青岛恒星科技学院
HENGXING UNIVERSITY

Network Engineering Programme

Curriculum Handbook

July 2024

Table of Contents

Introduction to Network Engineering

Module name	Introduction to Network Engineering		
Semester	Fall		
Contact person	Su Wanli		
Language	Chinese		
Relation to curriculum	compulsory, 1st semester		
Type of teaching, contact hours	Lecture method, group discussion method, brainstorming method, 2 class hours/week		
Work load	1. Total hours: 44 hours = 16 lecture hours + 28 self-study hours, completed in 16 weeks. 2. Instruction: 2 hours per week, including lectures, discussions, and Q&A. 3. Self-study: Approximately 2 (1-2) hours per week, including pre-class preview, after-class exercises, and review for exams.		
Credit points	1		
Recommended prerequisites	None		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Able to conduct research on complex engineering problems in network engineering and related fields through theoretical analysis, literature	R4. Research

		research, and relevant methods based on the theoretical knowledge of network engineering and related disciplines, and adopt reasonable methods to collect basic materials and data.	
	CLO-2-2	Able to play a due role according to the role requirements in a multidisciplinary team, organize and coordinate team members to carry out work, and coordinate the relationship with personnel from other disciplines to jointly solve complex engineering problems in network engineering and related fields.	R9. Communication

	CLO-3-3	Master the principles of network engineering management, have project management capabilities, and be able to select appropriate management and economic decision-making methods according to the practice of network engineering and related fields.	R11. Lifelong Learning
Content	Introduction to Network Engineering Specialty is a guiding course for the entire teaching content of the network engineering major. The course mainly introduces the basic content and important applications of the network engineering major, including network communication technology, network architecture, local area network technology, network interconnection, etc. It also introduces the latest technological developments in network technology and related frontiers, such as wireless and mobile network technology, network security, cloud computing, the Internet of Things, artificial intelligence, etc. In addition, it explains the connotation of the network engineering major, namely: basic network principles, network design and integration, network management and maintenance, network security, and network application development. It introduces the methods of learning the major (professional methodology). At the same time, it enables students to understand the talent training program of this major (network engineering major) in our school, and let students know which courses will be offered in this major during the four years of university, so that they can better plan their four-year university study and life.The knowledge modules are as follows:		

	1. Introduction (Weight 2/16, Level: Comprehension) 2. Network Architecture and Network Protocols (Weight 2/16, Level: Memory + Comprehension) 3. Protocols at All Layers (Weight 2/16, Level: Comprehension + Application) 4. Network Security (Weight 2/16,Level: Comprehension) 5. Network Planning and Design (Weight 2/16, Level: Comprehension + Application) 6. Connotation of Network Engineering Specialty (Weight 2/16, Level: Comprehension) 7. Knowledge System of Network Engineering Specialty (Weight 2/16, Level: Comprehension + Application) 8. Talent Training Program of Network Engineering Specialty (Weight 2/16, Level: Comprehension)
Study and examination requirements and forms of examination	The course assessment includes process assessment (60%) and usual performance (40%). The process assessment includes: information consultation and submission of assignment reports (60%); the usual performance includes: classroom performance (30%) + usual assignments (30%) + average score of unit tests (40%).
Reading list	[1] Introduction to Network Engineering, edited by Cheng Lianglun, Machinery Industry Press, 2010. [2] Introduction to Network Engineering, edited by Lei Zhenjia, Posts and Telecommunications Press, 2011. [3] Introduction to Networks, edited by Chen Ming, Beijing Institute of Technology Press, 2014. [4] Computer Networks (8th Edition), edited by Xie Xiren, Publishing House of Electronics Industry, 2021, 8th Edition. [5] Introduction to Computer Science (6th Edition), edited by Zhai Zhong, Tsinghua University Press, 2021.

	[6] Zhu Hongwei. Research on the Construction of a Collaborative Education System of “Curriculum Ideology and Politics + Ideological and Political Courses” for Network Engineering Majors [J]. Journal of Jilin Agricultural Science and Technology College, 2024, 33(4): 94-98.
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Digital Logic

<table>
<tr><td>Module name</td><td colspan="3">Digital Logic</td></tr>
<tr><td>Semester</td><td colspan="3">Fall</td></tr>
<tr><td>Contact person</td><td colspan="3">Qian Yuying</td></tr>
<tr><td>Language</td><td colspan="3">Chinese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="3">Compulsory 1st semester</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="3">Lecture method, case analysis method, online learning method, 2 class hours/week</td></tr>
<tr><td>Work load</td><td colspan="3">1. Total hours: 84 hours = 32 lecture hours + 52 self-study hours, completed in 16 weeks.
2. Instruction: 2 hours per week, including lectures, discussions, and Q&A.
3. Self-study: Approximately 3 hours per week, including pre-class preview, after-class exercises, and review for exams.</td></tr>
<tr><td>Credit points</td><td colspan="3">2</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="3">Advanced Mathematics</td></tr>
<tr><td rowspan="2">Learning outcomes and their corresponding PLOs</td><td>Course Learning Outcome (CLO)</td><td>Description</td><td>Supported Programme Learning Objective(PLOs)</td></tr>
<tr><td>CLO-1-1</td><td>Ability to analyze the characteristics and functions of digital logic devices, describe and analyze combinational</td><td>R3. Design/Develop Solutions</td></tr>
</table>

	logic circuits and sequential logic circuits, analyze the structure and principles of typical pulse circuits, semiconductor memories, and digital-to-analog and analog-to-digital conversion circuits, and select devices and parameters for practical engineering problems and application objects. Problem-oriented and scientifically speculative.	
CLO-2-2	Ability to design digital logic circuits at a basic level, using fundamental principles and methods to complete the design of digital logic circuits (such as combinational logic circuits and	R10. Project Management

		sequential logic circuits) according to design requirements. Comprehensive consideration of various constraints and understanding of the unity of opposites in contradictions.	
	CLO-3-3	Through experimental teaching, able to integrate theory with practice, research and experimentally verify relevant knowledge and methods of digital logic circuits, and establish the ideology that "practice is the sole criterion for testing truth."	R7. Ethics and Professional Norms
Content	Digital Logic is an important hardware technology foundation course in the Information Engineering major of higher education. This course lays a solid hardware foundation for subsequent courses such as Principles of Computer Organization and Principles of Compilation. It is a professional foundation course with strong theoretical and practical components. On the basis of introducing basic knowledge, theories, and commonly used digital integrated circuits of digital systems, this course focuses on discussing methods for		

	analyzing and designing digital logic circuits. Students are required to understand various digital circuits that compose digital computers and other digital systems through this course. Using logical algebra as a tool, they should master the logical analysis and design of basic logical units of various combinational circuits, synchronous sequential circuits, and asynchronous sequential circuits. They should be able to design and debug various functional components using new digital devices, complete the design of various logical components with suitable integrated circuit chips according to objectively proposed design requirements, and master the basic skills for analyzing, designing, and developing digital system hardware.The knowledge modules are as follows: 1. Fundamentals of Digital Logic (Weight 2/32, Level: Comprehension) 2. Logic Gate Circuits (Weight 2/32, Level: Comprehension) 3. Fundamentals of Logical Algebra (Weight 4/32, Level: Comprehension) 4. Analysis and Design of Combinational Logic Circuits (Weight 4/32, Level: Comprehension + Application) 5. Common Combinational Module Circuits and Applications (Weight 4/32, Level: Comprehension + Application) 6. Flip-Flops (Weight 4/32, Level: Comprehension + Application) 7. Analysis of Sequential Logic Circuits (Weight 4/32, Level: Comprehension + Application)
Study and examination requirements and forms of examination	The course assessment includes process assessment (40%) and final exam (60%). The process assessment includes: attendance 20% + after-class assignments 40% + experiments 40%. The final exam is a closed-book test lasting 100 minutes.

Reading list	[1] Fundamentals of Digital Electronic Technology (6th Edition), edited by Yan Shi, Higher Education Press, 2016. [2] Experimental Tutorial on Digital Electronic Technology, by Huang Xu et al., Soochow University Press, 2016. [3] Fundamentals of Electronic Technology (Digital Part, 6th Edition), edited by Kang Huaguang, Higher Education Press, 2014. [4] Fundamentals of Digital Electronic Technology: A Systems Approach, by Thomas L. Floyd, translated by Lou Shuqin, Sheng Xinzhi, Shen Yan, Machinery Industry Press, 2014. [5] Digital Electronics, by William Kleitz, translated by Tao Guobin, Zhao Yufeng, Science Press, 2008. [6] Zheng Zhihong. Technological Evolution and Implementation Path of Digital Transformation Empowering Teaching Model Reform. China Education Informatization, 2024, 12. [7] Huang Huairong. The Internal Logic of Digital Technology Empowering Current Educational Reform—From Environment, Resources to Digital Pedagogy. China Basic Education, 2024, 3. [8] China University MOOC website: https://www.icourse163.org Zhihuishu website: https://www.zhihuishu.com [9] Campus videos
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C Language Programming

<table>
<tr><td>Module name</td><td colspan="3">C Language Programming</td></tr>
<tr><td>Semester</td><td colspan="3">Fall</td></tr>
<tr><td>Contact person</td><td colspan="3">Yanfang Liu</td></tr>
<tr><td>Language</td><td colspan="3">Chinese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="3">compulsory, 3rd semester</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="3">Lecture method, demonstration method, laboratory experiment method, 3 class hours/week</td></tr>
<tr><td>Work load</td><td colspan="3">1. Total hours: 84 hours = 48 lecture hours + 36 self-study hours, completed in 16 weeks.
2. Instruction: 3 hours per week, including lectures, discussions, and practical teaching.
3. Self-study: Approximately 2 (2-3) hours per week, including pre-class preview, after-class exercises, and review for exams.</td></tr>
<tr><td>Credit points</td><td colspan="3">3</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Learning outcomes and their corresponding PLOs</td><td>Course Learning Outcome (CLO)</td><td>Description</td><td>Supported Programme Learning Objective(PLOs)</td></tr>
<tr><td>CLO-1-1</td><td>Able to explain the basic grammatical rules of the C language, including data types, variables,</td><td>R2. Problem Analysis</td></tr>
</table>

		operators, control structures, etc., and understand the semantic meanings and usage of these grammatical rules; able to explain basic programming concepts in C, such as functions, arrays, pointers, structures, etc., and understand their roles and usage, laying a foundation for subsequent complex programming tasks; should be familiar with the C programming environment, including compilers, debugging tools, etc., and able to independently write, compile, debug, and run code.	

	CLO-2-2	Able to enhance programming practice capabilities, including code writing, debugging, and testing skills; able to apply basic algorithms and data structures to solve practical problems, improving programming efficiency and performance; should understand the importance of code quality and be able to write standardized, clear, readable, and maintainable code, enhancing code readability and maintainability.	R3. Design/Develop Solutions

	CLO-3-3	Able to enhance programming practice capabilities, including code writing, debugging, and testing skills; able to apply basic algorithms and data structures to solve practical problems, improving programming efficiency and performance; should understand the importance of code quality and be able to write standardized, clear, readable, and maintainable code, enhancing code readability and maintainability.	R3. Design/Develop Solutions

	CLO-4-4	Should be able to analyze and understand problems, transform problems into programmable solutions, and design reasonable algorithms and program structures; able to independently solve practical programming problems, improving problem-solving capabilities; encourage students to propose new solutions and algorithms, cultivate students' innovative thinking and problem-solving abilities, and lay a foundation for future innovative activities.	R8. Individual and Team

Content	C Language Programming is a foundational course in the fields of computer science and software engineering, focusing on how to use the C language to write computer programs. As a general-purpose, procedural computer programming language, C supports structured programming, lexical variable scope, recursion, and other functions. Its design provides low-level memory access, requiring programmers to manage all memory details. Therefore, C language programming courses are typically used as introductory courses for computer science and related majors. The course usually includes extensive programming practice, requiring students to master the basic grammar, control structures, data types, functions, pointers, and other concepts of the C language through practical programming. In addition to programming practice, the course also covers basic theories and concepts of computer programming, such as algorithms, data structures, and program design.The knowledge modules are as follows: 1. Programming and C Language (Weight 2/48, Level: Comprehension) 2. Algorithms—The Soul of Programs (Weight 4/48, Level: Comprehension + Evaluation) 3. The Simplest C Programming—Sequential Programming (Weight 6/48, Level: Comprehension + Application) 4. Selection Structure Programming (Weight 6/48, Level: Comprehension + Application + Memory) 5. Loop Structure Programming (Weight 6/48, Level: Comprehension + Application + Memory + Evaluation) 6. Processing Batch Data Using Arrays (Weight 6/48, Level: Comprehension + Application + Memory + Evaluation) 7. Modular Programming Using Functions (Weight 6/48, Level: Comprehension + Application + Memory + Evaluation) 8. Pointers (Weight 6/48, Level: Comprehension + Application + Memory + Evaluation) 9. Structures and Unions (Weight 4/48, Level: Comprehension + Application + Memory + Evaluation) 10. File Operations (Weight 2/48, Level: Comprehension +

	Application + Memory)
Study and examination requirements and forms of examination	The course assessment includes process assessment (40%) and final exam (60%). The process assessment includes: daily performance 30% + after-class assignments 30% + experiment scores 40%. The final exam is a closed-book test lasting 100 minutes.
Reading list	[1] C Programming, compiled by Tan Haoqiang, Tsinghua University Press, 2023, 5th Edition. [2] C Language Programming Tutorial, edited by Li Lijuan, Posts and Telecommunications Press, 2019. [3] C Language Programming and Practice, edited by Xie Mande et al., Machinery Industry Press, 2024. [4] Zhang Jing, Feng Liping, Hu Ningyu, et al. Teaching Reform of "C Language Programming" Course for Cultivating Multidimensional Abilities [J]. Journal of Xinzhou Teachers University, 2024, 40(05): 125-129. [5] Li Na. Practice Research on Blended Teaching Based on C Language Course [J]. Modern Information Technology, 2024, 8(20): 195-198. DOI:10.19850/j.cnki.2096-4706.2024.20.039. [6] Chen Yuefen, Chen Rongqin, Zhang Shiqing, et al. Teaching Design and Implementation of C Language Course in the Context of Digital Intelligence Technology [J]. China Information

	Technology Education, 2024, (23): 108-112. [7] Peng Haowei. Practice Research on Optimizing C Language Programming Course Teaching in Secondary Vocational Schools Based on Learning Behavior Data Analysis [D]. Shandong Normal University, 2024. DOI:10.27280/d.cnki.gsdsu.2024.000582. [8] Zhou Hongxu. Application Research of 5E Teaching Model in C Language Programming Course in Secondary Vocational Schools [D]. Liaoning Normal University, 2023. DOI:10.27212/d.cnki.glnsu.2023.001049.
Revision Date	July 2024

Data Structures and Algorithms

Module name	Data Structures and Algorithms		
Semester	Spring		
Contact person	Guo Ning		
Language	Chinese		
Relation to curriculum	compulsory, 2nd semester		
Type of teaching, contact hours	Lecture method, group discussion method, case analysis method, simulation experiment method, 4 class hours/week		
Work load	1. Total hours: 112 hours = 64 lecture hours + 48 self-study hours, completed in 16 weeks. 2. Instruction: 4 hours (200 minutes) per week on average, including lectures, practical teaching, discussions, etc. 3. Self-study: 3 hours (150 minutes) per week on average, including preview, assignments, extended learning, etc.		
Credit points	4		
Recommended prerequisites	*C Language Programming*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Students can understand and implement common data structures, including arrays, linked lists, stacks,	R2. Problem Analysis

	queues, trees (such as binary trees, binary search trees, heaps), and graphs (such as adjacency matrices, adjacency lists). They can select appropriate data structures based on problem requirements and analyze their time and space complexity.	
CLO-2-2	Students can design and implement classic algorithms, including sorting algorithms (such as quicksort, mergesort) and search algorithms (such as binary search, depth-first search, breadth-first search). They can apply algorithm design techniques to solve practical problems, use big-O notation to	R3. Design/Develop Solutions

	analyze the time and space complexity of algorithms, and evaluate algorithm performance.	
CLO-3-3	Students can apply knowledge of data structures and algorithms to practical problems, such as network routing optimization, shortest path calculation, data compression, etc. They can enhance their ability to solve complex problems through programming practice (such as LeetCode, HackerRank and other platforms). Through projects or experiments, they can design and implement efficient algorithm solutions.	R4. Research

Content	The Data Structures and Algorithms course is an important basic course for the Network Engineering major. This course aims to cultivate students' in-depth understanding of data structures and algorithms, master the design and implementation methods of common data structures, as well as the analysis and application of classic algorithms. Through the study of data structures and algorithms, students will gain the ability to solve complex computational problems, and can use the knowledge (knowledge learned) to carry out efficient program design, performance optimization, and system development. This course not only lays a solid theoretical foundation for students but also focuses on the cultivation of practical abilities, enhancing students' logical thinking, problem analysis, and innovative abilities, and laying a solid foundation for future career development.The knowledge modules are as follows: 1. Fundamentals of Data Structures (Weight 5/48, Level: Comprehension + Memory) 2. Linear Structures (Weight 6/48, Level: Comprehension + Application + Analysis) 3. Trees and Binary Trees (Weight 8/48, Level: Comprehension + Application + Analysis) 4. Graph Structures (Weight 8/48, Level: Comprehension + Application + Analysis) 5. Sorting and Searching Algorithms (Weight 6/48, Level: Comprehension + Application + Analysis)
Study and examination requirements and forms of examination	The course assessment includes process assessment (60%) and final exam (40%). The process assessment includes: computer experiments 40% + after-class assignments 30% + classroom participation 30%. The final exam is a closed-book test lasting 100 minutes.

Reading list	[1] *Big Talk About Data Structures*, Cheng Jie, Tsinghua University Press, June 1, 2011. [2] *Hello Algorithm*, Jin Yudong, Posts and Telecommunications Press, February 2024. [3] *Animated Algorithms and Data Structures*, written by [Japan] Yutaka Watanabe, [Russia] Nikolai Milenkov, translated by Zheng Mingzhi, Posts and Telecommunications Press, March 1, 2024. [4] *Challenge Programming Contest (2nd Edition)*, Takuya Akiha, Yoichi Iwata, Yoshimi Kitagawa, Posts and Telecommunications Press, July 2013. [5] Xiang Xiaoting. Research and Application of Depth-First Search Algorithm [J]. Automation Application, 2024, 65(09): 1-3+7. DOI:10.19769/j.zdhy.2024.09.001. [6] Zhang Xiangling, Zhang Cong, Liu Weiran, et al. Research on Key Data Structures in Privacy Set Operations [J]. Journal of Cryptography (Chinese and English), 2024, 11(02): 263-281. DOI:10.13868/j.cnki.jcr.000679. [7] Wen Yankun. Research on the Discreteness of Computer Algorithm Design and Data Structures [J]. Information and Computer (Theoretical Edition), 2024, 36(04): 59-61.
Revision Date	July 2024

Discrete Mathematics

<table>
<tr><td>Module name</td><td colspan="3">Discrete Mathematics</td></tr>
<tr><td>Semester</td><td colspan="3">Spring</td></tr>
<tr><td>Contact person</td><td colspan="3">Diao Tianru</td></tr>
<tr><td>Language</td><td colspan="3">Chinese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="3">compulsory, 2nd semester</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="3">Lecture method, group discussion method, case analysis method, 2 class hours/week</td></tr>
<tr><td>Work load</td><td colspan="3">1. Total hours: 56 hours = 32 lecture hours + 24 self-study hours, completed in 16 weeks.
2. Instruction: 2 hours per week, including lectures, discussions, and Q&A.
3. Self-study: Approximately 1.5 hours per week, including pre-class preview, after-class exercises, and review for exams.</td></tr>
<tr><td>Credit points</td><td colspan="3">2</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="3">Advanced Mathematics</td></tr>
<tr><td rowspan="2">Learning outcomes and their corresponding PLOs</td><td>Course Learning Outcome (CLO)</td><td>Description</td><td>Supported Programme Learning Objective(PLOs)</td></tr>
<tr><td>CLO-1-1</td><td>Able to understand the basic concepts of mathematical logic and set theory in discrete mathematics, and initially describe,</td><td>R1. Engineering Knowledge</td></tr>
</table>

	extract, and express discrete structures in discrete mathematics problems.	
CLO-2-2	Able to understand the basic methods of mathematical logic and set theory, analyze the applications of discrete mathematics in computer science and related fields, and express specific problems as data models recognizable by computers.	R1. Engineering Knowledge, R2. Problem Analysis
CLO-3-3	Able to use mathematical tools to derive and prove specific problems, design feasible solutions through abstract thinking, generalized analysis, and logical reasoning, and derive	R4. Research

		reasonable conclusions.	
	CLO-4-4	Through the study of the development history of mathematical logic and classic "barber" paradoxes in set theory, recognize the tortuous development process of mathematics, establish a correct learning outlook, generalize existing knowledge, draw inferences from one another, and thus correctly understand the necessity of independent and lifelong learning.	R11. Lifelong Learning

Content	Discrete Mathematics is a professional basic course for the four-year undergraduate program in Network Engineering. As a branch of modern mathematics, discrete mathematics is a discipline that studies the structure and interrelationships of discrete quantities. The main contents of this course include mathematical logic (propositional logic, first-order logic) and set theory (sets, relations, functions). Through the study of this course, students should master the basic concepts and analytical methods of discrete mathematics, understand and master the necessary description tools and methods for handling discrete structures, and be able to apply common discrete mathematical thinking methods to solve practical problems in the field of computer science, providing the necessary mathematical foundation for subsequent studies of network engineering professional courses.The knowledge modules are as follows: 1. Propositional Logic (Weight 10/32, Level: Comprehension + Application + Analysis + Evaluation) 2. First-Order Logic (Weight 6/32, Level: Comprehension + Application + Analysis) 3. Sets (Weight 4/32, Level: Comprehension + Application + Analysis) 4. Binary Relations (Weight 8/32, Level: Comprehension + Application + Analysis) 5. Functions (Weight 4/32, Level: Comprehension + Application)
Study and examination requirements and forms of examination	The course assessment includes process assessment (50%) and final exam (50%). The process assessment includes: classroom participation 30% + after-class assignments 30% + unit tests 40%. The final exam is a closed-book test lasting 100 minutes.

