4
				Subtotal(Required Professional Practice)		**23.5**	**712**		**712**	
	select different courses in different modules for 6 credits	Module A	b4012108	Practice for Internet Big Data Application Technology	non-test	3	72		72	Spring 3
			b4012076	Mobile Internet Front-end Development Technology	non-test	3	72		72	Summer 3
		Module B	b4012002	Advanced Linux Web Server Administration	non-test	3	72		72	Autumn 3
			b4012065	Network Security Planning and Implementation	non-test	3	72		72	Summer 3
				Subtotal(Selective Professional Practice)		**6**	**144**		**144**	
				Subtotal (Professional Practice)		**29.5**	**856**		**856**	
Extracurricular Class	required	Others	b5110001	Extracurricular Class	non-test	1	-	-	-	Autumn, Spring, Summer
Total						**167**	**3176**	**1985**	**1191**	

Description of Selective Professional Course and Selective Practice:

Professional Courses are divided into modules according to the competencies required for the different directions, and students must take one of the modules and achieve the required number of credits for that module. The Selective Practice modules (A and B) must be taken in correspondence with the Professional Courses modules (A and B).

Module A: Application of New Network Technologies module, i.e. based on the design and set-up of computer network systems, focuses on developing students' skills in the application of new network technologies such as advanced web application development, mobile client application development and big data processing on the Internet.

Module B: Network Security module, i.e. based on the design and set-up of computer network systems, focuses on training students in the design of network security solutions and the configuration and management of security devices and software.

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.