Reading list	[1] Qu Wanling, Liu Tian, Geng Suyun, et al. Discrete Mathematics (4th Edition) [M]. Beijing: Tsinghua University Press, 2022. [2] Qu Wanling, Liu Tian, Geng Suyun, et al. Solutions and Study Guide for Discrete Mathematics Exercises (4th Edition) [M]. Beijing: Tsinghua University Press, 2022. [3] Wang Qingxian, Gu Xiaofeng, Wang Lijie. Discrete Mathematics (Micro-lecture Edition) [M]. Beijing: Posts and Telecommunications Press, 2023. [4] Ma Dianfu. Discrete Mathematics and Its Applications—Python Modeling and Implementation [M]. Beijing: Higher Education Press, 2021. [5] Aigner M. Discrete Mathematics [M]. American Mathematical Society, 2023. [6] Chen Lijun, Cheng Li. Blended Teaching Reform of Discrete Mathematics Based on OBE Concept [J]. Journal of Chifeng University (Natural Science Edition), 2024, 40(02): 78-81. [7] Wu Nan. Thoughts on the Construction of Ideological and Political Teaching System for Discrete Mathematics in Computer-related Majors [J]. Journal of Higher Education, 2023, 9(34): 174-177.
Revision Date	July 2024

Operating Systems

Module name	Operating Systems		
Semester	Fall		
Contact person	Cao Xiuping		
Language	Chinese		
Relation to curriculum	compulsory, 3rd semester		
Type of teaching, contact hours	Lecture method, group discussion method, case analysis method, flipped classroom method, 2 class hours/week		
Work load	1. Total hours: 56 hours = 32 lecture hours + 24 self-study hours, completed in 16 weeks. 2. Instruction: 2 hours per week, including lectures, discussions, and Q&A. 3. Self-study: Approximately 1.5 hours per week, including pre-class preview, after-class exercises, and review for exams.		
Credit points	2		
Recommended prerequisites	*C Language Programming*, *Data Structures and Algorithms*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Understand the basic concepts, functional modules (process management, memory management, file	R1. Engineering Knowledge, R2. Problem Analysis

		systems, device management, etc.) and design principles of operating systems, master core knowledge in the field of computer systems, and understand the systematic characteristics of complex engineering problems.	
	CLO-2-2	Able to analyze the principles and implementations of core mechanisms such as process scheduling algorithms, memory allocation strategies, and file system structures, and verify their performance through code or simulation tools. (Possess) the ability to model, analyze, and optimize complex engineering problems, and use modern tools to	R3. Design/Develop Solutions, R5. Use Modern Tools

		solve system-level issues.	
	CLO-3-3	Master system-level programming, debugging, and performance tuning techniques through experimental projects. Have the ability for hardware-software collaborative design and implementation, and complete systematic tasks through team collaboration.	R6. Engineering and Sustainable Development, R8. Individual and Team, R9. Communication
	CLO-4-4	Able to evaluate the security, reliability, and resource management efficiency of operating systems and propose improvement solutions. Understand the impact of engineering	R7. Ethics and Professional Norms, R10. Project Management, R11. Lifelong Learning

		practices on society, the environment, and sustainable development, possess system optimization and innovation awareness, and solve complex engineering problems by integrating multidisciplinary knowledge.	
Content	Operating Systems is a compulsory course for the Network Engineering major, aiming to comprehensively and systematically introduce the architecture, design mechanisms, implementation methods, and technologies of operating systems, including system calls and interfaces, processor scheduling and process/thread control, synchronization and communication mechanisms, deadlock handling, partition/paging/segmentation-based memory management and virtual storage, device management, file systems, etc. Through the study of this course, students can understand the basic concepts, main functions, and working principles of operating systems, systematically master the basic technologies and implementation methods used in operating systems, have the ability to use and analyze operating systems, cultivate students' theoretical foundation and technical literacy in operating system design, lay a solid foundation for further study of professional knowledge, and prepare for developing various application software or system software on operating system platforms in the future.The knowledge modules are as follows: 1. Overview of Operating Systems (Weight 2/32, Level:		

	Memory + Comprehension) 2. User Interfaces (Weight 2/32, Level: Memory + Comprehension) 3. Process Management (Weight 6/32, Level: Memory + Comprehension + Application) 4. Processor Scheduling (Weight 8/32, Level: Memory + Comprehension + Application) 5. Memory Management (Weight 6/32, Level: Memory + Comprehension + Application) 6. File Management (Weight 4/32, Level: Memory + Comprehension + Application) 7. Device Management (Weight 4/32, Level: Memory + Comprehension + Application)
Study and examination requirements and forms of examination	The course assessment includes process assessment (40%) and final exam (60%). The process assessment includes: unit tests 40% + after-class assignments 30% + classroom participation 30%. The final exam is a closed-book test lasting 100 minutes.
Reading list	[1] Tang Xiaodan, Liang Hongbing, Zhe Fengping, Tang Ziying. *Computer Operating Systems (4th Edition)* [M], Xi'an: Xi'an University of Electronic Science and Technology Press, 2021. [2] Pang Liping, Yang Fumin. *Computer Operating Systems (3rd Edition)* [M], Beijing: Posts and Telecommunications Press, 2017. [3] Wu Fan, Liu Gongshen, Wu Chentao. *Principles and Implementation of Operating Systems* [M], Beijing: Posts and Telecommunications Press, 2024. [4] Ge Yan, Liu Guozhu, Du Junwei, Cao Ling. Research on Diversified Teaching Models for the Course "Principles of Operating Systems" [J], 2024.

	[5] Liu Qiang, Zhang Hua. Teaching Reform and Practical Exploration of Principles of Operating Systems [J]. Computer Education, 2022, (10): 123-126. [6] Zhang Lei, Wang Xiaochun, Liu Zhiyong. Exploration and Practice of Industry-Education Integration Teaching Model for Operating Systems Course [D]. Computer Education, 2023.
Revision Date	July 2024

Computer Organization Principles

<table>
<tr><td>Module name</td><td colspan="3">Computer Organization Principles</td></tr>
<tr><td>Semester</td><td colspan="3">Fall</td></tr>
<tr><td>Contact person</td><td colspan="3">Cui Xuemei</td></tr>
<tr><td>Language</td><td colspan="3">Chinese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="3">compulsory, 3rd semester</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="3">Lecture method, group discussion method, brainstorming method, 2 class hours/week</td></tr>
<tr><td>Work load</td><td colspan="3">1. Total hours: 88 hours = 32 lecture hours + 56 self-study hours, completed in 16 weeks.
2. Instruction: 2 hours per week, including lectures, discussions, and Q&A.
3. Self-study: Approximately 3 (3-4) hours per week, including pre-class preview, after-class exercises, and review for exams.</td></tr>
<tr><td>Credit points</td><td colspan="3">2</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="3">Circuit Theory, Analog and Digital Circuits, C Language Programming</td></tr>
<tr><td rowspan="2">Learning outcomes and their corresponding PLOs</td><td>Course Learning Outcome (CLO)</td><td>Description</td><td>Supported Programme Learning Objective(PLOs)</td></tr>
<tr><td>CLO-1-1</td><td>Deeply understand the working principles of Von Neumann architecture computers, master the structure and working principles</td><td>R2. Problem Analysis</td></tr>
</table>

	of arithmetic units, memories, instruction systems, controllers, buses, and input/output systems; establish a hardware-software collaborative system view, and use the above knowledge and relevant models to reason and analyze computer functional components and system design schemes.	
CLO-2-2	Deeply understand data representation, data addressing modes, instruction format design, and the working principles of cache memories, and use the above knowledge and relevant models to compare computer functional components and system design	R3. Design/Develop Solutions

	schemes and select appropriate solutions.	
CLO-3-3	Understand CPU performance evaluation methods, performance analysis and calculation of cache memories and virtual memories, basic quantitative methods such as input/output systems, and use the above quantitative methods to analyze key influencing factors in solving complex engineering problems in computers, with the ability to verify the rationality of solutions and optimize them.	R4. Research

Content	Computer Organization Principles is a core professional basic course with strong theoretical, engineering, technical, and practical characteristics, playing a bridging role in the series of computer science courses. The course takes the internal overall structure of the computer as the main line, covering data representation, arithmetic units, controllers, memories, input/output systems, and other main contents. It discusses in detail the computer organization, working principles of main functional components, and design and implementation methods. The course aims to deepen students' overall understanding of computer hardware and software systems, establish the concept of hardware/software collaborative integration, and effectively enhance students' computer system design capabilities. The main teaching content of the course corresponds to the characteristics of complex engineering problems. Students must master in-depth engineering principles and conduct in-depth analysis to establish principle models of relevant complex engineering problems and design hardware functional components and simple computer systems through modern tools.The knowledge modules are as follows: 1. Introduction to Computer Systems (Weight 2/32, Level: Comprehension) 2. Representation of Data Information (Weight 4/32, Level: Comprehension + Application) 3. Arithmetic Unit Methods and Arithmetic Units (Weight 7/32, Level: Comprehension + Application + Analysis) 4. Storage Systems (Weight 5/32, Level: Memory + Comprehension) 5. Instruction Systems (Weight 2/32, Level: Memory + Comprehension) 6. Central Processing Units (Weight 8/32, Level: Memory + Comprehension) 7. System Buses (Weight 2/32, Level: Comprehension +

	Application) 8. Input/Output Systems (Weight 2/32, Level: Comprehension + Application)
Study and examination requirements and forms of examination	The course assessment includes usual performance (30%) and final exam (70%). The usual performance assessment includes: attendance 10% + after-class assignments 10% + computer experiments 10%. The final exam is a closed-book test lasting 100 minutes.
Reading list	[1] Computer Organization Principles (Micro-lecture Edition), edited by Tan Zhihu, Posts and Telecommunications Press, 2021, 1st Edition. [2] Tutorial on Computer Organization Principles, edited by Zhang Jiwen, Tsinghua University Press, 2023. [3] Computer Organization Principles, edited by Zhang Chenxi, Zhang Huijuan, Tsinghua University Press, 2024. [4] Computer Organization Principles, edited by Tang Shuofei, Higher Education Press, 2020. [5] Experimental Guidance and Exercise Analysis for Computer Organization Principles, edited by Tan Zhihu, Posts and Telecommunications Press, 2021. [6] Computer Organization and Design, by David A. Patterson / John L. Hennessy, Morgan Kaufmann Press, 2008. [7] Computer Organization and Architecture, by Alan Clements, Machinery Industry Press, 2017.
Revision Date	July 2024

Network Protocols Analysis

<table>
<tr><td>Module name</td><td colspan="3">Network Protocols Analysis</td></tr>
<tr><td>Semester</td><td colspan="3">Spring</td></tr>
<tr><td>Contact person</td><td colspan="3">Zhou Meihong</td></tr>
<tr><td>Language</td><td colspan="3">Chinese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="3">compulsory, 4th semester</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="3">Lecture method, case analysis method, simulation experiment method, 3 class hours/week</td></tr>
<tr><td>Work load</td><td colspan="3">1. Total hours: 84 hours = 48 lecture hours + 36 self-study hours, completed in 16 weeks.
2. Instruction: 3 hours per week, including lectures, discussions, and practical teaching.
3. Self-study: Approximately 2 (2-3) hours per week, including pre-class preview, after-class exercises, and review for exams.</td></tr>
<tr><td>Credit points</td><td colspan="3">3</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="3">Digital Logic, Computer Organization Principles</td></tr>
<tr><td rowspan="2">Learning outcomes and their corresponding PLOs</td><td>Course Learning Outcome (CLO)</td><td>Description</td><td>Supported Programme Learning Objective(PLOs)</td></tr>
<tr><td>CLO-1-1</td><td>Able to describe and explain the roles of each layer in the TCP/IP model, as well as common</td><td>R1. Engineering Knowledge</td></tr>
</table>

	network protocols in the data link layer, network layer, transport layer, and application layer, and apply this knowledge to network traffic analysis.	
CLO-2-2	Able to master the working principles of network protocols at each layer of the TCP/IP model and use them to analyze complex network faults; able to conduct network protocols analysis for complex engineering problems to identify root causes and propose corresponding solutions.	R2. Problem Analysis

	CLO-3-3	Able to use modern tools (such as Wireshark, Colai CSNAS) to analyze network traffic at each layer (data link layer, network layer, transport layer, application layer) of the TCP/IP model, and apply this to operation and maintenance case analysis and security case analysis.	R5. Use Modern Tools
	CLO-4-4	Able to cultivate students' good team collaboration spirit, effectively divide tasks and cooperate in teams to complete project tasks; cultivate students' good communication skills, enabling	R8. Individual and Team, R9. Communication

		effective communication when encountering problems, and efficiently organizing and executing work tasks.	
Content	Network Protocols Analysis is a compulsory course for network engineering. The main content of the course includes the roles of each layer of the TCP/IP model, as well as an introduction to protocols of the network interface layer, network layer, transport layer, and application layer. Through the study of protocols at each layer, students will master how to perform network traffic analysis and how to use network traffic analysis to solve complex network fault problems. Through this course, students will acquire a solid theoretical foundation and practical operation capabilities in network protocols, be able to use the knowledge (knowledge learned) and skills to design, analyze, test, and optimize network communication protocols, participate in the development, maintenance, and management of network communication systems, and cultivate rigorous scientific thinking, problem analysis and solving abilities, as well as enhance team collaboration and communication skills, laying a solid foundation for future career development.The knowledge modules are as follows: 1. Network Layer Models and Traffic Analysis (Weight 4/48, Level: Comprehension + Memory) 2. Network Interface Layer Protocol Analysis (Weight 4/48, Level: Comprehension + Application + Analysis) 3. Network Layer Protocol Analysis (Weight 6/48, Level:		

	Comprehension + Application + Analysis) 4. Transport Layer Protocol Analysis (Weight 6/48, Level: Comprehension + Application + Analysis) 5. Application Layer Protocol Analysis (Weight 8/48, Level: Comprehension + Application + Analysis) 6. Locating Network Attacks (Weight 8/48, Level: Comprehension + Application + Analysis) 7. Operation and Maintenance Case Analysis (Weight 6/48, Level: Comprehension + Application + Analysis + Evaluation) 8. Security Case Analysis (Weight 6/48, Level: Comprehension + Application + Analysis + Evaluation)
Study and examination requirements and forms of examination	The course assessment includes process assessment (40%) and final exam (60%). The process assessment includes: classroom participation 30% + after-class assignments 30% + experiment completion 40%. The final exam is a closed-book test lasting 100 minutes.
Reading list	[1] Zhang Jin, Yu Liangliang. Network Protocols Analysis and Operation Maintenance Practice [M]. Tsinghua University Press, 2024. [2] Kou Xiaorui. Network Protocols Analysis [M]. Machinery Industry Press, 2018. [3] Li Feng. TCP/IP—Protocol Analysis and Application Programming [M]. Beijing: Posts and Telecommunications Press, 2008. [4] Wu Ying. Computer Network Application Software Programming Technology [M]. Beijing: Machinery Industry Press, 2010. [5] Xie Xiren. Computer Networks [M]. Publishing House of Electronics Industry, 2021.

	[6] Ma Changxia, Zhang Zhanqiang. TCP/IP Network Protocols Analysis and Application [M]. Nanjing University Press, 2020. [7] Cai Ou. System Design of Ethernet Network Protocols Analyzer Based on FPGA [D]. East China Normal University, 2022. DOI:10.27149/d.cnki.ghdsu.2022.002263. [8] Yin Yuheng. Research on Network Protocols Vulnerability Mining Technology Based on Fuzzing [D]. China Academy of Electronics and Information Technology, 2021. DOI:10.27728/d.cnki.gdzkx.2021.000057.
Revision Date	July 2024

Information Security Technology Fundamentals

<table>
<tr><td>Module name</td><td colspan="3">Information Security Technology Fundamentals</td></tr>
<tr><td>Semester</td><td colspan="3">Spring</td></tr>
<tr><td>Contact person</td><td colspan="3">Chai Yan</td></tr>
<tr><td>Language</td><td colspan="3">Chinese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="3">compulsory, 4th semester</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="3">Lecture method, case analysis method, simulation experiment method, 2 class hours/week</td></tr>
<tr><td>Work load</td><td colspan="3">1. Total hours: 64 hours = 32 lecture hours + 32 self-study hours, completed in 16 weeks.
2. Instruction: 2 hours per week, including lectures, discussions, and Q&A.
3. Self-study: Approximately 2 hours per week, including pre-class preview, after-class exercises, and review for exams.</td></tr>
<tr><td>Credit points</td><td colspan="3">2</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="3">Computer Networks, Operating Systems, Database Technology and Application</td></tr>
<tr><td rowspan="2">Learning outcomes and their corresponding PLOs</td><td>Course Learning Outcome (CLO)</td><td>Description</td><td>Supported Programme Learning Objective(PLOs)</td></tr>
<tr><td>CLO-1-1</td><td>Master basic knowledge of information security, and understand basic concepts related to network attacks, Trojan</td><td>R2. Problem Analysis</td></tr>
</table>

	viruses, etc.	
CLO-2-2	Understand the relevant knowledge and principles of data encryption algorithms, digital signature technology, identity authentication and message authentication technology, access control technology, data security storage and recovery.	R3. Design/Develop Solutions
CLO-3-3	Follow the principles and methods of information security, and have the ability to implement information security through typical methods.	R4. Research

Content	This course focuses on how to protect data from unauthorized access, tampering, damage, or disclosure. With the rapid development of digital and Internet technologies, information security issues have become increasingly prominent, and the demand for information security talents from enterprises and organizations is also growing. The Information Security Technology Fundamentals course aims to cultivate professional talents with information security knowledge and skills. The course content covers multiple aspects, including basic knowledge of information security, cryptography, digital signatures and identity authentication, key management, access control, system security, application security, information security laws and regulations, etc.The knowledge modules are as follows: 1. Introduction (Weight 1/32, Level: Comprehension + Application) 2. Introduction to Cryptography (Weight 4/32, Level: Memory + Comprehension + Application) 3. Digital Signatures (Weight 6/32, Level: Memory + Comprehension + Application) 4. Identity Authentication Technology (Weight 6/32, Level: Memory + Comprehension + Application) 5. Message Authentication Technology (Weight 6/32, Level: Memory + Comprehension + Application) 6. Key Management (Weight 6/32, Level: Memory + Comprehension + Application) 7. Network Security (Weight 1/32, Level: Comprehension + Application) 8. Data Security (Weight 2/32, Level: Comprehension + Application)

Study and examination requirements and forms of examination	The final grade of this course consists of 40% usual performance (including 30% classroom participation, 30% assignment completion, and 40% experiment completion) and 60% final exam grade. The final exam is a closed-book test lasting 100 minutes. A comprehensive score of 60 or above is required to pass.
Reading list	[1] Chen Yue, Yang Kuiwu, & Hu Xuexian. *Data Security Theory and Technology* [M]. Beijing: Science Press, 2023. [2] Chen Tieming. *Data Security* [M]. Beijing: Publishing House of Electronics Industry, 2021. [3] Zhang Li. *Data Governance and Data Security* [M]. Beijing: Posts and Telecommunications University Press, 2019. [4] Chen Zhuang, Zou Hang, Zhang Xiaoqin, Zhang Junfeng, Huang Yuanjiang, & Liu Hongbing. *Data Security and Governance* [M]. Beijing: Tsinghua University Press, 2022. [5] Shen Xinyan. *Computer Network Security* [M]. Beijing: Posts and Telecommunications Press, 2015. [6] Fu Zhongyong, Zhao Zhenzhou, & Qiao Mingqiu. *Computer Network Security Tutorial* [M]. Beijing: Tsinghua University Press, 2017. [7] Guo Shanshan. Exploration of China's Public Information Security in the Mobile Internet Era [J]. Network Security Technology and Application, 2024, (12): 79-81. [8] Mei Wenshan. Analysis of Information Security Strategies in Computer Software Development [J]. Electronic Technology, 2024, 53(10): 288-289.
Revision Date	July 2024

Database Technology and Application

<table>
<tr><td>Module name</td><td colspan="3">Database Technology and Application</td></tr>
<tr><td>Semester</td><td colspan="3">Fall</td></tr>
<tr><td>Contact person</td><td colspan="3">Wan Minghao</td></tr>
<tr><td>Language</td><td colspan="3">Chinese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="3">compulsory, 3rd semester</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="3">Lecture method, group discussion method, case analysis method, laboratory experiment method, 3 class hours/week</td></tr>
<tr><td>Work load</td><td colspan="3">1. Total hours: 84 hours = 48 lecture hours + 36 self-study hours, completed in 16 weeks.
2. Instruction: 3 hours per week, including lectures, discussions, and Q&A.
3. Self-study: Approximately 3 (3-4) hours per week, including pre-class preview, after-class exercises, and review for exams.</td></tr>
<tr><td>Credit points</td><td colspan="3">3</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="3">C Language Programming, Data Structures and Algorithms</td></tr>
<tr><td rowspan="2">Learning outcomes and their corresponding PLOs</td><td>Course Learning Outcome (CLO)</td><td>Description</td><td>Supported Programme Learning Objective(PLOs)</td></tr>
<tr><td>CLO-1-1</td><td>Able to master basic concepts of databases, relational data models, and data normalization theory; master SQL, the standard</td><td>R1. Engineering Knowledge</td></tr>
</table>

	language for relational databases; master basic methods and steps of database design.	
CLO-2-2	Cultivate students' abstract thinking, logical reasoning abilities, and problem-solving skills; enable students to use database technology knowledge to design efficient and standardized databases that meet specific requirements based on specific needs.	R2. Problem Analysis, R3. Design/Develop Solutions
CLO-3-3	Cultivate students' professional ethics and craftsmanship through database experiments and database application system design; inspire students' patriotic feelings and mission to serve the country through science	R8. Individual and Team

		and technology by discussing database security technologies.	
Content	This course introduces and expounds the basic theories, technologies, and methods of database systems. Students are required to master knowledge of relational data theory, database protection, database design, and database management systems. Specifically including: history of database technology, data models, database system architecture, composition of database systems, etc.; relational databases; SQL language; relational systems and query optimization; relational data theory and relational normalization; database design; transactions, failure recovery, and concurrency control; database system security and integrity constraints, etc. Through the study of this course, students will master theoretical knowledge and applications in database basics, database design, database management and maintenance, etc.The knowledge modules are as follows: 1. Overview of Database Systems (Weight 4/48, Level: Memory + Comprehension) 2. Relational Databases (Weight 4/48, Level: Memory + Comprehension + Application) 3. Basics of SQL Server Databases (Weight 4/48, Level: Memory + Comprehension) 4. SQL—Standard Language for Relational Databases (Weight 24/48, Level: Memory + Comprehension + Application + Analysis)		

	5. Relational Database Design Theory (Weight 4/48, Level: Memory + Comprehension + Application) 6. Database Design (Weight 4/48, Level: Memory + Comprehension + Application + Analysis) 7. Database Management (Weight 4/48, Level: Memory + Comprehension + Application)
Study and examination requirements and forms of examination	The course assessment includes process assessment (40%) + final exam (60%) (including 30% attendance, 30% assignment completion, and 40% experiment completion). The final exam is a closed-book test lasting 100 minutes.
Reading list	[1] Wang Fengling. Principles and Applications of Database Systems [M]. Xi'an University of Electronic Science and Technology Press, 2022. [2] Wan Changxuan, Liao Guoqiong, Wu Jinghui, Liu Xiping. Principles and Design of Database Systems (3rd Edition) [M]. Tsinghua University Press, 2017. [3] Wang Shan, Sa Shixuan. Introduction to Database Systems (5th Edition) [M]. Higher Education Press, 2014.

	[4] Li Guoliang, Feng Jianhua, Chai Chengliang, Li Hui. Database System Theory: From Basic Principles to System Construction [M]. Higher Education Press, 2024. [5] Wang Xuhui. Database Technology and Its Application in the Big Data Environment [J]. Information Recording Materials, 2023, 24(03). [6] Wu Dan. Application Value and Methods of Distributed Database Technology [J]. Digital Communication World, 2023(04).
Revision Date	July 2024

Computer Networks

<table>
<tr><td>Module name</td><td colspan="3">Computer Networks</td></tr>
<tr><td>Semester</td><td colspan="3">Spring</td></tr>
<tr><td>Contact person</td><td colspan="3">Wei Liangping</td></tr>
<tr><td>Language</td><td colspan="3">Chinese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="3">compulsory, 4th semester</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="3">Lecture method, group discussion method, case analysis method, simulation experiment method, flipped classroom method, 2 class hours/week</td></tr>
<tr><td>Work load</td><td colspan="3">1. Total hours: 56 hours = 32 lecture hours + 24 self-study hours, completed in 16 weeks.
2. Instruction: 2 hours per week, including lectures, discussions, and Q&A.
3. Self-study: Approximately 1.5 hours per week, including pre-class preview, after-class exercises, and review for exams.</td></tr>
<tr><td>Credit points</td><td colspan="3">2</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="3">Digital Literacy in University</td></tr>
<tr><td rowspan="2">Learning outcomes and their corresponding PLOs</td><td>Course Learning Outcome (CLO)</td><td>Description</td><td>Supported Programme Learning Objective(PLOs)</td></tr>
<tr><td>CLO-1-1</td><td>Able to apply basic knowledge of computer network architecture, protocols, topologies, network devices,</td><td>R1. Engineering Knowledge</td></tr>
</table>

	and transmission media, use hierarchical architecture to analyze resource and communication subnets, and design and implement simple computer networks.	
CLO-2-2	Able to apply learned knowledge to identify network-related faults or requirements from various phenomena, determine the location of network faults, and comprehensively analyze and solve problems by considering network hierarchy, device interactions, and user operation habits.	R2. Problem Analysis, R3. Design/Develop Solutions

	CLO-3-3	Understand network construction standards, evaluate project design, construction, and operation plans, assess the impact of new technologies, possess awareness of sustainable development, and integrate sustainable development concepts into network planning practices.	R6. Engineering and Sustainable Development
Content	This course takes the hierarchical model of computer network architecture as the main line, introducing the basic principles, components, and structures of computer networks. It combines mainstream LAN and WAN technologies to explain the functions and implementation principles of the physical layer and data link layer, and integrates with TCP/IP to introduce the functions and main protocols of the network layer, transport layer, and application layer. The course cultivates students' thinking methods and network problem analysis capabilities, equips them with practical and application skills in computer network technology, and lays a necessary foundation for future engagement in computer network application, design, development, and further professional studies.The knowledge modules are as follows: 1. Overview of Computer Networks (Weight 2/32, Level:		

	Memory + Comprehension) 2. Network Architecture and Protocols (Weight 2/32, Level: Memory + Comprehension) 3. Physical Layer (Weight 2/32, Level: Memory + Comprehension) 4. Data Link Layer (Weight 8/32, Level: Memory + Comprehension + Application) 5. Network Layer (Weight 10/32, Level: Memory + Comprehension + Application) 6. Transport Layer (Weight 4/32, Level: Comprehension + Application) 7. Application Layer (Weight 2/32, Level: Comprehension + Application) 8. Network Security (Weight 2/32, Level: Memory + Comprehension)
Study and examination requirements and forms of examination	The course assessment includes process assessment (40%) and final exam (60%). The process assessment includes: classroom performance 40% + after-class assignments 30% + experiment completion 30%. The final exam is a closed-book test lasting 100 minutes.
Reading list	[1] Xie Xiren. *Computer Networks (8th Edition)* [M]. Beijing: Publishing House of Electronics Industry, 2021. [2] Wu Gongyi. *Computer Networks (5th Edition)* [M]. Beijing: Tsinghua University Press, 2021. [3] Hu Liang, Xu Gaochao. *Computer Networks* [M]. Beijing: Higher Education Press, 2024. [4] James F. Kurose, Keith W. Ross. *Computer Networking: A Top-Down Approach (7th Edition, Chinese Version)* [M]. Beijing: China Machine Press. [5] Pu Wei. Design and Implementation of a Question Answering System for Computer Network Courses Based on

	Knowledge Graph [D]. Ningxia University, 2021. DOI:10.27257/d.cnki.gnxhc.2021.001477. [6] Zheng Yi. Research on Routing Optimization Algorithms for Computer Networks Based on Deep Reinforcement Learning [D]. Southwest University of Science and Technology, 2023. DOI:10.27415/d.cnki.gxngc.2023.000547.
Revision Date	July 2024

Network Engineering

Module name	Network Engineering		
Semester	Fall		
Contact person	Su Nannan		
Language	Chinese		
Relation to curriculum	compulsory, 5th semester		
Type of teaching, contact hours	Lecture method, group discussion, laboratory experiments, 4 hours per week		
Work load	1. Total Hours: 112 hours = 64 hours of lectures + 48 hours of self-study, to be completed in 16 weeks. 2. Lectures per Week: Average of 4 hours (200 minutes) per week, including lectures, practical teaching, and discussions. 3. Self-study per Week: Average of 3 hours (150 minutes) per week, including previewing, homework, and extended learning.		
Credit points	4		
Recommended prerequisites	Computer Networks Network Protocols Analysis Network Device Configuration Debugging Practice		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**

CLO-1-1	Through practical training in network engineering, students will be able to master the basic knowledge and core skills of network engineering, including network planning and design, cabling principles, and cable making.	R6. Engineering and Sustainable Development
CLO-2-2	Understand and apply the principles and basic settings of switches and routers, as well as the use of network management platforms, to enhance the ability to handle network failures and conduct network testing and acceptance.	R8. Individual and Team

	CLO-3-3	Through specific examples, elaborate on the application of network engineering knowledge and methods, including the capture and analysis of network data packets, and the construction of network documentation.	R9. Communication； R10. Project Management
Content	This course is a core course in the Network Engineering major. It mainly introduces the preparation for network engineering, including the accumulation of network engineering knowledge and the construction process of network engineering, which includes network theory knowledge, planning and design methods, cabling principles and cable making, principles and basic settings of switches and routers, network management platforms, and common network tools. It also covers the later stages of network engineering, including the capture and analysis of network data packets, network failures and their handling, network testing and acceptance, and the construction of documentation. The content is detailed through specific examples.The knowledge modules are as follows: 1. Network Technology Fundamentals (Weight: 4/64, Level: Memory) 2. Local Area Networks (Weight: 14/64, Level: Understanding + Analysis) 3. Metropolitan Area Networks (Weight: 8/64, Level:		

	Understanding + Analysis) 4. Wide Area Networks (Weight: 8/64, Level: Understanding + Analysis) 5. Internet (Weight: 2/64, Level: Understanding) 6. Internet of Things (Weight: 6/64, Level: Understanding) 7. Network Center Construction and Network Management (Weight: 10/64, Level: Understanding) 8. Network Security (Weight: 4/64, Level: Understanding) 9. Network Failure Analysis and Handling (Weight: 4/64, Level: Understanding) 10. Network Device Configuration (Weight: 4/64, Level: Analysis)
Study and examination requirements and forms of examination	The course assessment includes formative assessment (60%) and a final exam (40%). The formative assessment consists of: laboratory experiments (40%) + homework (30%) + class participation (30%). The final closed-book exam lasts for 100 minutes.
Reading list	[1]Soheil Boroushaki;Jacek Malczewski.Measuring consensus for collaborative decision-making: A GIS-based approach[J].Computers, Environment and Urban Systems,2010(4). [2]Gangjun Zhai;;Zhu Long;;Jianxun Zhong;;Yunpeng Cui.Design and Research of VLAN Communication Experiment Based on the WEB Environment[J].Procedia Engineering,2012. [3]Sameh Monir El-Sayegh.Risk assessment and allocation in the UAE construction industry[J].International Journal of Project Management,2007(4). [4]Shou Qing Wang;Mohammed Fadhil Dulaimi;Muhammad Yousuf Aguria.Risk management framework for construction

	projects in developing countries[J].Construction Management and Economics,2004(3). [5]BARNEY DALGARNO，ANDREA G BISHOP. Effectiveness of a VirtualLaboratory as a preparatory resource for Distance Education chemistrystudents[J]. Computer & Education，2009(53)：853-865. [6]CATALIN COSMIN GLAVA，ADINA ELENA GLAVA. Student's Voices on Science teaching and learning based on Virtual Instrumentations. An international comparative view[J]. Procedia Social and Behavioral Sciences，2010(2)：2594-2598.
Revision Date	July 2024

Network Application Development

Module name	Network Application Development		
Semester	Fall		
Contact person	Chang Laihua		
Language	Chinese		
Relation to curriculum	compulsory, 5th semester		
Type of teaching, contact hours	Lecture method, group discussion, simulation experiment method, 3 hours per week		
Work load	1. Total hours: 80 hours = 48 hours of lectures + 32 hours of self-study, to be completed in 16 weeks. 2. Lectures: 3 hours per week, including lectures, discussions, and Q&A. 3. Self-study: Approximately 2 (2-3) hours per week, including pre-class preview, post-class practice, and review for exams.		
Credit points	3		
Recommended prerequisites	*Data Structures and Algorithms* *Database Technology and Applications*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Remember the use of WINSOCK API network programming interface	R1. Engineering Knowledge

	functions and understand the implementation of various WINSOCK I/O models, with the ability to design basic network communication programs.	
CLO-2-2	Be able to design a chat program based on the TCP protocol in a C/S model to enhance students' programming and debugging skills.	R3.Design/Develop Solutions
CLO-3-3	Implement relevant examples and design simple communication programs based on WINSOCK API network programming interface functions, WINSOCK I/O models, application	R5.Use Modern Tools

		layer protocols, and the two MFC socket base classes in Windows.	
Content	*Network Application Development* is a core course in the Network Engineering major. It has dual characteristics of both a technical foundation course and a technical practice course. Students are expected to master both database theory and design programming methods, as well as Web programming skills, debugging abilities, and programming techniques. This is a highly integrated course that covers common information processing and management concepts and integrates most ASP.Net technologies. The goal of this course is to enable students to correctly understand the basic concepts and theories of ASP.Net programming, master its basic operations and applications, and be able to design simple and practical Web applications using scripting languages, XML, ASP.Net objects, and components. Students will also become familiar with the basic concepts of network database technology and master the skills and methods for software development using network database technology.The knowledge modules are as follows: 1. Overview of Network Application Development (Weight: 2/48, Level: Understanding) 2. Network Programming Interface Functions (Weight: 6/48, Level: Understanding + Memory) 3. Windows Programming (Weight: 6/48, Level: Understanding + Memory)		

	4. Design of C/S Mode Chat Program (Weight: 9/48, Level: Understanding + Application) 5. WINSOCK I/O Models (Weight: 8/48, Level: Understanding + Application) 6. E-MAIL Programming (Weight: 9/48, Level: Understanding + Application) 7. HTTP and FTP Protocols (Weight: 8/48, Level: Understanding + Application)
Study and examination requirements and forms of examination	The course assessment includes formative assessment (60%) and a final exam (40%). The formative assessment consists of: unit tests (40%) + homework (30%) + individual presentations (30%). The final closed-book exam lasts for 100 minutes.
Reading list	[1]Microsoft Corporation. Web Application Development. Higher Education Press, 2021. [2] Zhang Jun. JSP Network Application Development: Examples and Practice. Tsinghua University Press, 2020. [3] Chen Can. VB.NET Network Application Development: Examples and Practice. Tsinghua University Press, 2020. [4] Guo Changzhen. ASP Network Application Development: Examples and Practice. Tsinghua University Press, 2019. [5] Anthony Jones. Windows Network Programming. Tsinghua University Press, 2019. [6] Liu Feifei. “Research on Blended Teaching and Evaluation of the Course ‘Network Application Development’.” Office Automation, 2023, 28(13): 21-24. [7] Song Weiwei, Tao Jun. “Exploring Network Application Programming Teaching Methods Integrated with Framework Thinking.” Fujian Computer, 2023, 39(04):

	63-66. DOI:10.16707/j.cnki.fjpc.2023.04.012. [8] Zhai Guangkun. “Real-time Lane Line Detection Based on Lightweight Networks and Its Embedded Application Development.” Dissertation, Shanghai Jiao Tong University, 2021. DOI:10.27307/d.cnki.gsjtu.2021.000421. [9] Wang Yan. “Research on 3D Point Cloud Denoising Deep Learning Networks and Application Program Development.” Dissertation, Taiyuan University of Science and Technology, 2024. DOI:10.27721/d.cnki.gyzjc.2024.000599.
Revision Date	July 2024

Network Security

Module name	Network Security		
Semester	Fall		
Contact person	Zhao Xia		
Language	Chinese		
Relation to curriculum	compulsory, 5th semester		
Type of teaching, contact hours	lecturing, group discussion, case analysis, and simulation experiment. The class hours are 2 hours per week.		
Work load	1. Total hours: 56 hours, which consists of 32 hours of teaching and 24 hours of self - study, to be completed in 16 weeks. 2. Teaching: 2 hours per week, including lecturing, discussion, and Q&A. 3. Self - study: Approximately 1.5 hours per week, including preview before class, homework after class, understanding, practice, and review for exams.		
Credit points	2		
Recommended prerequisites	Network Protocols Analysis, Fundamentals of Information Security Technology		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Through the study of this course, students should understand the current situation and requirements	R2.Problem analysis

	of network security, the necessity of security prevention, comprehend the basic concepts and principles of network security, as well as common types of network threats, and be able to identify and assess potential network security risks.	
CLO-2-2	Through the study of this course, students will be able to select and apply network security tools to analyze and predict network security problems, and be able to use network security knowledge and mainstream technologies and methods to design and implement effective security control measures.	R3.Design/develop solutions

	CLO-3-3	Through the study of this course, students will be able to understand the network security defense system, recognize the network security laws, regulations, and standard specifications, form a sense of security, network ethics, and moral awareness, enhance the social responsibility of network behavior, and be able to fully consider security factors in the network design, implementation, and maintenance processes.	R6.Engineering and sustainable development, R7. Ethics and professional norms
Content	Network Security is a professional core course of network engineering, which combines theory with practice. The course focuses on the security problems and various related security technologies involved in computer networks to carry out teaching tasks. The course content includes basic knowledge of network security, network security system and management, network protocols security, hacker attack and detection defense, computer virus prevention, firewall technology, operating system security, new network security		

	technologies and solutions, etc.The knowledge modules are as follows: 1. Network security basics (weight 2/32, level: memory + understanding) 2. Network security system and management (weight 2/32, level: memory + understanding) 3. Network protocols security (weight 4/32, level: memory + understanding) 4. Hacker attack and detection defense (weight 8/32, level: memory + understanding + analysis) 5. Computer virus prevention (weight 4/32, level: memory + understanding + analysis) 6. Firewall technology (weight 4/32, level: memory + understanding) 7. Operating system security (weight 6/32, level: memory + understanding + application) 8. New network security technologies and solutions (weight 4/32, level: memory + understanding + analysis + evaluation)
Study and examination requirements and forms of examination	The final grade is composed of 40% of the usual performance (including 30% of classroom performance, 30% of homework completion, and 40% of experiment completion) and 60% of the final exam score. Students need to achieve a comprehensive score of 60 to pass.
Reading list	[1] Jia Tiejun, He Daojing, Luo Yiyuan. Network Security Technology and Application [M]. Beijing: China Machine Press, 2024. [2] Wang Qun, Li Fujuan. Network Security Technology [M]. Beijing: Tsinghua University Press, 2020. [3] Yuan Jinsheng, Wu Yannong. Fundamentals of Computer

	Network Security [M]. Beijing: Posts and Telecommunications Press, 2018. [4] Yan Huaizhi. Network Security - Applied Technology and Engineering Practice [M]. Beijing: Higher Education Press, 2023. [5] Introduction to Computer Network Security, by Obadet, Science Press, 2009. [6] Xi Jinping. Speech at the Symposium on Cybersecurity and Informatization Work [N]. People's Daily, 2016 - 04 - 26(002). [7] Jiang Jianchun, Ma Hengtai, Ren Dang'en, et al. Network Security Intrusion Detection: A Research Review [J]. Journal of Software, 2000, (11): 1460 - 1466.
Revision Date	July 2024

Network Management

Module name	Network Management		
Semester	Spring		
Contact person	Li Yan		
Language	Chinese		
Relation to curriculum	compulsory, 6th semester		
Type of teaching, contact hours	lecture method, simulation experiment method, project - based learning method. 3 class hours are arranged per week.		
Work load	1. The total duration of the course is 96 hours, including 48 hours of lecture and 48 hours of self - study. 2. The course lasts for 16 weeks. 3 hours of teaching are carried out per week, including lecture, Q&A, and discussion sessions. 3. 3 hours of self - study are required per week for preview before class, practice after class, and review for exams.		
Credit points	3		
Recommended prerequisites	*Computer Networks*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Master the theories and professional knowledge of computer network	R1. Engineering Knowledge.

	planning and design, system development, operation management, and maintenance. Through practical training, students will be able to solve complex practical problems in network engineering. This helps students obtain registered network engineer and related professional qualification certificates, and become key professionals in network engineering fields, corresponding to the graduation objective	

CLO-2-2	Improve language expression and application abilities, and acquire the skills to read, write, and translate foreign literature related to network engineering. Master the methods of using information technology to solve professional problems, and cultivate the abilities of literature retrieval and scientific research, reaching the professional level of network engineers, corresponding to the graduation objective.	R2. Problem Analysis.

CLO-3-3	Cultivate good humanistic qualities, social responsibilities, and engineering professional ethics. Familiarize students with relevant policies, regulations, and laws in network engineering, enhance their abilities to serve society, communicate socially, and handle public relations, and make them important forces for social progress, corresponding to the graduation objective.	R6. Engineering and Sustainable Development.

	CLO-4-4	Grasp the development trends of the major and related fields, possess innovative, entrepreneurial, and systematic thinking abilities, and have the ability of lifelong learning. Form core competitiveness in the field of network engineering and be able to take on independent responsibilities in professional technology or management fields, corresponding to the graduation objective.	R4. Research.

Content	This course is a core theoretical and practical course for undergraduate students majoring in computer science. It mainly focuses on network resource management, covering the comprehensive coordination of hardware, software, and human resources, and realizing the monitoring, testing, configuration, analysis, evaluation, and control of network resources to ensure network real - time performance and quality of service, and to handle network failures in a timely manner. By constructing a complete network operation environment, students will complete the installation and configuration of network devices, basic security configuration, network management, diagnosis and troubleshooting of simple network failures, and other tasks within the entire work area of network operation, maintenance, and management. They will master the basic knowledge and skills of network operation, maintenance, and management, and be able to meet the requirements of corresponding network operation and maintenance management positions.The knowledge modules are as follows: 1. Introduction to Network Management (Weight: 1/48, Level: Memorization + Comprehension) 2. Abstract Syntax Notation One (ASN.1) (Weight: 6/48, Level: Memorization + Comprehension + Application) 3. Management Information Base (Weight: 6/48, Level: Memorization + Comprehension + Application) 4. Simple Network Management Protocol (Weight: 6/48, Level: Memorization + Comprehension + Application) 5. Remote Network Monitoring (Weight: 9/48, Level: Memorization + Comprehension + Application) 6. Application of SNMPc Network Management Software (Weight: 6/48, Level: Memorization + Comprehension + Application) 7. Network Analysis System (Weight: 4/48, Level:

	Memorization + Comprehension + Application) 8. Network Management Tools (Weight: 8/48, Level: Memorization + Comprehension + Application) 9. Network Testing and Performance Evaluation (Weight: 2/48, Level: Memorization + Comprehension)
Study and examination requirements and forms of examination	The course assessment includes process assessment (60%) and final examination (40%). The process assessment includes 40% of class participation, 30% of after - class assignments, and 30% of experiment reports. The final examination is a closed - book test lasting 100 minutes.
Reading list	[1] *Computer Network Management*, edited by Lei Zhenjia, published by Xidian University Press, 3rd edition, 2021 [2] William Stallings. *Data and Computer Communications*, 7th edition. Beijing: Higher Education Press, 2006 [3] Andrew S. Tanenbaum. *Computer Networks*, 4th edition. Beijing: Tsinghua University Press, 2004 [4] Lei Zhenjia. *Network Engineer Tutorial*, 4th edition. Beijing: Tsinghua University Press, 2014 [5] Lei Zhenjia. *Computer Networks*, 3rd edition. Xi'an: Xidian University Press, 2011 [6] Li Ming, Zhang Wei, Wang Fang. Research on Optimization of Dynamic Traffic Management in Software - Defined Networks Based on AI [J]. Chinese Journal of Computers, 2023, 45(2): [7] Chen Tao, Liu Yang, Zhou Li. Research on Collaborative Management Mechanism of Network Resources for 5G Edge Computing [J]. Journal on Communications, 2022, 43(9):

Revision Date	July 2024

Java Programming

Module name	Java Programming		
Semester	Spring		
Contact person	Liu Xiaofeng		
Language	Chinese		
Relation to curriculum	restricted elective, 6th semester		
Type of teaching, contact hours	lecture method, demonstration method, group discussion method. 2 class hours are arranged per week.		
Work load	1. The total duration of the course is 80 hours, including 32 hours of lecture and 48 hours of self - study. The course lasts for 16 weeks. 2. hours of teaching are carried out per week, including lecture, discussion, and Q&A sessions. 3. hours of self - study are required per week for preview before class, practice after class, and review for exams.		
Credit points	2		
Recommended prerequisites	*C Programming*, *Python Programming*, *Data Structures and Algorithms*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Understand the characteristics of the Java language, and comprehend the operation principles and methods of Java Application programs. Master	R5. Use of Modern Tools.

	the operations of compiling and running programs in the JDK environment, and be familiar with the operations of editing, compiling, running, and debugging programs in integrated development environments such as Eclipse and IDEA. Corresponding to the graduation objective.	
CLO-2-2	Master the basic syntax components of the Java language, including data types, statements, methods, etc. Comprehend the object - oriented programming ideology, master the principles of class encapsulation and inheritance, understand runtime	R4. Research.

		polymorphism, and understand the roles of abstract classes and final classes. Corresponding to the graduation objective.	
	CLO-3-3	Master the declaration and usage methods of interfaces and interface - implementing classes, understand the functions of interfaces; be familiar with nested types; be familiar with Java API language packages and utility packages. Corresponding to the graduation objective.	R1. Engineering Knowledge.
Content	This course mainly introduces the basic knowledge, methods, and techniques of Java programming. Through the teaching of this course, students should be able to comprehensively apply the Java language to design Java Web and Java applications, improve their ability to analyze and solve problems in the research and application fields of Java programs; master the application of the Java language in specific software engineering, lay a solid knowledge and technical foundation for subsequent courses and future practical work, and		

	enhance students' ability to self - study and update professional knowledge.The knowledge modules are as follows: 1. Introduction (Weight: 4/32, Level: Memorization + Comprehension) 1. Java Language Basics (Weight: 4/32, Level: Memorization + Comprehension + Application) 2. Object - Oriented Features of Java (Weight: 4/32, Level: Memorization + Comprehension + Application) 3. Advanced Class Features, Interfaces and Common Classes (Weight: 4/32, Level: Memorization + Comprehension + Application) 4. Exception Handling (Weight: 4/32, Level: Memorization + Comprehension + Application) 5. Database Programming (Weight: 4/32, Level: Memorization + Comprehension + Application) 6. Multithreaded Programming (Weight: 4/32, Level: Memorization + Comprehension + Application) 7. Stream and File Operations (Weight: 4/32, Level: Memorization + Comprehension + Application)
Study and examination requirements and forms of examination	The course assessment includes process assessment (60%) and final examination (40%). The process assessment includes 40% of unit tests, 30% of after - class assignments, and 30% of attendance. The final examination is a closed - book test lasting 100 minutes.
Reading list	[1] Java Programming Tutorial, Cui Miao, Zhao Xiaohua, China Machine Press, 2019 [2] Introduction to Java Programming (Fundamentals), Y. Daniel Liang, China Machine Press, 2019

	[3] Java Programming Tutorial, Xiao Yunpeng, Li Tun, Liu Yanbing, Tsinghua University Press, 2019 [4] Java Programming Practical Training, Wang Wei, Yang Liping, Tsinghua University Press, 2019 [5] Guidance on Knowledge Units of Java Object - Oriented Programming, Shi Jun et al., Higher Education Press, 2018 [6] "The Next 700 Programming Languages" (Revisited) by Peter J. Landin (2020) [7] "Performance and Scalability of Java - based Web Applications: A Survey" by Mark S. Smucker and Alexander G. Schmidt (2021)
Revision Date	July 2024

Modern Communication Technology

Module name	Modern Communication Technology		
Semester	Spring		
Contact person	Song Jing		
Language	Chinese		
Relation to curriculum	compulsory, 6th semester		
Type of teaching, contact hours	lecture method, group discussion method, case analysis method. 2 class hours are arranged per week.		
Work load	1. The total duration of the course is 56 hours, including 32 hours of lecture and 24 hours of self - study. The course lasts for 16 weeks. 2. 2 hours of teaching are carried out per week, including lecture, discussion, and Q&A sessions. 3. Approximately 1.5 hours of self - study are required per week for preview before class, practice after class, and review for exams.		
Credit points	2		
Recommended prerequisites	*Advanced Mathematics*, *Computer Networks*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Through the study of this course, students will be able to remember the basic concepts and principles of modern communication	R1. Engineering Knowledge.

		technology, summarize the composition and key technologies of digital communication systems, master the basic principles and transmission technologies of digital microwave and satellite communication, mobile communication networks, and optical fiber communication, and retell the development trends and application prospects of new communication network technologies. Corresponding to the graduation objective.	

CLO-2-2	Through the study of this course, students will be able to apply the principles and technologies of modern communication, analyze common communication methods, the principles of information transmission sending and receiving, diagnose simple fault problems, and design some simple communication systems. Corresponding to the graduation objective.	R3. Design/Development of Solutions.
CLO-3-3	Stimulate students' interest and enthusiasm for modern communication technology, cultivate students' professional qualities and work ethics, enable students to	R7. Ethics and Professional Norms.

		recognize the importance and role of communication technology in modern society, and enhance students' sense of identity and responsibility towards the communication industry. Corresponding to the graduation objective.	
Content	Modern Communication Technology is a specialized course for students majoring in Network Engineering. The main contents of the course include: (1) Basic concepts of modern communication, multiplexing technology, and communication networks and their composition; (2) Digitization of analog signals, modulation and demodulation, and transmission of digital signals; (3) Circuit switching, packet switching, and generalized switching technology; (4) Fading and anti - fading in digital microwave and satellite communication, and multiple access technology in satellite communication; (5) Optical fiber communication systems and new technologies; (6) Key technologies of mobile communication networks, GSM, 2G, 3G, 4G, 5G technologies; (7) Computer network communication, including local area network, wide area network, and Internet technologies; (8) Access networks, including XDSL technology, optical access networks, and other access technologies; (9) New communication network technologies, including broadband IP networks, intelligent networks (IN), and virtual private networks (VPN). Through the study of knowledge such as optical fiber communication		

	technology, digital microwave and satellite communication, and mobile communication in this course, it also provides knowledge support for the study of subsequent courses.The knowledge modules are as follows: 1. Introduction (Weight: 2/32, Level: Description) 2. Digital Communication Systems (Weight: 4/32, Level: Memorization + Comprehension) 3. Modern Switching Technology (Weight: 4/32, Level: Memorization + Comprehension) 4. Digital Microwave and Satellite Communication (Weight: 4/32, Level: Mastery + Analysis) 5. Optical Fiber Communication (Weight: 6/32, Level: Mastery + Analysis + Evaluation) 6. Mobile Communication Networks (Weight: 4/32, Level: Mastery + Analysis) 7. Computer Network Communication (Weight: 4/32, Level: Memorization + Comprehension) 8. Access Networks (Weight: 2/32, Level: Memorization + Comprehension) 9. New Communication Network Technologies (Weight: 2/32, Level: Comprehension)
Study and examination requirements and forms of examination	The course assessment includes process assessment (50%) and final examination (50%). The process assessment includes 10% of daily performance, 20% of regular assignments, and 20% of unit tests. The final examination is a closed - book test lasting 100 minutes.
Reading list	[1] Cui Jianshuang. Introduction to Modern Communication Technology (3rd Edition). Beijing: China Machine Press, 2020. [2] Sun Qinghua. Modern Communication Technology and

	Applications [M]. Beijing: Posts & Telecom Press, 2021. [3] Shen Qingguo. Modern Communication Networks (3rd Edition) [M]. Beijing: Posts & Telecom Press, 2020. [4] Tian Guangdong. Principles and Technologies of Modern Communication [M]. Beijing: China Railway Publishing House, 2018. [5] Zhang Kaiwen. Research on Diagnosis of Cable Electrical Tree Aging Defects Based on Power Line Carrier Communication Technology [D]. Xi'an University of Technology, 2024. DOI:10.27398/d.cnki.gxalu.2024.001309. [6] Zhang Xuyang. Research on Multi - beam Satellite Communication Technology Based on NOMA [D]. Beijing Information Science & Technology University, 2024. [7] Yang Jianfeng, Zhang Yan. Application of Modern Communication Technology in Firefighting and Rescue [J]. Fire Protection Today, 2024, 9(05): 56 - 57 + 80.
Revision Date	July 2024

Wireless and Mobile Network Technology

Module name	Wireless and Mobile Network Technology		
Semester	Spring		
Contact person	Wang Peixun		
Language	Chinese		
Relation to curriculum	restricted elective, 6th semester		
Type of teaching, contact hours	Lectures, Group Discussions, Project-based Learning, 2 hours/week		
Work load	1. Total Hours: 56 hours (completed in 16 weeks) 2. Lectures: 32 hours (including in-class discussions and Q&A) 3. Self-study: 24 hours (including pre-class preview, after-class exercises, and revision)		
Credit points	2		
Recommended prerequisites	*Network Engineering*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Describe and explain the basic principles of wireless communication, master the concepts of wireless transmission,	R1. Engineering Knowledge

	functions of the physical layer and data link layer, as well as signal propagation mechanisms.	
CLO-2-2	Familiarize with typical wireless network technologies (e.g., WLAN, cellular networks, mobile ad-hoc networks), and understand their networking methods and system architectures.	R1. Engineering Knowledge
CLO-3-3	Possess the ability to plan and design wireless networks, including signal coverage, capacity planning, frequency planning, and topology design.	R3. Design/Development of Solutions

	CLO-4-4	Cultivate teamwork and project management capabilities through team projects, and enhance practical problem-solving skills.	R8. Individual and Teamwork
Content	The course covers basic principles of wireless communication and typical network technologies, aiming to develop skills in network planning, design, and management. The knowledge modules are as follows: 1. Foundation of Wireless Communication Technology (Weight: 2/32, Memory Level) Basic concepts of wireless transmission, principles of the physical layer and data link layer 2. Wireless Network Architecture and Protocols (Weight: 4/32, Comprehension+Analysis Level) Network architecture design, communication protocols (e.g., 802.11 series) 3. Mobile Network Technologies and Applications (Weight: 5/32, Comprehension+Analysis Level) Cellular networks (e.g., 5G), mobility management, typical application scenarios 4. Wireless Network Planning and Optimization (Weight: 6/32, Comprehension+Application Level) Coverage and capacity planning, frequency allocation, topology optimization methods 5. Wireless Network Security and Management (Weight: 6/32, Comprehension+Analysis Level) Security protocols, encryption technologies, network monitoring and fault handling		

	6. Mobile Application Development and Testing (Weight: 9/32, Comprehension+Application Level) Mobile application development frameworks, testing processes, and performance optimization
Study and examination requirements and forms of examination	Process Assessment (60%) Unit Tests: 40% After-class Assignments: 30% Individual Presentations: 30% Final Examination (40%) Closed-book exam, 100 minutes
Reading list	[1] William Stallings. Data and Computer Communications. Beijing: Publishing House of Electronics Industry, 2021. [2] James F. Kurose, Keith W. Ross. Computer Networking: A Top-Down Approach. Beijing: China Machine Press, 2020. [3] Matthew S. Gast. 802.11 Wireless Networks: The Definitive Guide. Nanjing: Southeast University Press, 2019. [4] Theodore S. Rappaport. Wireless Communications: Principles and Practice. Beijing: Publishing House of Electronics Industry, 2018. [5] Li Xin. “Research on Data Transmission and Network Optimization Technology in Mobile Communication Networks.” Telecom World, 2024, 31(05): 46-48. [6] Chen Jinyan. “Technical Analysis and Implementation of New Mobile Emergency Communication Networks.” Telecom

	World, 2024, 31(10): 19-21.
Revision Date	July 2024

Network Attack and Defense

Module name	Network Attack and Defense		
Semester	Spring		
Contact person	Yan Lingling		
Language	Chinese		
Relation to curriculum	restricted elective, 6th semester		
Type of teaching, contact hours	Lectures, Demonstrations, Group Discussions, 2 hours/week		
Work load	1. Total Hours: 56 hours (completed in 16 weeks) 2. Lectures: 32 hours (including in-class discussions and Q&A) 3. Self-study: 24 hours (including pre-class preview, after-class exercises, and revision)		
Credit points	2		
Recommended prerequisites	*Fundamentals of Information Security Technology, Network Security*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Cultivate students' ability to identify, analyze, and propose solutions to problems in complex network security environments.	R3. Design/Development of Solutions

	Enhance sensitivity to network security ethics to ensure technical practices comply with moral and legal standards, safeguarding user privacy and data security.	
CLO-2-2	Familiarize students with the TCP/IP protocol stack and security issues at each layer. Understand common encryption technologies (e.g., SSL/TLS), authentication mechanisms (e.g., Kerberos), and access control strategies. Comprehend the concepts, classification, discovery, and patching of vulnerabilities, as well as security practices in the software development lifecycle.	R5. Use of Modern Tools

CLO-3-3	Enable students to recognize network security as an evolving field and cultivate the habit of continuous learning about new technologies, threats, and defense strategies. Understand and abide by professional ethics in network security, such as respecting privacy, avoiding illegal activities, and protecting intellectual property.	R7. Ethics and Professional Norms, R8. Individual and Teamwork

Content	This comprehensive course in network security aims to help students understand the basic principles of network attacks and defense methods, cultivating network security awareness and skills. The content includes: Basic knowledge of network security; Network attack technologies, including how attackers exploit vulnerabilities and weaknesses, as well as attack strategies and processes; Defense strategies and measures The course includes experiments and simulated attack exercises, allowing students to practice attack and defense techniques in a secure environment. These hands-on operations deepen theoretical understanding and enhance practical capabilities to address network security threats.The knowledge modules are as follows: 1. Introduction (Weight: 6/48, Level: Comprehension) 2. Information Gathering (Weight: 6/48, Level: Comprehension+Memory) 3. Network Scanning (Weight: 4/48, Level: Comprehension+Application) 4. Password Cracking (Weight: 4/48, Level: Comprehension+Application) 5. Software Vulnerabilities (Weight: 6/48, Level: Comprehension+Application) 6. Script Attacks and Defense (Weight: 4/48, Level: Comprehension+Application) 7. Malicious Code and Defense (Weight: 4/48, Level: Comprehension+Application) 8. False Message Attacks (Weight: 5/48, Level: Comprehension+Application) 9. Denial-of-Service Attacks (Weight: 5/48, Level: Comprehension+Application) 10. Attacks and Defense of Network Security Devices (Weight: 4/48, Level: Comprehension+Analysis)

Study and examination requirements and forms of examination	Assessment Type: Coursework Evaluation Composition: Process Assessment (50%) Timeliness (10%) + Quality (20%) + Quantity (20%) Final Assessment (50%) Theoretical Assessment (20%) + Practical Operation Assessment (30%)
Reading list	[1] Zhu Junhu. Network Attack and Defense Technology. China Machine Press, n.d. [2] Zhang Yuqing, Chen Shenglong, Yang Tong. Network Attack and Defense. Tsinghua University Press, n.d. [3] Cisco Systems (China) Network Technology Co., Ltd. Next-Generation Network Security. Posts & Telecom Press, n.d. [4] Liang Yiasheng. Computer Network Security (3rd ed.). China Machine Press, n.d. [5] Shen Xinyan. Computer Network Security. Posts & Telecom Press, n.d. [6] Zhong Zaichun. "Artificial Intelligence-Based Network Intrusion Detection and Prevention Technologies." Network Security Technology & Application, 2024(12): 6-8. [7] Feng Liming, Wang Yuemei, Han Guoxin. "Research on the Development Trends of Computer Network Attack and Defense Technologies." Computer Knowledge and Technology, 2024, 20(33): 79-81.
Revision Date	July 2024

Network System Integration

<table>
<tr><td>Module name</td><td colspan="3">Network System Integration</td></tr>
<tr><td>Semester</td><td colspan="3">Fall</td></tr>
<tr><td>Contact person</td><td colspan="3">Li Yan</td></tr>
<tr><td>Language</td><td colspan="3">Chinese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="3">restricted elective, 7 th semester</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="3">Lectures, Simulated Experiments, Online Learning, 2 hours/week</td></tr>
<tr><td>Work load</td><td colspan="3">1. Total Hours: 84 hours (completed in 16 weeks)
2. Lectures: 32 hours (including in-class discussions and Q&A)
3. Self-study: 52 hours (including pre-class preview, after-class exercises, and revision)</td></tr>
<tr><td>Credit points</td><td colspan="3">2</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="3">Network Attack and Defense

Network Testing and Performance Evaluation

Wireless and Mobile Network Data</td></tr>
<tr><td rowspan="2">Learning outcomes and their corresponding PLOs</td><td>Course Learning Outcome (CLO)</td><td>Description</td><td>Supported Programme Learning Objective(PLOs)</td></tr>
<tr><td>CLO-1-1</td><td>Enable students to master the operation and configuration of network devices, as well as the use of network</td><td>R2. Problem Analysis</td></tr>
</table>

	protocols analysis software.	
CLO-2-2	Help students grasp key concepts and principles of computer network technology, as well as the design ideas and methods of computer network architecture and major network protocols.	R3. Design/Development of Solutions
CLO-3-3	Enable students to proficiently apply computer network technology in the design and integration of network systems.	R6. Engineering and Sustainable Development

Content	Network system integration is an indispensable engineering technology in network engineering construction. This course focuses on the theoretical knowledge and practical cases of computer network system integration, covering: fundamentals of network communication；network interconnection devices；integrated wiring systems； LAN and WAN technologies；network security；software platforms. Students will master the design, requirement analysis, equipment selection, construction plans, testing plans, acceptance criteria, and budget planning for system integration and integrated wiring systems, and learn to design specific solutions in accordance with detailed design specifications. With Computer Networks as a prerequisite, this course builds on foundations in data communication and network security. It cultivates students' capabilities in LAN design, network server technology, and equipment selection, laying the groundwork for graduation thesis design and subsequent courses. The knowledge modules are as follows: 1. Network System Integration Orientation 2. Overview of Network System Integration 3. Usage of Packet Tracer Software 4. Requirement Analysis for Network System Integration 5. Selection, Installation, and Configuration of Switches (Part 1) 6. Design of Computer Network Systems 7. Selection, Installation, and Configuration of Switches (Part 2) 8. Equipment and Selection Strategies for Network System Integration

	9. Configuration and Application of Routers (Part 1) 10. Network Management and Network Security 11. Configuration and Application of Routers (Part 2) 12. Fundamentals of Integrated Wiring Systems 13. Discussion on Network Management and Network Security 14. Transmission Media and Their Characteristics 15. Discussion on Integrated Wiring Systems and Case Studies
Study and examination requirements and forms of examination	Process Assessment (60%) Unit Tests: 40% After-class Assignments: 30% Attendance: 30% Final Examination (40%) Closed-book exam, 100 minutes
Reading list	[1] Network System Integration and Integrated Wiring (2nd ed.), Liu Tianhua, Posts & Telecom Press, 2016 [2] Network Engineering Design and System Integration (3rd ed.), Yang Zhizhuo, Posts & Telecom Press, 2014 [3] Network System Integration, Liu Xiaoxiao, Shao Jingbo, Tang Hongwei, Guo Feng, Tsinghua University Press, 2016 [4] Network System Integration, Qin Zhi, Xidian University Press, 2017 [5] Network Engineering Design Tutorial: System Integration Methods (3rd ed.), Chen Ming, China Machine Press, 2014 [6] Zhao Li, Liu Fang. "Computer Network System Integration Technology and Applications." Modern Information

	Technology, 2020, 4(12): 78-80. [7] He Zhong. "Research on the Application of Computer Network System Integration Technology Methods." Proceedings of the 2021 South China Education Informatization Research Experience Exchange Conference (IV), 2021.
Revision Date	July 2024

Network Testing

Module name	Network Testing		
Semester	Fall		
Contact person	Zhao Hui		
Language	Chinese		
Relation to curriculum	restricted elective, 7 th semester		
Type of teaching, contact hours	Lectures, Case Analysis, Simulated Experiments, Project-based Learning, 2 hours/week		
Work load	1. Total Hours: 56 hours (completed in 16 weeks) 2. Lectures: 32 hours (including discussions, Q&A, and experiments) 3. Self-study: 24 hours (pre-class preview, exercises, revision)		
Credit points	2		
Recommended prerequisites	Network Protocols Analysis, Network Device Configuration，Debugging Practice		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Understand core principles and methods of network testing, including key performance indicators (KPIs) like throughput, latency, and packet	R1. Engineering Knowledge

	loss rate. Learn to design and execute effective network performance tests to evaluate system stability.	
CLO-2-2	Proficiently use network testing tools and technologies (e.g., Ping, Traceroute, iPerf). Master practical operations to conduct performance testing, fault diagnosis, and system optimization.	R5. Use of Modern Tools
CLO-3-3	Cultivate capabilities in performance analysis and optimization. Analyze test results to identify bottlenecks, and propose effective optimization solutions based on analysis.	R2. Problem Analysis

	CLO-4-4	Enhance teamwork and project management skills through group projects. Learn to organize teams, allocate tasks, monitor progress, and communicate effectively to ensure project success.	R10. Project Management
Content	Network Testing is a specialized course for network engineering and related majors, covering: Network fundamentals； Performance testing principles； Testing tool usage； Performance analysis and optimization. The course aims to cultivate students' practical abilities in network performance testing and evaluation, laying a foundation for future engineering practice. It first introduces basic network protocols, devices, and data transmission principles, then elaborates on testing concepts, indicators, methods, and processes. Common tools (e.g., Ping, Traceroute, iPerf) are taught alongside techniques for analyzing bottlenecks and proposing optimizations. Combining theoretical lectures, experimental operations, and case analysis, the course equips students with solid theoretical and technical foundations for subsequent studies and practical applications, while enhancing self-learning and knowledge updating capabilities.The knowledge modules are as follows: 1. Overview of Computer Network Testing and Fault Diagnosis (Weight: 2/32, Level: Comprehension) 2. Computer Network Testing and Fault Diagnosis Tools (Weight: 4/32, Level: Application) 3. Physical Layer Testing and Fault Diagnosis (Weight: 4/32,		

	Level: Comprehension+Application+Analysis) 4. Data Link Layer Testing and Fault Diagnosis (Weight: 4/32, Level: Comprehension+Application+Analysis) 5. Network Layer Testing and Fault Diagnosis (Weight: 4/32, Level: Comprehension+Application+Analysis) 6. Transport Layer Testing and Fault Diagnosis (Weight: 4/32, Level: Comprehension+Application+Analysis) 7. Application Layer Testing and Fault Diagnosis (Weight: 4/32, Level: Comprehension+Application+Analysis) 8. Comprehensive Application of Network Testing and Fault Diagnosis (Weight: 6/32, Level: Application+Analysis+Evaluation)
Study and examination requirements and forms of examination	Process Assessment (50%) Daily Performance: 30% Homework: 30% Unit Tests: 40% Final Assessment (50%) Capstone Project
Reading list	[1] Network Testing and Fault Diagnosis (2nd ed.), Pan Kaien (Ed.), Publishing House of Electronics Industry, 2022 [2] Network Testing Technology and Applications, He Linbo (Ed.), Xidian University Press, 2018 [3] Network Testing Automation, Jin Kezhong (Ed.), Higher Education Press, 2023 [4] Network Security Penetration Testing, Miao Chunyu (Ed.), Publishing House of Electronics Industry, 2021 [5] Kali Linux 2 Network Penetration Testing Practice Guide, Li Huafeng (Ed.), Posts & Telecom Press, 2018

	[6] Li Diantao. "Application of Linux Network Tools in Network Testing." Computer Programming Skills & Maintenance, 2023(12): 174-176. [7] Chen Jing, Zhang Kun. "Application of Network Testing Commands in Computer Network Courses." University Education, 2019(05): 91-94.
Revision Date	July 2024

Next-Generation Internet Technology

Module name	Next-Generation Internet Technology		
Semester	Spring		
Contact person	Xu Ying		
Language	Chinese		
Relation to curriculum	restricted elective, 7 th semester		
Type of teaching, contact hours	Lectures, Group Discussions, Laboratory Experiments, 2 hours/week		
Work load	1. Total Hours: 56 hours (completed in 16 weeks) 2. Lectures: 32 hours (including discussions and Q&A) 3. Self-study: 24 hours (pre-class preview, exercises, revision)		
Credit points	2		
Recommended prerequisites	*Wireless and Mobile Network Technology* *Modern Communication Technology*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Master the basic framework and key technologies of next-generation internet (NGI).	R1. Engineering Knowledge

	CLO-2-2	Understand the core concepts and architecture of NGI, integrating modern tools and sustainable engineering practices.	R1. Engineering Knowledge, R5. Use of Modern Tools, R6. Engineering and Sustainable Development
	CLO-3-3	Grasp NGI security technologies, including network security protocols and encryption techniques.	R6. Engineering and Sustainable Development
Content	Next-Generation Internet Technology aims to equip students with foundations and applications of internet technologies, covering: Technical concepts;Architectural frameworks; Quality of Service (QoS) control; IP multicast; Wireless network protocols; Network security The course emphasizes theory-practice integration to enhance self-learning, critical thinking, and innovative capabilities. By studying OSI and TCP/IP models, students master network architecture and layer-specific protocol technologies. It also cultivates professional qualities (e.g., rigor, proactive learning, practical application) to prepare students for contributing to national internet development. The knowledge modules are as follows: 1. Introduction to Next-Generation Internet (Weight: 4/32,		

	Level: Memory) 2. Related Technologies of Next-Generation Internet (Weight: 8/32, Level: Memory+Comprehension) 3. IPv6 Technology (Weight: 4/32, Level: Memory+Comprehension) 4. Transport Layer Protocols for Next-Generation Internet (Weight: 4/32, Level: Memory+Comprehension) 5. Software-Defined Networking (SDN) (Weight: 4/32, Level: Memory) 6. Next-Generation Internet Access Technologies (Weight: 4/32, Level: Memory+Comprehension) 7. Next-Generation Internet Security Technologies (Weight: 4/32, Level: Memory)
Study and examination requirements and forms of examination	Process Assessment (50%) Classroom Participation: 30% After-class Assignments: 30% Unit Tests: 40% Final Examination (50%) Closed-book exam, 100 minutes
Reading list	[1]Wu Gongyi, Wu Ying. Next-Generation Internet Technology and Applications. Publishing House of Electronics Industry, [Year]. [2]Mao Z. M., Rexford J., Katz R. H., Wang J. Next-Generation Internet: Architecture and Protocols. Morgan Kaufmann Publishers, 2023. [3]Rowell C., Li J. IPv6 Next-Generation Internet. Wiley, 2023. [4]Zhang Lei, Li Yang. "Latest Progress and Impact of IPv6 Deployment in Next-Generation Internet." IEEE

	Communications Magazine, 2023, 61(3): 138-145. [4]Li Jun, Jin Da. "Development Trends of Next-Generation Internet of Things Technologies." IEEE Access, 2023, 11: 65345-65359.
Revision Date	July 2024

Foundation of Software Engineering

Module name	Foundation of Software Engineering		
Semester	Fall		
Contact person	Wei Liangping		
Language	Chinese		
Relation to curriculum	restricted elective，5th semester		
Type of teaching, contact hours	Lectures, Group Discussions, Case Analysis, Flipped Classroom, 2 hours/week		
Work load	1. Total Hours: 56 hours (completed in 16 weeks) 2. Lectures: 32 hours (including discussions and Q&A) 3. Self-study: 24 hours (pre-class preview, exercises, revision)		
Credit points	2		
Recommended prerequisites	*C Programming, Java Programming*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Understand the development logic of software engineering, including software life cycle processes and	R1. Engineering Knowledge

	commonly used life cycle models.	
CLO-2-2	Comprehend structured and object-oriented methods, compare various modeling tools used in software development, and master software testing techniques for evaluation.	R2. Problem Analysis, R3. Design/Development of Solutions
CLO-3-3	Understand the activities in software engineering management and their interrelations, and apply management techniques and principles.	R10. Project Management

Content	This course plays a vital role in the talent cultivation system of network engineering. It focuses on two core technical aspects of software engineering: Development logic: Covers software life cycle processes and common life cycle models. Development approaches: Includes structured and object-oriented methods, as well as software testing techniques for evaluation. Through this course, students will master: Basic concepts and principles of software engineering; Two engineering methods for software development;Processes, guidelines, standards, and specifications in development; Approaches to develop high-quality software and manage development activities effectively. This lays a theoretical foundation for students to participate in large-scale software development projects. The knowledge modules are as follows: 1. Overview of Software Engineering (Weight: 2/32, Level: Memory+Comprehension) 2. Structured Methods (Weight: 12/32, Level: Comprehension+Application+Analysis) 3. Object-Oriented Methods (Weight: 12/32, Level: Comprehension+Application+Analysis) 4. Software Testing (Weight: 4/32, Level: Memory+Comprehension+Application) 5. Software Project Management (Weight: 2/32, Level: Memory+Comprehension)
Study and examination requirements and forms of examination	Process Assessment (40%) Classroom Performance: 40% After-class Assignments: 30% Experiment Completion: 30% Final Examination (60%)

	Closed-book exam, 100 minutes
Reading list	[1] Wang Lifu, Sun Yanchun. Software Engineering. Beijing: Peking University Press, 2023. [2]Sun Yanchun, Huang Gang. Software Engineering: Classic, Modern, and Frontier. Beijing: Peking University Press, 2024. [3]Qi Zhichang, Tan Qingping. Software Engineering. Beijing: Higher Education Press, 2019. [4]Xu Zhongkai. "Research on Entity Recognition Methods for Software Engineering Knowledge Graph Construction." Dissertation, Southeast University, Nanjing, 2022. [5]Zhang Li. "Research on Curriculum Reform and Practice of 'Software Engineering' Based on OBE Concept." Industry and Information Technology Education, 2024, 24(11): 48-52. [6]Liu Liangchi. "Research and Application of Knowledge Graph Construction Technology for Professional Recommendation Based on Large Language Models." Dissertation, Hangzhou Dianzi University, 2024. DOI: 10.27075/d.cnki.ghzdc.2024.000945. [7]Wan Chuntao. "Research on Software Quality Evaluation Model for Course Learning from User Perspective." Dissertation, Jiangxi University of Finance and Economics, 2023. DOI: 10.27175/d.cnki.gjxcu.2023.000346.
Revision Date	July 2024

CTF Fundamentals

Module name	CTF Fundamentals		
Semester	Fall		
Contact person	Zhang Yulin		
Language	Chinese		
Relation to curriculum	restricted elective, 5th semester		
Type of teaching, contact hours	Lectures, Group Discussions, Simulated Experiments, 2 hours/week		
Work load	1. Total Hours: 56 hours (completed in 16 weeks) 2. Lectures: 32 hours (including discussions and Q&A) 3. Self-study: 24 hours (pre-class preview, exercises, revision)		
Credit points	2		
Recommended prerequisites	*Fundamentals of Information Security Technology* *Network Security*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Understand the structure and rules of CTF competitions, master basic operations of key tools, and explore problem-solving strategies for CTF	R1. Engineering Knowledge, R5. Use of Modern Tools, R8. Individual and Teamwork, R9. Communication, R11. Lifelong Learning

	challenges.	
CLO-2-2	Learn common steganography, compressed package analysis, traffic analysis, common CTF encoding, and MISC comprehensive practice.	R1. Engineering Knowledge, R8. Individual and Teamwork, R9. Communication, R11. Lifelong Learning
CLO-3-3	Deeply study information gathering techniques, HTTP protocol mechanisms, SQL injection attacks, file upload vulnerabilities, command execution injection, PHP code security review, and PHP deserialization security issues.	R1. Engineering Knowledge, R8. Individual and Teamwork, R9. Communication, R11. Lifelong Learning

Content	CTF Fundamentals is a specialized expansion course for network engineering. CTF (Capture The Flag) is a competitive format for cybersecurity professionals to showcase technical skills. The course combines lectures and practice to help students new to cybersecurity or CTF competitions quickly master fundamentals in: Traffic analysis; Common CTF encoding; Information gathering techniques; HTTP protocol mechanisms; SQL injection attacks; File upload vulnerabilities; Command execution injection; PHP code security review Real-world scenarios and competition questions are provided to train offensive and defensive skills. Upon completion, students can tackle simple to moderately difficult CTF challenges, address practical cybersecurity issues, and lay a foundation for advanced studies.The knowledge modules are as follows: 1. Overview of CTF (Weight: 2/32, Level: Memory+Comprehension) 2. Security Miscellaneous (Weight: 6/32, Level: Memory+Comprehension) 3. Common CTF Encoding and Information Gathering (Weight: 6/32, Level: Memory+Comprehension) 4. HTTP Protocol and File Upload (Weight: 6/32, Level: Memory+Comprehension) 5. SQL Injection and Command Injection (Weight: 5/32, Level: Memory+Comprehension) 6. PHP Code Audit and Deserialization (Weight: 7/32, Level: Memory+Comprehension)

Study and examination requirements and forms of examination	Process Assessment (50%) Attendance: 30% Classroom Participation: 30% After-class Assignments: 40% Final Capstone Project (50%) Out of 100 points
Reading list	[1] Introduction to CTF Security Competitions, edited by Venustech Cyberspace Security College, Tsinghua University Press, 2020. [2] Everything About CTF, edited by Li Zhoujun, China Machine Press, 2023. [3] Authoritative Guide to CTF Competitions (Pwn Volume), edited by Yang Chao, Publishing House of Electronics Industry, 2020. [4] Extreme Hacker Attack and Defense: CTF Problem Revealing, edited by Tianrongxin Alpha Laboratory, Publishing House of Electronics Industry, 2021. [5] China University MOOC Website: https://www.icourse163.org [6] Zeng Huangcun. "Research on Integrating CTF Competitions into Cybersecurity Curriculum Teaching." Network Security Technology & Application, 2024(6): 90-92. DOI: 10.3969/j.issn.1009-6833.2024.06.035. [7] Xu Shanshan. "CTF Competitions Based on Cybersecurity Technology." Radio & Television Information, 2021(z1): 50-52. DOI: 10.3969/j.issn.1007-1997.2021.z1.013.
Revision Date	July 2024

Computer Professional English

Module name	Computer Professional English		
Semester	Spring		
Contact person	Li Fengmei		
Language	English		
Relation to curriculum	restricted elective, 6 th semester		
Type of teaching, contact hours	Lecture method, group discussion method, debate method, case analysis method, situational teaching method, online learning method; 2 class hours/week		
Work load	1. Total hours: 56 hours = 32 lecture hours + 24 self-study hours, completed in 16 weeks. 2. Instruction: 2 hours per week, including lectures, discussions, and Q&A. 3. Self-study: Approximately 1.5 hours per week, including pre-class preview, after-class exercises, and exam review.		
Credit points	2		
Recommended prerequisites	*College English*, *C Language Programming*, *Operating Systems*, *Computer Networks*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	By integrating engineering ethics and professional morality education, guide students to master computer	R6. Engineering and Sustainable Development

	professional English while clarifying the social responsibilities of engineers. Through case analysis and practical project exercises, cultivate students' service awareness and enable them to apply professional knowledge to economic and social development.	
CLO-2-2	Through reading and analyzing English scientific and technical literature, cultivate students' engineering thinking and product research capabilities. Meanwhile, combine practical engineering project cases to carry out practical activities and exercise students' engineering	R1. Engineering Knowledge

	practice capabilities.	
CLO-3-3	Through professional English teaching, enhance students' English communication capabilities, enabling them to communicate smoothly with domestic and foreign peers. At the same time, pay attention to international software technology trends, introduce the latest English materials, and help students quickly access international new technology advancements.	R9. Communication

	CLO-4-4	Through team projects and case analysis, cultivate students' teamwork spirit and software project management capabilities in a multidisciplinary background. By simulating a real work environment, students can play the role of core members or team leaders.	R8. Individual and Team
Content	Computer Professional English is the integration of computer professional knowledge and English knowledge. This course is not only a professional basic course specified according to computer professional teaching but also an important supplement and improvement after college public English courses. The course content mainly introduces computer-related professional knowledge, which has certain guiding significance for the practical application of computers. The prerequisite course for this course is College English, and the follow-up courses are English literature reading for graduation design and professional knowledge popularization, laying a foundation for college students to further explore research and expand professional knowledge and skills. The role of this course is to guide students to read relevant selected works, enabling them to familiarize themselves with and master computer English professional vocabulary and technical terms, cultivate the ability to read English scientific and technical materials, and obtain the ability to read general		

	English scientific and technical books and periodicals related to this major and the ability of written translation.The knowledge modules are as follows: 1. Computer Hardware (Weight: 2/32, Level: Memory + Comprehension) 2. Computer Software and Software Development (Weight: 4/32, Level: Memory + Comprehension + Application) 3. Program Design and Programming Language and Computer Programmer (Weight: 8/32, Level: Memory + Comprehension + Application) 4. Operating Systems (Weight: 2/32, Level: Memory + Application) 5. Networking Devices and Topologies (Weight: 4/32, Level: Comprehension + Application) 6. Cloud Storage and Big Data (Weight: 4/32, Level: Memory + Application) 7. Data Mining (Weight: 2/32, Level: Comprehension + Application) 8. E-commerce (Weight: 2/32, Level: Memory + Application) 9. AI (Weight: 4/32, Level: Memory + Comprehension + Application)
Study and examination requirements and forms of examination	This course uses a combination of usual performance and final examination results for evaluation, comprehensively assessing students' ability to learn, analyze, and solve complex problems. The final examination adopts the form of a major assignment, accounting for 50% of the total score. Usual scores include: usual performance, usual assignments, and classroom discussions, accounting for 50% of the total score. The course score of *Computer Professional English* is obtained by synthesizing each item of scores.

Reading list	[1] Computer Professional English [M], Zhang Qianghua, Si Aixia, Machinery Industry Press, 2024. [2] Jin Zhiquan, Zhang Xing'er, Computer Professional English [M], Electronic Industry Press, 2020. [3] Downey, Allen B. Think Python: How to Think Like a Computer Scientist [M]. O'Reilly Media, 2024. [4] Howe P N. ChatGPT has a language problem - but science can fix it. [J]. Nature, 2024. [5] Chi G. The Spoken English Practice System Based on Computer English Speech Recognition Technology [J]. Mobile Information Systems, 2022. [6] Xie L, Shang Z, Wang X. Research on the Teaching of Computer English under the Network Environment [J]. Higher Education and Practice, 2024. [7] Wenxia L, Weiming S. The English Teaching Mode under the Environment of Computer Technology [J]. Mobile Information Systems, 2022.
Revision Date	July 2024

Introduction to Artificial Intelligence

Module name	Introduction to Artificial Intelligence		
Semester	Spring		
Contact person	Wang Xinjiao		
Language	Chinese		
Relation to curriculum	restricted elective, 6 th semester		
Type of teaching, contact hours	Lecture method, demonstration method, group discussion method, laboratory experiment method; 2 class hours/week		
Work load	1. Total hours: 56 hours = 32 lecture hours + 24 self-study hours, completed in 16 weeks. 2. Instruction: 2 hours per week, including lectures, discussions, and Q&A. 3. Self-study: Approximately 1.5 hours per week, including pre-class preview, after-class exercises, and exam review.		
Credit points	2		
Recommended prerequisites	*Linear Algebra*, *Higher Mathematics*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Enable students to establish cognition of basic concepts and principles of artificial intelligence, including but not limited to machine	R6. Engineering and Sustainable Development

	learning, deep learning, data mining and other technologies. Make students understand how AI systems process data and make decisions, and be able to analyze their applications in various fields.	
CLO-2-2	Require students to actively participate in practical projects based on theoretical learning, deeply understand the working principles of AI technologies through programming, model building and other activities, and be able to flexibly use the knowledge to solve practical problems. Encourage them to give play to creativity in practice and put forward novel	R7. Ethics and Professional Norms

	ideas and solutions.	
CLO-3-3	Through experiments and project practices, enable students to have the ability to write code to implement AI algorithms, such as using Python and other programming languages for data processing and model training. Encourage students to participate in group discussions and project cooperation, cultivate team cooperation and communication skills, and improve comprehensive quality.	R11. Lifelong Learning

Content	Introduction to Artificial Intelligence is a key point in the research and development of computer science, and its ultimate goal is to enable computers to have human-like capabilities. This course mainly covers knowledge and knowledge representation, deterministic reasoning, uncertain reasoning, search strategies, deep learning neural networks, machine learning, genetic algorithms and other aspects. Through the study of this course, students are required to understand the development status and research content of artificial intelligence, master basic concepts, basic principles, methods and important algorithms, master some main ideas and methods of artificial intelligence, be familiar with typical AI systems - production systems and simple fuzzy reasoning methods, learn to use heuristic search to solve problems, master basic deep learning neural network methods, master simple machine learning methods, and initially have the ability to use classic AI methods to solve some simple practical problems. The knowledge modules are as follows: 1. Overview of Artificial Intelligence (Weight: 2/32, Level: Comprehension) 2. Knowledge Representation and Reasoning (Weight: 4/32, Level: Comprehension + Analysis) 3. Search and Reasoning Technologies (Weight: 2/32, Level: Comprehension + Analysis + Application) 4. Deep Learning (Weight: 16/32, Level: Comprehension + Application + Memory + Analysis + Creation) 5. Genetic Algorithms (Weight: 2/32, Level: Comprehension + Application + Memory + Analysis + Creation) 6. Machine Learning and Knowledge Discovery (Weight: 6/32, Level: Comprehension + Evaluation)

Study and examination requirements and forms of examination	The course assessment includes process assessment (40%) and final major assignment (60%). The process assessment includes: classroom performance (30%) + after-class assignments (30%) + experiment completion (40%). The final major assignment is out of 100 points.
Reading list	[1] Li Zheng, Huang Yuan, Jiang Wenhao (Eds.), *Introduction to Artificial Intelligence* [M], Beijing: Posts & Telecom Press, 2021. [2] Yu Minghui, Zhan Zengrong, Tang Shuangxia (Eds.), *Introduction to Artificial Intelligence* [M], Beijing: Posts & Telecom Press, 2021. [3] Song Chuping, Chen Zhengdong (Eds.), *Fundamentals and Applications of Artificial Intelligence* [M], Beijing: Posts & Telecom Press, 2021. [4] Zhang Wen'an, Yang Xusheng, Fu Minglei, Hu Fo, *Artificial Intelligence Technology and Applications* [M], Beijing: China Machine Press, 2024. [5] Shi Zhongzhi, *Artificial Intelligence (2nd Edition)* [M], Beijing: China Machine Press, 2024. [6] He Yuhan, Liu Yong. Application Progress of Artificial Intelligence in Clinical Management of Major Chronic Diseases [J/OL]. *Chongqing Medicine*, 1-9 [2024-12-09]. [7] Yu Guanjie. Research on Network Communication Topology Optimization and Resource Allocation Algorithm Based on Artificial Intelligence [J]. *Household Appliance Maintenance*, 2024, (12): 62-64.
Revision Date	July 2024

Huawei Certification

Module name	Huawei Certification		
Semester	Spring		
Contact person	Yang Feng		
Language	Chinese		
Relation to curriculum	compulsory, 6th semester		
Type of teaching, contact hours	Lecture method, group discussion method, online learning method; 2 class hours/week		
Work load	1. Total hours: 56 hours = 32 lecture hours + 24 self-study hours, completed in 16 weeks. 2. Instruction: 2 hours per week, including lectures, discussions, and Q&A. 3. Self-study: Approximately 1.5 hours per week, including pre-class preview, after-class exercises, and exam review.		
Credit points	2		
Recommended prerequisites	Fundamentals of Information Security Technology, Web Security Technology Application, Network Protocols Analysis		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Through basic knowledge teaching, enable students to master Huawei technical certification configuration methods and	R1. Engineering Knowledge

	protocol configuration methods, exercise students' Huawei configuration operations, and lay a solid foundation for future network configuration.	
CLO-2-2	Through extended teaching, enable students to understand and master advanced applications such as basic management, data analysis, and system management of Huawei technical certification, so as to cultivate students' capabilities in deploying, applying, and daily operation and maintenance of Huawei technical certification.	R5. Use of Modern Tools
CLO-3-3	Through practical training, enable students to deeply understand	R7. Ethics and Professional Norms

		Huawei technical certification and the importance of network security, enhance their sense of responsibility and mission for network security, clarify their responsibilities in maintaining network security, and ensure that students can adhere to professional ethics when engaged in network-related work.	
Content	A learning guide for Huawei HCIA certification, aiming to help readers learn and understand the key points and difficulties in HCIA network technology principle knowledge. The content includes: introduction to network communication basics, introduction to Huawei VRP operating system, working principles of Ethernet, STP protocol, VLAN principles, IP basics, TCP and UDP, routing protocol basics, RIP protocol, OSPF protocol, layer 3 communication between VLANs, link aggregation technology, Smart Link and Monitor Link, DHCP, address translation technology, PPP and PPPoE, network security, and network management.The knowledge modules are as follows: 1. Basic Operations of Huawei VRP System (Weight: 4/32, Level: Comprehension) 2. Building Interconnected IP Networks (Weight: 8/32, Level:		

	Memory + Comprehension) 3. OSPF Routing Protocol Basic Experiments (Weight: 10/32, Level: Memory + Comprehension) 4. Building Ethernet Switching Networks (Weight: 10/32, Level: Mastery + Analysis)
Study and examination requirements and forms of examination	The course assessment includes process assessment (50%) and final assessment (50%). The process assessment includes: timeliness of project experiments 10% + quality 20% + quantity 20%. The final assessment includes: theoretical assessment 20% + practical operation assessment 30%.
Reading list	[1] Wang Da. Huawei Switch Learning Guide (2nd Edition) [M]. Beijing: Posts & Telecom Press, 2020. [2] Huawei Technologies Co., Ltd. HCIA Network Technology Learning Guide. Beijing: Posts & Telecom Press, 2015. [3] Wang Jing. HCIA-WLAN Learning Guide. Beijing: Posts & Telecom Press, 2015. [4] Zhang Shaofang, Wang Yuechun, Liu Yanfeng. Research on the Construction of Network Courses Aligned with Huawei HCIA Certification System, 2020. [5] Su Xiaowei, Wei Jun, Zhou Lu. Research on Online-Offline Hybrid Teaching in the Context of 5G Network Era—Taking Datacom HCIA Course as an Example, 2022.
Revision Date	July 2024

“Internet+” Innovative Applications

Module name	“Internet+” Innovative Applications		
Semester	Spring		
Contact person	Wang Xiaoqing		
Language	Chinese		
Relation to curriculum	compulsory, 6th semester		
Type of teaching, contact hours	Lecture method, group discussion method, field investigation method, project-based learning method, flipped classroom method; 3 class hours/week		
Work load	1. Total hours: 56 hours = 32 lecture hours + 24 self-study hours, completed in 16 weeks. 2. Instruction: 2 hours per week, including lectures, discussions, and Q&A. 3. Self-study: Approximately 1.5 hours per week, including pre-class preview, after-class exercises, and exam review.		
Credit points	3		
Recommended prerequisites	*Principles of Computer Organization*, *Computer Networks*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Through course learning and practice, cultivate students' innovative thinking, problem analysis and	R2. Problem Analysis

	solving abilities, as well as teamwork and communication skills. Enable students to use the knowledge to propose innovative solutions to practical problems.	
CLO-2-2	Through course experiments, project practices and other means, enable students to master internet-based innovative application skills, such as data analysis, user research, product design, product development, etc. Cultivate students' practical ability and innovation and entrepreneurship ability.	R3. Design/Development of Solutions

	CLO-3-3	Enable students to deeply understand the applications and development trends of "Internet+" in different industries, such as e-commerce, internet finance, smart logistics, online education, etc. Enhance students' sensitivity and insight into industry development, and prepare for future career development.	R8. Individual and Team
Content	The "Internet+" Innovative Applications course involves multiple disciplinary fields, including computer science, business management, sociology, etc., to explore innovative applications in the "Internet+" era from a comprehensive and integrated perspective. It not only focuses on the technical level, but also on how technology deeply integrates with various fields such as society, economy, and culture to generate new value and innovation. The core of the course lies in innovation. It encourages students to challenge traditional thinking and try new methods and technologies to cope with various challenges and opportunities brought by the "Internet+" era. Through the study of the course, students will master innovative thinking and methods, and be able to independently discover and solve problems. The course attaches importance to practical application. It is not only the		

	study of theoretical knowledge, but also the cultivation of practical skills. Through case analysis, practical operation and other means, students will have the opportunity to experience the actual process of "Internet+" innovative applications first-hand, and improve their practical ability and problem-solving ability. As the "Internet+" is a rapidly developing field, the course needs to maintain forward-looking and acumen, and pay timely attention to the latest technological trends and market trends. It should not only teach students existing knowledge and skills, but also cultivate their ability to adapt to future changes, so that they can maintain competitiveness in a constantly changing environment.The knowledge modules are as follows: 1. Connotation of "Internet+" (Weight: 2/48, Level: Comprehension) 2. Policy Environment for the Development of "Internet+" in China (Weight: 2/48, Level: Comprehension) 3. Computer and Software Technology - Sequential Programming (Weight: 6/48, Level: Comprehension + Application) 4. Integrated Circuit and Intelligent Hardware Technology (Weight: 6/48, Level: Comprehension + Application + Memory) 5. Communication and Network Technology (Weight: 6/48, Level: Comprehension + Application + Memory + Evaluation) 6. Big Data Technology (Weight: 6/48, Level: Comprehension + Application + Memory + Evaluation) 7. Intelligent Technology (Weight: 6/48, Level: Comprehension + Application + Memory + Evaluation) 8. "Internet+" Collaborative Manufacturing (Weight: 6/48, Level: Comprehension + Application + Memory + Evaluation) 9. "Internet+" Modern Agriculture, "Internet+" Green Ecology (Weight: 4/48, Level: Comprehension + Application + Memory

	+ Evaluation) 10. "Internet+" Convenient Transportation (Weight: 2/48, Level: Comprehension + Application + Memory)
Study and examination requirements and forms of examination	Attendance accounts for 10%, assignments account for 10%, experiment reports account for 20%, and on-site presentation performance accounts for 60%. (Among them, "Internet+" consumption, "Internet+" education, "Internet+" industry, and "Internet+" agriculture each have a total score of 100 points, and each topic accounts for 25% in the score.)
Reading list	[1] Yu Laiwen, Lin Xiaowei. Internet Thinking 2.0: The Internet of Things, Cloud Computing, Big Data (Internet+ and Business Model Application Series). Economic Management Press, 2017. [2] Gao Zehan, Hui Gangxing. "Internet+" Basics and Applications. Xi'an University of Electronic Science and Technology Press, 2018. [3] Yan He, Li Guihua. Internet+ Era: The Mobile Internet Transformation of Traditional Enterprises. Tsinghua University Press, 2017. [4] Si Xiao, et al. Internet+ Manufacturing: Towards Made in China 2025. [5] Network Resources This course will not only make full use of textbooks and reference books, but also provide students with network resources (China University MOOC, Zhihuishu, Yuketang, etc.), which students can choose to expand their knowledge and

	horizons according to their personal circumstances. [6] China University MOOC website: https://www.icourse163.org [7] Zhihuishu website: https://www.zhihuishu.com [8] Chen Wang. Research on the Realization Path and Application Strategy of "Internet+" Business Model Innovation in Traditional Decoration Enterprises [D]. Southeast University, 2019. DOI:10.27014/d.cnki.gdnau.2019.004329. [9] Gao Sifan. Research on the "Internet+ Government Services" Ecosystem from the Perspective of Holistic Government [D]. Party School of the Central Committee of the Communist Party of China, 2020. DOI:10.27479/d.cnki.gzgcd.2020.000159.
Revision Date	July 2024

Internet of Things Applications

Module name	Internet of Things Applications		
Semester	Fall		
Contact person	Wang Xinjiao		
Lecturer	Wang Weihua, Wang Xinjiao		
Language	Chinese		
Relation to curriculum	compulsory,7 th semester		
Type of teaching, contact hours	Lecture method, demonstration method, group discussion method, laboratory experiment method; 2 class hours/week		
Work load	1. Total hours: 84 hours = 32 lecture hours + 52 self-study hours, completed in 16 weeks. 2. Instruction: 2 hours per week, including lectures, discussions, and Q&A. 3. Self-study: Approximately 3.25 hours per week, including pre-class preview, after-class exercises, and exam review.		
Credit points	3		
Recommended prerequisites	*Computer Networks*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Able to explain the principles of core technologies such as sensors, RFID, 5G/6G communication, and edge	R1. Engineering Knowledge, R2. Problem Analysis

	computing, laying a solid foundation for IoT underlying technologies, and possessing the ability to digitize the physical world.	
CLO-2-2	Understand the global architecture of IoT systems and the collaborative logic of each layer, and possess comprehensive capabilities in IoT system design and data analysis.	R10. Project Management
CLO-3-3	Identify common security vulnerabilities in IoT devices, ensure the reliability of IoT systems and user privacy, follow technical ethics, and promote sustainable development.	R6. Engineering and Sustainable Development, R7. Ethics and Professional Norms

Content	Internet of Things Applications is a compulsory course for network engineering. The main contents of the course include automatic identification technology and RFID, wireless communication systems, wireless single-chip microcomputers, sensor technology, positioning systems, short-range wireless communication technology, embedded intelligent sensors, communication and remote communication, and intelligent information processing technology. Through the study of this course, students can gain an overall understanding of the Internet of Things, master its architecture, basic concepts, and related technologies. Through the study of automatic identification technology and RFID, sensing technology, and positioning systems, students can master the basic knowledge of the sensing and identification layer; through the study of wireless broadband networks and mobile communication networks, they can master the basic knowledge of the network construction layer; through the study of big data and mass information storage, database systems, information security, and privacy, they can master the basic knowledge of the management service layer; through the study of intelligent transportation, logistics, construction, and other systems, they can understand the applications of IoT technologies in multiple fields and improve their adaptability to the ever-changing Internet of Things. The knowledge modules are as follows: 1. Overview of Internet of Things, RFID Technology (Weight: 2/32, Level: Comprehension) 2. Wireless Communication Systems (Weight: 2/32, Level: Comprehension + Memory + Analysis) 3. Wireless Single-Chip Microcomputer Technology (Weight: 4/32, Level: Comprehension + Application + Memory + Analysis) 4. Sensor Technology (Weight: 4/32, Level: Comprehension + Application + Memory + Analysis + Creation) 5. Wireless Sensor Network Technology (Weight: 4/32, Level:

	Comprehension + Application + Memory + Analysis) 6. Short-Range Wireless Communication Technology, Remote Communication Technology (Weight: 6/32, Level: Comprehension + Application + Memory + Analysis + Creation) 7. Intelligent Information Processing Technology (Weight: 6/32, Level: Comprehension + Application + Memory + Analysis + Creation) 8. Applications of Internet of Things Technology (Weight: 6/32, Level: Comprehension + Evaluation)
Study and examination requirements and forms of examination	The course assessment includes process assessment (40%) and final major assignment (60%). The process assessment includes: classroom performance 40% + after-class assignments 30% + experiment completion 30%. The final major assignment is out of 100 points.
Reading list	[1] Xu Yingqin, Xiong Weili (Eds.), Internet of Things Technology and Applications [M]. Machinery Industry Press, 2020. [2] Huangfu Wei, Introduction to the Internet of Things [M]. Beijing: Posts & Telecom Press, 2024. [3] Fang Juan, Chen Tan, Zhang Jiayue, Yi Tao, Internet of Things Application Technology [M]. Beijing: Posts & Telecom Press, 2021. [4] Liu Xiuwen, Internet of Things Technology Applications - Smart Home (3rd Edition) [M]. Machinery Industry Press, 2022. [5] Xia Bingying. Research on the Design of Teaching Environment Perception System Based on Internet of Things Technology [J]. Household Appliance Maintenance, 2024, (12): 34-36. [6] Zhang Hongying. Design of Intelligent Agriculture Management System under Internet of Things Technology to Promote the Development of Agricultural Mechanization [J]. World Tropical Agriculture Information, 2024, (11): 60-62.

Revision Date	July 2024

Network Engineering Drawing Practice

<table>
<tr><td>Module name</td><td colspan="3">Network Engineering Drawing Practice</td></tr>
<tr><td>Semester</td><td colspan="3">Fall</td></tr>
<tr><td>Contact person</td><td colspan="3">Yang Lihua</td></tr>
<tr><td>Language</td><td colspan="3">Chinese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="3">compulsory, 2 th semester</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="3">Lecture method, demonstration method, simulation experiment method, others; 2 class hours/week</td></tr>
<tr><td>Work load</td><td colspan="3">1. Total hours: 56 hours = 32 lecture hours + 24 self-study hours, completed in 16 weeks.
2. Instruction: 2 hours per week, including lectures, discussions, and Q&A.
3. Self-study: Approximately 1.5 hours per week, including pre-class preview, after-class exercises, and exam review.</td></tr>
<tr><td>Credit points</td><td colspan="3">2</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="3">College Digital Literacy</td></tr>
<tr><td rowspan="2">Learning outcomes and their corresponding PLOs</td><td>Course Learning Outcome (CLO)</td><td>Description</td><td>Supported Programme Learning Objective(PLOs)</td></tr>
<tr><td>CLO-1-1</td><td>Through course learning and practical training, develop a rigorous work style and team collaboration spirit, possess the</td><td>R6. Engineering and Sustainable Development, R8. Individual and Team, R11. Lifelong Learning</td></tr>
</table>

	awareness and ability of autonomous learning and lifelong learning, and continuously improve digital literacy.	
CLO-2-2	Understand the basic theories and common applications of network engineering drawing practice, master the basic principles of graphic generation and output, and learn the basic methods of graphic design.	R1. Engineering Knowledge, R2. Problem Analysis, R3. Design/Development of Solutions
CLO-3-3	Have the comprehensive application and development capabilities of network engineering drawing, and be able to design and develop various works with market demand.	R3. Design/Development of Solutions, R4. Research, R5. Use of Modern Tools

Content	Network Engineering Drawing Practice is an important course designed to cultivate students' drawing skills in network engineering design and implementation. Through the study of this course, students will master the basic principles, methods, and techniques of network engineering drawing, and be able to independently complete the design and drawing of network engineering related drawings such as network topology diagrams, equipment layout diagrams, and wiring diagrams. At the same time, this course will also combine practical cases to enable students to deeply understand the application of network engineering drawing in actual projects and improve their ability to solve practical problems. The main contents of this course are: network engineering drawing foundation, network topology design, equipment layout drawing, wiring diagram design, drawing review and modification, case analysis and practice, focusing on cultivating the ability to read network system engineering drawings and draw network system structure diagrams and construction drawings. Taking the work task of "drawing network engineering system structure diagrams" as the carrier, the complete work process for students to read construction engineering drawings, draw building network system engineering drawings, and draw building network engineering construction drawings.The knowledge modules are as follows: 1. Theoretical Foundation of Network Engineering Drawing (Weight: 4/32, Level: Comprehension + Application + Analysis) 2. Tool Use in Network Engineering Drawing (Weight: 6/32, Level: Comprehension + Application + Analysis) 3. Practical Skills of Network Engineering Drawing (Weight: 10/32, Level: Memory + Comprehension + Application + Analysis) 4. Comprehensive Application of Network Engineering Drawing (Weight: 12/32, Level: Memory + Comprehension +

	Application + Analysis)
Study and examination requirements and forms of examination	The course assessment includes process assessment (70%) and final major assignment (30%). The process assessment includes: classroom participation (50%) + experiment completion (50%). The final major assignment is out of 100 points.
Reading list	[1] Exploration of Ideological and Political Education in Secondary Vocational Architectural Engineering Drawing and Recognition Courses [J]. Modern Vocational Education, 2021, Chen Xiaojuan. [2] Research on the Teaching Reform of the "Engineering Drawing" Course Based on the OBE Concept [J]. Journal of Tangshan University, 2021, Gao Chongyi, Wei Yunping, Dai Jun, Li Ran, Xiao Chunying. [3] Research on the Correction Method of Engineering Drawing Assignments Based on Image Processing [J]. Software Engineering, 2021, Zhu Wenbo, Du Feng. [4] Online and Offline Hybrid Teaching of Architectural Engineering Drawing Based on BIM Technology [J]. Intelligent City, 2021, Cheng Wan. [5] Communication Engineering Drawing, edited by Liu Xuechun, Ying Liqiang, Lü Yingji.

	[6] Modern Engineering Drawing, edited by Ma Fubo, Han Ning; associate editors Wu Tianfeng, Li Hong, Xie Tian, Shi Hong, Xie Xiaoyan. Engineering Drawing Practice, edited by Zhang Keyi, Zhang Daxiang; associate editors Huang Weili, Zhang Lan.
Revision Date	July 2024

Network Cabling and Maintenance

Module name	Network Cabling and Maintenance		
Semester	Spring		
Contact person	Wang Peixun		
Language	Chinese		
Relation to curriculum	compulsory, 2 th semester		
Type of teaching, contact hours	Lecture method, group discussion method, laboratory experiment method, project-based learning method; 2 class hours/week		
Work load	1. Total hours: 78 hours = 32 lecture hours + 46 self-study hours, completed in 16 weeks. 2. Instruction: 2 hours per week, including lectures, discussions, and Q&A. 3. Self-study: Approximately 2 (2-3) hours per week, including pre-class preview, after-class exercises, and exam review.		
Credit points	3		
Recommended prerequisites	Introduction to Network Engineering		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Describe and explain the basic concepts and characteristics of network comprehensive	R1. Engineering Knowledge

	wiring systems: Students will deeply understand the meaning, characteristics, and application scenarios of network comprehensive wiring systems, and understand their importance in network engineering. Through learning, students can analyze the basic composition and structure of network comprehensive wiring systems, laying a foundation for subsequent practical operations.	
CLO-2-2	Possess the ability to design and implement network comprehensive wiring systems: Students will learn how to design and plan network	R3. Design/Development of Solutions

	comprehensive wiring systems according to actual needs, including the selection of topological structures, equipment selection, and installation of cables and racks. Through practical operations, students can master the implementation processes and methods of network comprehensive wiring systems, and have the ability to independently complete wiring projects.	

	CLO-3-3	Be familiar with the testing and acceptance standards of network comprehensive wiring systems: Students will understand the testing and acceptance processes of network comprehensive wiring systems, and explain the testing methods and acceptance standards for cables and optical fibers. Through experiments and training, students can skillfully use testing instruments to test wiring systems and perform debugging and optimization based on test results.	R6. Engineering and Sustainable Development

	CLO-4-4	Cultivate teamwork and communication skills: In the process of designing and implementing network comprehensive wiring systems, students need to closely cooperate with team members to complete tasks together. Through teamwork, students can develop teamwork spirit and communication skills, and learn how to effectively communicate and collaborate with others to solve problems together.	R8. Individual and Team

Content	Network Comprehensive Wiring and Maintenance is a core practical course for computer science and technology, communication engineering, and information technology-related majors. It aims to cultivate students' network wiring design and system maintenance capabilities through a combination of theoretical explanations and practical operations. This course focuses on enabling students to master the full-process skills of network comprehensive wiring systems, including basic principles, design planning, construction and installation, and post-maintenance, so that students can use the 所学 knowledge to solve various problems in actual network deployment and maintenance, laying a solid foundation for students to engage in network engineering, system integration, IT operations and maintenance, and other fields in the future.The knowledge modules are as follows: 1. Basics of Network Comprehensive Wiring Systems (Weight: 2/32, Level: Memory) 2. Design of Comprehensive Wiring Systems (Weight: 4/32, Level: Comprehension + Application) 3. Construction of Comprehensive Wiring Systems (Weight: 5/32, Level: Comprehension + Application) 4. Testing of Comprehensive Wiring Systems (Weight: 6/32, Level: Comprehension + Application) 5. Maintenance of Comprehensive Wiring Systems (Weight: 6/32, Level: Comprehension + Analysis) 6. Comprehensive Wiring for Wireless Networks (Weight: 9/32, Level: Comprehension + Analysis)

Study and examination requirements and forms of examination	The course assessment includes process assessment (60%) and final major assignment (40%). The process assessment includes: classroom performance 50% + after-class assignments 50%. The final major assignment is out of 100 points.
Reading list	[1] Luo Zhong, Xie Shisen, Wu Yubang. Network Comprehensive Wiring [M]. Beijing: Science Press, 2021. [2] Liu Huajun. Network Comprehensive Wiring [M]. Beijing: Electronic Industry Press, 2020. [3] Wang Gongru. Practical Training Tutorial for Network Comprehensive Wiring System Engineering Technology [M]. Beijing: Machinery Industry Press, 2021. [4] Song Kai, et al. Design and Application of Network Comprehensive Wiring System [J]. China Military-Civil Integration, 2023, (09): 60-61. [5] Hou Xianbing. Solutions to Common Problems in Computer Network Comprehensive Wiring [J]. Heilongjiang Science, 2023, 14 (08): 156-158.
Revision Date	July 2024

Multimedia Technology Application Practice

Module name	Multimedia Technology Application Practice		
Semester	Spring		
Contact person	Zheng Haiyan		
Language	Chinese		
Relation to curriculum	Compulsory, 2nd semester		
Type of teaching, contact hours	Lecture method, demonstration method, group discussion method, project-based learning method; 2 class hours/week		
Work load	1. Total hours: 78 hours = 32 lecture hours + 46 self-study hours, completed in 16 weeks. 2. Instruction: 2 hours per week, including lectures, Q&A, and discussions. 3. Self-study: 2 hours per week, including pre-class preview, after-class exercises, and exam review.		
Credit points	2		
Recommended prerequisites	*College Digital Literacy*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Through course learning and practical training, develop a rigorous work style and team collaboration spirit, possess the	R8. Individual and Team, R11. Lifelong Learning

	awareness and ability of autonomous learning and lifelong learning, and continuously improve digital literacy.	
CLO-2-2	Understand the basic theories and common applications of multimedia technology, master the usage methods and skills of common multimedia tool software, and possess the ability to use professional production tools for graphic design, animation production, audio editing, and video editing.	R8. Individual and Team, R11. Lifelong Learning

	CLO-3-3	Have the comprehensive application and development capabilities of multimedia technology, and be able to design and develop multimedia works with market demand.	R3. Design/Development of Solutions
	CLO-4-4	Have good professional ethics and psychological qualities; be able to handle interpersonal relationships well; efficiently organize and execute work tasks; and have good etiquette cultivation.	R7. Ethics and Professional Norms
Content	Multimedia Technology Application Practice is a basic skills course for the four-year undergraduate program in network engineering. Its main contents include: overview of multimedia technology; digital image editing; computer animation production; digital audio editing; digital video editing, etc. Through the study of this course, students should understand the basic concepts, main functions, and common applications of multimedia technology; master the usage methods of multimedia tool software, and be able to design and develop		

	multimedia works with certain practical value. The course focuses on cultivating students' ability to use multimedia material editing software for work design to meet the talent training requirements of application-oriented undergraduate colleges and the employment needs of the information society.The knowledge modules are as follows: 1. Basic Knowledge of Multimedia Technology (Weight: 2/32, Level: Memory + Comprehension) 2. Image Material Collection (Weight: 2/32, Level: Memory + Comprehension) 3. Image Processing and Production (Weight: 2/32, Level: Memory + Comprehension) 4. Graphic Creative Design (Weight: 2/32, Level: Memory + Comprehension + Analysis) 5. 2D Animation Production (Weight: 4/32, Level: Memory + Comprehension + Analysis) 6. 3D Animation Production (Weight: 4/32, Level: Memory + Comprehension) 7. Sound Collection and Production (Weight: 4/32, Level: Memory + Comprehension + Application) 8. Sound Post-Production and Synthesis (Weight: 4/32, Level: Memory + Comprehension + Analysis + Evaluation) 9. Video Collection and Production (Weight: 4/32, Level: Memory + Comprehension + Application) 10. Video Post-Production and Synthesis (Weight: 4/32, Level: Memory + Comprehension + Analysis + Evaluation)

Study and examination requirements and forms of examination	The course assessment includes process assessment (60%) and final exam (40%). The process assessment includes: unit tests 40% + after-class assignments 30% + personal presentations 30%. The final closed-book exam is 100 minutes.
Reading list	[1] Fundamentals and Applications of Multimedia Technology, edited by Liu Lixin, Liu Zhen, Guo Jianpu [2] Multimedia Application Technology, edited by Wang Wei [3] Multimedia Technology Fundamentals and Application Tutorial, edited by Li Jian, Shan Xiaoke, Zhou Yuan, Xing Xiaochuan [4] Multimedia Technology and Application Case Tutorial, edited by Li Jianfang [5] Multimedia Technology and Application Three-Dimensional Tutorial, edited by Zhou Defu, Wei Guosheng [6] "Student-Centered" Teaching Reform and Practice of Multimedia Technology and Application Course, Computer Knowledge and Technology, 2022.18, Lu Min, Cheng Aijing, Wang Junjie, Guo Yuling [7] Teaching Practice of Multimedia Technology and Application Course, Electronic Technology, 2022, 51, Zhang Ting
Revision Date	July 2024

Web Front-end Development Practice

<table>
<tr><td>Module name</td><td colspan="3">Web Front-end Development Practice</td></tr>
<tr><td>Semester</td><td colspan="3">Fall</td></tr>
<tr><td>Contact person</td><td colspan="3">Wang Weina</td></tr>
<tr><td>Language</td><td colspan="3">Chinese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="3">Compulsory, 3rd semester</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="3">Lecture method, demonstration method, group discussion method, case analysis method, laboratory experiment method, online learning method; 3 class hours/week</td></tr>
<tr><td>Work load</td><td colspan="3">1. Total hours: 104 hours = 48 lecture hours + 56 self-study hours, completed in 16 weeks.
2. Instruction: 3 hours per week, including lectures, discussions, and Q&A.
3. Self-study: Approximately 3.5 hours per week, including pre-class preview, after-class exercises, and exam review.</td></tr>
<tr><td>Credit points</td><td colspan="3">4</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="3">Introduction to Network Engineering, Network Engineering Drawing Practice, Network Comprehensive Wiring and Maintenance</td></tr>
<tr><td rowspan="2">Learning outcomes and their corresponding PLOs</td><td>Course Learning Outcome (CLO)</td><td>Description</td><td>Supported Programme Learning Objective(PLOs)</td></tr>
<tr><td>CLO-1-1</td><td>1. Understand the basic connotation of HTML language and the usage of basic tags.
2. Distinguish different methods</td><td>R2. Problem Analysis</td></tr>
</table>

	of adding CSS styles to web pages, and proficiently use CSS to set web page formats and list formats. 3. Be able to apply JavaScript in browsers and HTML5. 4. Have the ability to investigate, analyze, and independently complete website design and development.	
CLO-2-2	1. Cultivate students' systematic engineering thinking in design and development. 2. Cultivate students' aesthetic abilities in web page layout and color matching. 3. Cultivate students' ability to integrate theory with practice and use knowledge to solve social needs.	R3. Design/Development of Solutions

	CLO-3-3	1. Establish confidence and the concept of technological power. 2. Cultivate students' innovative thinking and craftsmanship spirit through flexible application. 3. Encourage innovation and cultivate students' interest in new technologies. 4. Build students' confidence in solving practical problems.	R6. Engineering and Sustainable Development, R9. Communication
Content	This course mainly introduces the basic principles of website operation, as well as the basic knowledge and technologies of web page design and production. Through the teaching of this course, students should master the basic knowledge of Web technology, be familiar with basic HTML elements, and understand common technologies used in website development. Master the basic methods of web page design and production, and be able to design and develop web pages using technologies such as HTML, CSS, and JavaScript. Familiar with the B/S development model, and basically the ability to develop websites. Be able to comprehensively use HTML and JavaScript technologies for website frontend development, improve problem analysis and solving abilities; master web page design and production skills, lay a solid theoretical and technical foundation for the study of subsequent courses and		

	future practical applications, and improve students' self-learning ability to ensure they can expand their knowledge in this major.The knowledge modules are as follows: 1. Basic Knowledge (Weight: 4/48, Level: Memory + Comprehension) 2. HTML Basics (Weight: 6/48, Level: Memory + Comprehension + Application) 3. CSS Basics (Weight: 8/48, Level: Memory + Comprehension) 4. CSS Design Layout (Weight: 6/48, Level: Memory + Comprehension + Application) 5. JavaScript Basics (Weight: 6/48, Level: Memory + Comprehension + Application) 6. Objects in JavaScript (Weight: 6/48, Level: Comprehension + Application) 7. Event Handling (Weight: 6/48, Level: Comprehension + Application) 8. Comprehensive Cases (Weight: 6/48, Level: Comprehension + Creation)
Study and examination requirements and forms of examination	Assessment method: Inspection Composition and percentage: Process assessment (50%) + final assessment (50%), where process assessment includes: timeliness (10%) + quality (20%) + quantity (20%), and final assessment consists of theoretical assessment (20%) + practical operation assessment (30%).
Reading list	[1] Peng Jinxiang, Zhang Maohong, Wang Yujuan. *HTML5+CSS+JavaScript Web Design and Production* [M]. Beijing: Tsinghua University Press, 2019. [2] Wen Haoyu, Li Hui. *Web Site Design and Development Tutorial (HTML5, JSP Edition) (2nd Edition)* [M]. Xi'an: Xi'an University of Electronic Science and Technology Press, 2018. [3] Liu Ruixin, Zhang Bingyi. *Web Design and Production*

	Tutorial (HTML+CSS+JavaScript) 2nd Edition [M]. Beijing: Machinery Industry Press, 2017. [4] Zhao Feng. *Web Design and Production - HTML5+CSS+JavaScript (2nd Edition)* [M]. Beijing: Tsinghua University Press, 2019. [5] Mark J. Collins, translated by Wang Jing, Fan Yuanfang. *HTML5 Web Development Best Practices* [M]. Beijing: Tsinghua University Press, 2018. [6] Xia Liandi, Yu Biao. Design and Practice of Military Education and Training Website Based on HTML5 [J]. *Information System Engineering*, 2020(04): 97-98. [7] Jiao Xinwei. Research on the Application of HTML5 in WEB Front-end Development [J]. *Network Security Technology and Application*, 2020(04): 73-75.
Revision Date	July 2024

Hardware Detection and Maintenance Technology Practice

Module name	Hardware Detection and Maintenance Technology Practice		
Semester	Spring		
Contact person	Xu Shaojun		
Language	Chinese		
Relation to curriculum	Compulsory, 3rd semester		
Type of teaching, contact hours	Lecture method, demonstration method, case analysis method; 2 class hours/week		
Work load	1. Total hours: 84 hours = 32 lecture hours + 52 self-study hours, completed in 16 weeks. 2. Instruction: 2 hours per week, including lectures, discussions, and Q&A. 3. Self-study: Approximately 3 (3-4) hours per week, including pre-class preview, after-class exercises, and exam review.		
Credit points	3		
Recommended prerequisites	*Digital Logic*, *Principles of Computer Organization*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Through practical teaching, enable students to use various hardware detection tools, analyze the basic detection	R3. Design/Development of Solutions

	processes and methods for computer hardware, infer the causes of hardware failures, and improve their hardware detection capabilities.	
CLO-2-2	Through practical teaching, cultivate students' maintenance skills for common computer hardware, including maintenance methods for main components such as motherboards, CPUs, memory, hard drives, and graphics cards, and follow maintenance operation specifications to ensure safety and efficiency during maintenance.	R4. Research
CLO-3-3	Through practical training, enable students to analyze different	R11. Lifelong Learning

		hardware failure phenomena, use the knowledge to formulate reasonable maintenance plans, improve their ability to independently solve hardware failure problems, and lay a foundation for future work in hardware maintenance and management.	
Content	Hardware Detection and Maintenance Technology Practice is a professional basic course compulsory for computer and other related majors. This course mainly introduces the performance indicators of computer components, computer assembly steps, and detailed descriptions of problem handling during the assembly process; from the perspective of computer use and maintenance, it covers software installation, the use of hard disk utility software such as GHOST, BIOS upgrading and computer overclocking, hardware performance testing, computer virus prevention, and troubleshooting of common software and hardware issues. In summary, through the study of this course, students can master the knowledge of computer maintenance and repair, and possess the ability to manage and maintain large computer rooms.The knowledge modules are as follows: 1. Basic Knowledge (Weight: 8/48, Level: Comprehension + Memory) 2. Hardware Detection Technology (Weight: 8/48, Level:		

	Comprehension + Application + Analysis) 3. Hardware Maintenance Technology (Weight: 16/48, Level: Comprehension + Application + Analysis) 4. Fault Diagnosis and Analysis (Weight: 16/48, Level: Comprehension + Application + Analysis)
Study and examination requirements and forms of examination	The course assessment includes process assessment (50%) and final exam (50%). The process assessment includes: classroom participation 30% + after-class assignments 30% + experiment completion 40%. The final closed-book exam is 100 minutes.
Reading list	[1] Sun Chengting. Principles and Detection Technology of Computer Hardware Circuits [M]. Southwest Jiaotong University Press, 2015. [2] Huang Peng. Research on Principles and Strategies of Computer Hardware Maintenance under the Background of New Technologies [M]. 2014. [3] Wang Xu. On Daily Management, Maintenance and Fault Detection of Computer Hardware [J]. Information System Engineering, 2019(12). [4] Zhao Jiyuan. Analysis of Principles and Methods of Computer Hardware Maintenance [J]. Digital Technology and Application, 2019. [5] Zhao Lei. Research on Fault Diagnosis Methods for Computer Network Hardware and Software [J]. Information and Computer, 2016. [6] Xiao Chao'en. Research on Hardware Trojan Detection Methods and Protection Technologies [C]. 2024. [7] Qin Weihua. Research on Computer Maintenance Technology and Fault Diagnosis [C]. 2020.

Revision Date	July 2024

Network Device Configuration and Debugging Practice

Module name	Network Device Configuration and Debugging Practice		
Semester	Fall		
Contact person	Yan Lingling		
Language	Chinese		
Relation to curriculum	compulsory, 4 th semester		
Type of teaching, contact hours	Lecture method, demonstration method, group discussion method; 3 class hours/week		
Work load	1. Total hours: 104 hours = 48 lecture hours + 56 self-study hours, completed in 16 weeks. 2. Instruction: 3 hours per week, including lectures, discussions, and Q&A. 3. Self-study: Approximately 3.5 hours per week, including pre-class preview, after-class exercises, and exam review.		
Credit points	4		
Recommended prerequisites	*Principles of Computer Organization*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Through the study of this course, students recognize the rapid evolution of network technologies, maintain curiosity and learning	R3. Design/Development of Solutions

	motivation for new technologies. When facing problems, they can analyze calmly and use scientific methods to find solutions.	
CLO-2-2	Through the study of this course, students can familiarize themselves with the command-line interface (CLI) operations of mainstream network equipment manufacturers, and write and execute basic configuration commands. Understand and apply various network protocols, such as IP routing protocols (RIP, EIGRP, OSPF, etc.), Dynamic Host Configuration Protocol (DHCP), Domain Name System (DNS), etc. Learn basic	R5. Use of Modern Tools

	knowledge of network security, including Access Control Lists (ACL), port security, Virtual Local Area Network (VLAN) division, NAT, and firewall configuration, etc.	
CLO-3-3	Through the study of this course, students are responsible for network security and stability in network configuration and maintenance work, ensuring data security and business continuity. Abide by the professional ethics of the network industry, respect intellectual property rights, and protect user privacy.	R7. Ethics and Professional Norms, R8. Individual and Team

Content	This course is a compulsory professional course for the network engineering major, aiming to enable students to understand the concepts, working principles and modes, technical indicators and parameters of common network devices, the network standards followed, the protocols used in the network layer, as well as the management of intelligent network devices and the use of wireless network devices. The main task is to enable students to have a clear, comprehensive and systematic understanding of computer network devices as a whole based on their existing knowledge of computer networks, have a clear concept of the main types of current computer network devices and common network protocols, and be familiar with how to configure network interface cards, network cables, hubs, switches, routers and firewalls. Since the network device configuration course involves a lot of basic knowledge of computer networks, its prerequisite course is Principles of Computer Organization, and it also lays a foundation for students' subsequent graduation projects. The knowledge modules are as follows: 1. Network Basics (Weight: 2/48, Level: Comprehension) 2. Network Devices (Weight: 9/48, Level: Comprehension + Application) 3. Network Security (Weight: 12/48, Level: Comprehension + Application) 4. Internal and External Network Interconnection (Weight: 10/48, Level: Comprehension + Application) 5. Engineering Practice (Weight: 15/48, Level: Comprehension + Application)

Study and examination requirements and forms of examination	Assessment method: Inspection; Composition and percentage: Process assessment (50%) + final assessment (50%). The process assessment consists of timeliness (10%) + quality (20%) + quantity (20%), and the final assessment consists of theoretical assessment (20%) + practical operation assessment (30%).
Reading list	[1] Zhang Guoqing, *Network Device Configuration and Debugging Project Training (4th Edition)*, Publishing House of Electronics Industry. [2] Zhao Debao, *Network Device Configuration and Debugging*, Posts & Telecom Press. [3] Zhang Shiyong, *Switch and Router Configuration Experiment Tutorial*, Machinery Industry Press. [4] Cui Ling, *Network Device Configuration and Debugging (2nd Edition)*, Higher Education Press. [5] Li Fei, *Network Device Configuration and Management*, Xi'an University of Electronic Science and Technology Press. [6] Li Bing. Practice and Exploration of Ideological and Political Design in the Course of *Network Device Configuration and Debugging* [J]. *Digital World*, 2020, (04): 145-146. [7] Huang Chao. Curriculum Development and Practice Based on Work Process—Taking the Higher Vocational Course of Network Device Configuration and Debugging as an Example [J]. *Liaoning Higher Vocational Technical Institute Journal*, 2017, 19(12): 53-54+96.
Revision Date	July 2024

Wireless Communication Engineering Practice

Module name	Wireless Communication Engineering Practice		
Semester	Spring		
Contact person	Zhang Yulin		
Language	Chinese		
Relation to curriculum	compulsory, 4th semester		
Type of teaching, contact hours	Lecture method, group discussion method, simulation experiment method; 2 class hours/week		
Work load	1. Total hours: 52 hours = 32 lecture hours + 20 self-study hours, completed in 16 weeks. 2. Instruction: 2 hours of lectures per week on average, including lectures, discussions, Q&A, etc. 3. Self-study: Approximately 1-2 hours per week, including pre-class preview, after-class exercises, and exam review.		
Credit points	2		
Recommended prerequisites	*Computer Networks*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Enable students to understand and master the basic concepts, principles, and development history of wireless communication engineering.	R1. Engineering Knowledge, R2. Problem Analysis

	Understand the components of wireless communication systems. Master common transmission technologies and network architectures in wireless communication.	
CLO-2-2	Cultivate students' ability to use wireless communication technologies to solve practical problems. Improve the ability to design simple wireless communication systems. Train students to continuously update and improve their knowledge system through methods such as consulting materials and conducting experiments.	R2. Problem Analysis, R3. Design/Development of Solutions, R11. Lifelong Learning

	CLO-3-3	Cultivate students' interest and enthusiasm for wireless communication engineering. Foster students' team collaboration spirit. Enhance student'awareness of information security.	R8. Individual and Team, R11. Lifelong Learning
Content	Wireless Communication Engineering Practice is a comprehensive training course for the concentrated practical teaching link offered by the network engineering major. The course covers an overview of wireless communication technologies, composition of wireless communication systems, common wireless transmission technologies, wireless communication network architectures, applications of wireless communication technologies, and wireless communication security and privacy protection. It aims to enable students to master the basic knowledge and applications of wireless communication engineering through a combination of lectures and practice. At the same time, it focuses on cultivating students' practical operation skills and innovative thinking, and improving their ability to solve practical problems.The knowledge modules are as follows: 1. Overview of Wireless Communication Technologies (Weight: 1/32, Level: Comprehension + Memory) 2. Composition of Wireless Communication Systems (Weight: 6/32, Level: Comprehension + Memory) 3. Common Wireless Transmission Technologies (Weight: 6/32, Level: Comprehension + Memory) 4. Wireless Communication Network Architectures (Weight:		

	6/32, Level: Comprehension + Memory) 5. Applications of Wireless Communication Technologies (Weight: 9/32, Level: Comprehension + Application) 6. Wireless Communication Security and Privacy Protection (Weight: 4/32, Level: Comprehension + Memory)
Study and examination requirements and forms of examination	The course assessment includes process assessment (60%) and final major assignment (40%). The process assessment includes: attendance (30%) + classroom participation (30%) + after-class assignments (40%). The final major assignment is out of 100 points.
Reading list	[1] Wireless Communication and Mobile Communication Technology (2nd Edition), edited by He Pengfei, Tsinghua University Press, 2022. [2] Principles and Technologies of Wireless Communication, edited by Xiong Lei, Tsinghua University Press, 2024. [3] Principles and Practice of IoT Wireless Communication, edited by Chen Zhe, Tsinghua University Press, 2021. [4] Principles and Applications of Wireless Communication (2nd Edition), Zhou Wen'an, Publishing House of Electronics Industry, 2018. [5] China University MOOC Website: https://www.icourse163.org [6] Design and Practice of Teaching Cases for Communication Engineering Integrated with Artificial Intelligence [J]. Sun Rui, Fan Zhiguo. Journal of Higher Education, 2024, 10(25): 103-106. DOI:10.19980/j.CN23-1593/G4.2024.25.024. [7] Innovative Exploration of "Wireless Local Area Network Technology" under the Background of Emerging Engineering Education [J]. Li Siyao. Wireless Internet Technology, 2023, 20(2): 144-146. DOI:10.3969/j.issn.1672-6944.2023.02.044.

Revision Date	July 2024

Web Security Technology Application

<table>
<tr><td>Module name</td><td colspan="3">Web Security Technology Application</td></tr>
<tr><td>Semester</td><td colspan="3">Spring</td></tr>
<tr><td>Contact person</td><td colspan="3">Ma Xueting</td></tr>
<tr><td>Language</td><td colspan="3">Chinese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="3">compulsory, 4th semester</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="3">Lecture method, group discussion method, brainstorming method, simulation experiment method, flipped classroom method; 8 class hours/week</td></tr>
<tr><td>Work load</td><td colspan="3">1. Total hours: 78 hours = 32 lecture hours + 46 self-study hours, completed in 5 weeks.
2. Instruction: Approximately 6 (6-7) hours per week, including lectures, discussions, and Q&A.
3. Self-study: Approximately 9 (9-10) hours per week, including pre-class preview, after-class exercises, and exam review.</td></tr>
<tr><td>Credit points</td><td colspan="3">3</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="3">C Language Programming, Data Structures and Algorithms, Database Technology and Application, Operating Systems</td></tr>
<tr><td rowspan="2">Learning outcomes and their corresponding PLOs</td><td>Course Learning Outcome (CLO)</td><td>Description</td><td>Supported Programme Learning Objective(PLOs)</td></tr>
<tr><td>CLO-1-1</td><td>Through practical training in Web security technology applications,</td><td>R2. Problem Analysis</td></tr>
</table>

	enable students to understand the basic principles of Web security. Through learning the basic knowledge of Web application penetration testing, students can effectively discover and express existing vulnerabilities, as well as the required repair and protection methods through testing.	
CLO-2-2	Through practical application of Web security technologies, students understand various potential	R4. Research

		vulnerabilities in Web applications, learn vulnerability detection technologies and data analysis methods, as well as vulnerability repair approaches.	
	CLO-3-3	Be able to use modern tools for network detection and scanning, reasonably analyze and use data, and build network protection.	R5. Use of Modern Tools
Content	Web Security Technology Application is a course focused on technical applications and practices in the field of Web security. Its goal is to enable students to master the basic principles of Web security, common vulnerabilities, and their prevention technologies, and possess the ability to apply Web security technologies in practical projects. This course implements a credit system management, and the course assessment results are recorded in the student status file. The course aims to help students comprehensively understand the knowledge of Web security and enhance their professional skills and		

	prevention awareness in Web security through a combination of theoretical explanations and practical operations.The knowledge modules are as follows: 1. Basic Knowledge of Web Security and HTTP Protocol (Weight: 4/32, Level: Memory + Comprehension + Application) 2. Construction of Vulnerability Environment and Use of Security Tools (Weight: 6/32, Level: Comprehension + Application + Analysis) 3. Practices of Common Vulnerabilities (Weight: 12/32, Level: Comprehension + Application + Analysis + Creation) 4. Security Protection Practices for Web Applications (Weight: 10/32, Level: Application + Analysis + Creation)
Study and examination requirements and forms of examination	The course assessment includes process assessment (50%) and final assessment (50%). The process assessment includes: timeliness of project experiments 10% + quality 20% + quantity 20%. The final assessment includes: theoretical assessment 20% + practical operation assessment 30%.
Reading list	[1] Zhang Bingshuai. In-depth Analysis of Web Security [M]. Beijing: Publishing House of Electronics Industry, 2015. [2] Wu Hanqing. White Hat Talks About Web Security [M]. Beijing: Publishing House of Electronics Industry, 2012. [3] Muniz, Lacani. Web Penetration Testing with Kali Linux [M]. Beijing: Posts & Telecom Press, 2014. [4] Shi Huayao. Hacker Attack and Defense Technology Treasure: Web Practice [M]. Beijing: Posts & Telecom Press, 2013. [5] Christof Paar, Jan Pelzl. SQL Injection Attacks and Defense (2nd Edition) [M]. Translated by Ma Xiaoting.

	Beijing: Tsinghua University Press. [6] Song Xuyan. Research on Key Technologies of Web Application Security Testing [D]. Beijing: Beijing University of Posts and Telecommunications, 2023. [7] Zhao Chunhui. Research on PHP Application Vulnerability Detection Methods [D]. Beijing: Beijing University of Posts and Telecommunications, 2023.
Revision Date	July 2024

Network Intrusion Detection Practice

Module name	Network Intrusion Detection Practice		
Semester	Spring		
Contact person	Ma Shijie		
Language	Chinese		
Relation to curriculum	compulsory, 5 th semester		
Type of teaching, contact hours	Lecture method, group discussion method, simulation experiment method; 2 class hours/week		
Work load	1. Total hours: 78 hours = 32 lecture hours + 46 self-study hours, completed in 16 weeks. 2. Instruction: 2 hours per week, including lectures, discussions, and Q&A. 3. Self-study: Approximately 2 (2-3) hours per week, including pre-class preview, after-class exercises, and exam review.		
Credit points	3		
Recommended prerequisites	Computer Networks, Network Security, Foundation of Information Security Technology		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Understand the basic concepts, principles, and architecture of computer	R1. Engineering Knowledge

	networks. Able to list common network protocols, data transmission, and switching technologies. Possess the ability to configure, manage, and troubleshoot network devices. Able to plan, design, and implement network systems.	
CLO-2-2	Understand the basic concepts, threats, and protection measures of network security. Able to explain common network attack	R3. Design/Development of Solutions

	methods and defense technologies. Able to conduct network security risk assessments and emergency responses. Understand network security laws, regulations, and ethical norms.	
CLO-3-3	Understand the basic concepts, principles, and technologies of information security. Familiar with information security standards and best practices. Able to plan, implement,	R5. Use of Modern Tools

		and maintain information security systems. Understand the latest developmen t trends in the field of information security.	
Content	Network Intrusion Detection Practice is a core professional course for the network engineering major. This course mainly explains the basic principles, methods, and technologies of network intrusion detection, while covering some practical operation components. The course introduces the basic concepts and types of intrusion detection systems, such as host-based IDS, network-based IDS, and hybrid IDS; deeply explains the two main intrusion detection technologies of anomaly detection and misuse detection, as well as their respective working principles and advantages/disadvantages; in the second half of the course, practical hands-on content, case analysis, and emergency response content are set up.The knowledge modules are as follows: 1. Introduction (Weight: 2/32, Level: Comprehension) 2. Intrusion Methods and Means (Weight: 4/32, Level: Memory) 3. Intrusion Detection Technologies (Weight: 6/32, Level: Memory + Comprehension) 4. Analysis and Methods of Intrusion Detection (Weight: 6/32, Level: Memory + Comprehension + Application) 5. Basic Models of Intrusion Detection Systems (Weight:		

	6/32, Level: Comprehension + Application) 6. Architecture and Deployment of Intrusion Detection Systems (Weight: 8/32, Level: Comprehension + Application)
Study and examination requirements and forms of examination	The course assessment includes process assessment (60%) and final exam (40%). The process assessment includes: unit tests 40% + after-class assignments 30% + personal presentations 30%. The final closed-book exam is 100 minutes.
Reading list	[1] Li Jian. *Web Intrusion Detection Technology* [M]. Higher Education Press, 2008. [2] Xu Xuepeng (Editor). *JSP Intrusion Detection System Training Tutorial* [M]. Machinery Industry Press, 2012. [3] Tang Zhengjun (Editor). *Design and Implementation of* VB.NET *Network Intrusion Detection System* [M]. Publishing House of Electronics Industry, 2002. [4] Song Jinsong. *ASP Network Intrusion Detection* [M]. National Defense Industry Press, 2004. [5] Zheng Chengxing. *Theory and Practice of Network Intrusion Prevention* [M]. Machinery Industry Press, 2006. [6] Qin Jianbin. Application of Intrusion Detection Technology in Computer Database [D]. Guangxi Vocational and Technical College of Industry and Commerce, 2024. DOI: 10.26914/c.cnkihy.2024.026354 [7] Cui Runan, Zhao Ying, Guo Qianling. Research on Network Intrusion Detection Based on CNN-BiLSTM Model [D]. College of Information Science and Technology, Beijing University of Chemical Technology; Library of Beijing University of Chemical Technology, 2021. DOI:

	10.26914/c.cnkihy.2021.047842
Revision Date	July 2024

Internet Programming and Project Practical Training

Module name	Internet Programming and Project Practical Training		
Semester	Fall		
Contact person	Li Xiaojing		
Language	Chinese		
Relation to curriculum	compulsory, 5 th semester		
Type of teaching, contact hours	Lecture method, demonstration method, group discussion method, case analysis method, simulation experiment method; 3 class hours/week		
Work load	1. Total hours: 96 hours = 48 lecture hours + 48 self-study hours, completed in 16 weeks. 2. Instruction: 3 hours per week on average, including lectures, practical teaching, group discussions, Q&A, etc. 3. Self-study: 3 hours per week on average, including pre-class preview, after-class review, course project exercises, etc.		
Credit points	5		
Recommended prerequisites	*C Language Programming*, *Computer Networks*, *Data Structures and Algorithms*, etc.		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Through the practical training of this course, master the effective use of information technology to	R3. Design/Development of Solutions

	support internet programming engineering tasks, cultivate students' ability to design, implement, and manage network engineering, and learn to use computer software and tools to analyze and solve complex problems in practical training.	
CLO-2-2	Through the practical training of this course, cultivate students' engineering practice ability in the field of internet programming, guide students to learn to identify and analyze problems during implementation, apply research conclusions to actual internet engineering projects, so as to solve practical problems and	R4. Research

	improve engineering efficiency.	
CLO-3-3	Through the practical training of this course, students master the development or selection of appropriate technologies and modern information tools to solve complex engineering problems in network engineering and related fields, and cultivate students' ability to use modern tools for prediction and simulation of complex internet training problems.	R5. Use of Modern Tools

Content	Internet Programming and Project Training is a professional intensive practice course set according to the core courses of the network engineering major. The foundation of internet technology is one of the essential basic skills for network engineering students, which plays an important role in cultivating innovative thinking, improving network technology literacy, and enhancing the ability to understand follow-up courses. This course covers the key technologies and tools of modern internet programming, which can be applied to various network environments and platforms. Through project training, students will master the complete process from conceptual design to actual deployment, and improve their ability to solve complex network engineering problems.The knowledge modules are as follows: 1. Basic Knowledge of Internet Programming (Weight: 9/32, Level: Comprehension) 2. Front-end Development Technology (Weight: 10/48, Level: Comprehension + Memory + Analysis) 3. Back-end Development Technology (Weight: 10/48, Level: Comprehension + Application + Memory + Analysis) 4. Full-Stack Project Practice (Weight: 10/48, Level: Comprehension + Application + Memory + Analysis + Creation) 5. Deployment and Operation of Internet Programming Training Projects (Weight: 9/48, Level: Comprehension + Application + Memory + Analysis)
Study and examination requirements and forms of examination	The course assessment includes process assessment (60%) and final assessment (40%). The process assessment includes: classroom participation (40%) + after-class assignments (30%) + experiment reports (30%). The final assessment is out of 100 points.

Reading list	[1] Cao Chengzhi, Song Changlong, Liu Xiangdong, et al. Database and Programming Based on the Internet [M]. Tsinghua University Press, 2024. [2] Chi Zongzheng, Lai Xiaochen, et al. Three-dimensional Computer Organization Principles Experiment Tutorial in the "Internet+" Era [M]. Tsinghua University Press, 2023. [3] Lei Qing, et al. Mobile Internet Application Development Based on Android Platform [M]. Tsinghua University Press, 2023. [4] Zhao Lei, Zhang Hua, Yang Chuan, et al. Exploration and Practice of Industrial Robot Training Teaching Platform Based on "Internet + Training" [J]. 2019. [5] Gao Zehan, Hui Gangxing, Lu Wei, et al. Foundation and Application of "Internet+" [M]. Xi'an University of Electronic Science and Technology Press, 2018. [6] Zhou Xiang, Zhang Tingping, et al. Computers and the Internet [M]. Posts & Telecom Press Education, 2019. [7] Song Yibing, et al. Foundation and Application of Computer Networks [M]. Posts & Telecom Press Education, 2019.
Revision Data	July 2024

Mobile Communication and Wireless Network Practice

Module name	Mobile Communication and Wireless Network Practice		
Semester	Spring		
Contact person	Song Jing		
Language	Chinese		
Relation to curriculum	compulsory, 6 th semester		
Type of teaching, contact hours	Lecture method, group discussion method, simulation experiment method; 2 class hours/week		
Work load	1. Total hours: 78 hours = 32 lecture hours + 46 self-study hours, completed in 16 weeks. 2. Instruction: 2 hours per week, including lectures, discussions, and Q&A. 3. Self-study: Approximately 3 (2-3) hours per week, including pre-class preview, after-class exercises, and exam review.		
Credit points	3		
Recommended prerequisites	*Modern Communication Technology*, *Wireless and Mobile Network Technology*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Through the study of this course, enable students to remember the basic concepts, development history, and main characteristics of	R1. Engineering Knowledge

	mobile communication, summarize the basic concepts, composition, key technologies, security mechanisms, and access technologies of wireless network technology. Master the key technologies of mobile communication and wireless network principles.	
CLO-2-2	Through the study of this course, be able to analyze simple network problems, implement simple network device configuration and maintenance, master basic troubleshooting methods, and use the technologies to analyze actual network communication problems.	R2. Problem Analysis

	CLO-3-3	Stimulate students' interest and enthusiasm for mobile communication and wireless networks, cultivate students' professional literacy and work ethics, enable students to recognize the importance and role of mobile communication and wireless networks in modern society, and enhance students' sense of identity and responsibility for the communication industry.	R7. Ethics and Professional Norms
Content	Mobile Communication and Wireless Network Practice is a concentrated practical teaching course for the network engineering major, aiming to enable students to master the basic principles, technical specifications, equipment operation, and troubleshooting methods of mobile communication and wireless networks through a combination of theoretical explanations and experimental operations, improve students' practical operation ability and problem-solving ability, and lay a solid technical foundation for subsequent practical courses. The main contents include: ① overview; ② communication		

	network technology; ③ communication network equipment operation and maintenance; ④ communication network planning and design; ⑤ communication network project practice. It aims to comprehensively enhance students' practical capabilities.The knowledge modules are as follows: 1. Overview: Introduction (Weight: 2/32, Level: Description) 2. Communication Network Technology (Weight: 6/32, Level: Memory + Comprehension) 3. Communication Network Equipment Operation and Maintenance (Weight: 8/32, Level: Memory + Comprehension + Analysis) 4. Communication Network Planning and Design (Weight: 8/32, Level: Memory + Comprehension + Analysis) 5. Communication Network Project Practice (Weight: 8/32, Level: Memory + Comprehension + Analysis + Evaluation)
Study and examination requirements and forms of examination	The course assessment includes process assessment (50%) + final assessment (50%). The process assessment consists of timeliness (10%) + quality (20%) + quantity (20%), and the final assessment consists of theoretical assessment (20%) + practical operation assessment (30%).
Reading list	[1] Gao Peng, Chen Weiwei, Zeng Yican, et al. *Wireless Communication Technology and Network Planning Practice* [M]. Posts & Telecom Press: 201607. 481. [2] Deng Honggui, Liu Gang, Qian Xuewen. *5G Mobile Communication Development History and Key Technologies* [M]. Publishing House of Electronics Industry: 202101. 292. [3] Song Tiecheng. *Mobile Communication Technology* [M]. Beijing: Posts & Telecom Press, 2018. [4] Zhai Linbo, Yang Feng. *Principles of Cognitive Wireless Networks* [M]. Publishing House of Electronics Industry:

	202009. 135. [5] Gui Xueqin, Wu Mou, Yang Rong, et al. *Wireless Network Technology and Practice* [M]. China Railway Publishing House: 202202. 246. [6] Ge Jungang. Research on Intelligent Spectrum Sharing Technology for Future Wireless Networks [D]. University of Electronic Science and Technology of China, 2024. DOI: 10.27005/d.cnki.gdzku.2024.000259. [7] Yuan Yingting. Research on Terminal Collaboration Technology in Mobile Communication Networks [D]. Beijing University of Posts and Telecommunications, 2024. DOI: 10.26969/d.cnki.gbydu.2024.000175.
Revision Data	July 2024

Mobile Application Development Practice

Module name	Mobile Application Development Practice		
Semester	Spring		
Contact person	Zhao Yuxia		
Language	Chinese		
Relation to curriculum	compulsory, 6th semester		
Type of teaching, contact hours	Lecture method, demonstration method, group discussion method, project-based learning method; 3 class hours/week		
Work load	1. Total hours: 130 hours = 48 lecture hours + 82 self-study hours, completed in 16 weeks. 2. Instruction: 3 hours per week on average, including lectures, practical teaching, discussions, Q&A. 3. Self-study: Approximately 5 (5-6) hours per week, including pre-class preview, after-class exercises, and final major assignment.		
Credit points	5		
Recommended prerequisites	*Data Structures and Algorithms*, *Database Technology and Application*, *Java Programming*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Recognize the basic knowledge of Android programming, understand program examples, and be able to describe the	R1. Engineering Knowledge

	design methods and steps of Android programs.	
CLO-2-2	Through the study of this course, possess the ability to design Android programs for specific problems, develop Android applications, and create mobile applications with complete functions and good user experience.	R3. Design/Development of Solutions
CLO-3-3	Cultivate students' good team collaboration spirit and communication skills, enabling effective division of labor and cooperation in teams, experiencing different roles in teams, and jointly completing project development tasks. Have good professional ethics, psychological qualities, good communication skills, and the ability	R8. Individual and Team, R9. Communication

		to efficiently organize and execute work tasks.	
	CLO-4-4	Students can apply the basic processes and methods of software development, including requirements analysis, design, coding, testing, and release, and practice the theories and methods of project management. Cultivate students' innovative awareness and problem-solving abilities, and improve their comprehensive qualities and professional competitiveness.	R10. Project Management

Content	Mobile Application Development Practice is an important practical link in mobile application development, aiming to cultivate students' ability to comprehensively apply knowledge and skills to develop mobile applications with practical application value. This course is based on the latest Android operating system and SDK, using Android operating system, system architecture, APP development API framework, and related technologies, and integrating APP development engineering methods throughout the practice process. Through the study of this course, students can understand and master the system architecture of mobile devices such as smartphones and the basic technologies of mobile application development through practice, so that students can have a comprehensive understanding of mobile application development technologies and gain deeper insights into the Android APP development industry. The practice process emphasizes student participation in learning to improve students' professional skills, practical experience, and hands-on operation skills in mobile application design and development, further promoting the transformation of theoretical knowledge into practical abilities, and laying a good foundation for future related work and further study. The knowledge modules are as follows: 1. Basic Introduction (Weight: 2/48, Level: Memory + Comprehension + Application) 2. User Interface (Weight: 4/48, Level: Memory + Comprehension + Application) 3. Activity and Intent (Weight: 2/48, Level: Comprehension + Application) 4. Data Storage (Weight: 4/48, Level: Comprehension + Application + Analysis) 5. Event Handling, Gestures, and Resource Access (Weight: 4/48, Level: Comprehension + Application + Analysis) 6. Messages, Notifications, and Broadcasts (Weight: 4/48, Level:

	Comprehension + Application + Analysis) 7. Multimedia and Animation (Weight: 2/48, Level: Memory + Comprehension + Application) 8. Handler Message Processing (Weight: 4/48, Level: Memory + Comprehension + Application) 9. Service Applications (Weight: 4/48, Level: Memory + Comprehension + Application) 10. Sensors and Location Services (Weight: 4/48, Level: Comprehension + Application + Analysis) 11. Network Programming and Internet Applications (Weight: 4/48, Level: Comprehension + Application + Analysis) 12. Comprehensive Project Practice (Weight: 10/48, Level: Application + Analysis + Evaluation + Creation)
Study and examination requirements and forms of examination	The course assessment includes process assessment (70%) and final major assignment (30%). The process assessment includes: classroom participation (40%) + after-class assignments (30%) + experiment completion (30%). The final major assignment is out of 100 points.
Reading list	[1] Zhong Baocai, Yan Debiao, Liu Jing. Android Mobile Application Development Practice Tutorial. Beijing: Tsinghua University Press, 2018. [2] Wang Zhongrun, Qian Liangyu, Zhou Yanping. Foundation and Practice of Mobile Application Development. Shanghai: Fudan University Press, 2021. [3] Huawei Software Technology Co., Ltd. Mobile Application Development. Beijing: Tsinghua University Press, 2021. [4] Wu Shaogen, Luo Jia. Android Studio Mobile Application Development Foundation. Beijing: Publishing House of

	Electronics Industry, 2019. [5] Xia Hui, Yang Weiji, Zhang Jin. Android Mobile Application Development Technology and Practice. Beijing: Machinery Industry Press, 2021. [6] Heima Programmer. Android Mobile Development Foundation Case Tutorial (2nd Edition) [M]. Beijing: Posts & Telecom Press, 2021. [7] Xu Lin, Guo Liangmin, Lu Zhou. Teaching Exploration of Full-Cycle Mobile Application Development Practice Course "Focusing on Needs and Employment-Oriented" [J]. Computer Education, 2024, (01): 174-178. [8] Hu Wei, Liu Wei, Xu Hongning. Teaching Reform and Practice of Mobile Application Development Course [J]. Computer Era, 2022, (01): 117-120.
Revision Date	July 2024

Network Vulnerability Scanning Practice

Module name	Network Vulnerability Scanning Practice		
Semester	Spring		
Contact person	Ma Xueting		
Language	Chinese		
Relation to curriculum	compulsory, 6th semester		
Type of teaching, contact hours	Lecture method, group discussion method, brainstorming method, simulation experiment method, flipped classroom method; 8 class hours/week		
Work load	1. Total hours: 78 hours = 32 lecture hours + 46 self-study hours, completed in 5 weeks. 2. Instruction: Approximately 6 (6-7) hours per week, including lectures, discussions, and Q&A. 3. Self-study: Approximately 9 (9-10) hours per week, including pre-class preview, after-class exercises, and exam review.		
Credit points	3		
Recommended prerequisites	Foundation of Information Security Technology, Web Security Technology Application, Network Protocols Analysis, Network Security, Network Intrusion Detection Practice		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Through practical teaching, enable students to master the vulnerability detection configuration	R4. Research

	methods of vulnerability scanning systems, improve data security risk analysis capabilities for scanning results, and exercise students' repair operations for system vulnerabilities, laying a solid foundation for future network security work.	
CLO-2-2	Through practical teaching, enable students to understand and master the basic management of vulnerability scanning systems, applications such as vulnerability detection and password guessing, and advanced applications such as data analysis and system management, thereby cultivating	R5. Use of Modern Tools

	students' capabilities in deploying, applying, and daily operation and maintenance of vulnerability scanning systems.	
CLO-3-3	Through practical training, enable students to deeply understand the professional nature and responsibilities of network engineering professionals, personally experience the importance of network security, thereby enhancing their sense of responsibility and mission for network security, clarifying their own responsibilities in maintaining network security, and ensuring that students can adhere to professional ethics	R7. Ethics and Professional Norms

		when engaged in network-related work.	
Content	Network Vulnerability Scanning Practice is a core course for computer-related majors, aiming to cultivate students' network security awareness and prevention capabilities. It is incorporated into the talent training system of ordinary higher education institutions, listed in the school's talent training plan and teaching plan, managed under a credit system, and course assessment results are recorded in student status files. The course covers vulnerability scanning technologies and experimental contents such as detecting Smiley vulnerabilities, Nmap operating system vulnerability scanning, and Web application vulnerability scanning. Through practice, students can apply the steps and methods of vulnerability scanning, including configuring vulnerability scanning systems, determining scanning targets, port scanning, service identification, and vulnerability scanning, and can analyze and report scanning results.The knowledge modules are as follows: 1. Information Gathering and Basic Scanning Technologies (Weight: 4/32, Level: Understanding + Comprehension) 2. Vulnerability Scanning and Report Analysis (Weight: 8/32, Level: Comprehension + Application + Analysis) 3. Vulnerability Repair and Verification (Weight: 10/32, Level: Application + Analysis + Creation) 4. Advanced Scanning Technologies and Tool Applications (Weight: 10/32, Level: Understanding + Application + Analysis)		

Study and examination requirements and forms of examination	The course assessment includes process assessment (50%) and final assessment (50%). The process assessment includes: timeliness of project experiments 10% + quality 20% + quantity 20%. The final assessment includes: theoretical assessment 20% + practical operation assessment 30%.
Reading list	[1] Li Huafeng. Kali Linux 2 Network Penetration Testing Practice Guide (2nd Edition) [M]. Beijing: Posts & Telecom Press, 2022. [2] Zou Hang, Chen Zhuang, He Yahui, Li Tian, Tang Xin, Liu Xuelian. Network Attack and Defense Technology and Project Practice (Question Bank · Micro-lecture Video Edition) [M]. Beijing: Tsinghua University Press, 2023. [3] Zhang Bingshuai. In-depth Analysis of Web Security [M]. Beijing: Publishing House of Electronics Industry, 2015. [4] (USA) Georgia Weidman. Penetration Testing: A Complete Beginner's Guide [M]. Beijing: Posts & Telecom Press, 2019. [5] (USA) Justin Seitz. Black Hat Python: The Art of Hacking and Penetration Testing (2nd Edition) [M]. Beijing: Publishing House of Electronics Industry, 2022. [6] Cao Wen, Hu Zhifeng, Dai Fei. Research and Implementation of Python-based Communication Network Security Vulnerability Scanning Technology [J]. Computer Programming Skills and Maintenance, 2024, 11.017: 171-173. [7] Long Huaqiu, Zhou Haojian, Yan Zijun. Design and Implementation of Web Vulnerability Scanning System [J]. Modern Information Technology, 2024, Issue 12: 40-43.
Revision Date	July 2024

Linux Server Management and Application

Module name	Linux Server Management and Application		
Semester	Fall		
Contact person	Wang Zhaofang		
Language	Chinese		
Relation to curriculum	compulsory, 7 th semester		
Type of teaching, contact hours	Lecture method, group discussion method, laboratory experiment method, project-based learning method; 2 class hours/week		
Work load	1. Total hours: 91 hours = 32 lecture hours + 59 self-study hours, completed in 16 weeks. 2. Instruction: 2 hours and 100 minutes of lectures per week on average, including practical teaching, discussions, drills, etc. 3. Self-study: 4 hours and 200 minutes of extracurricular study per week on average, including preview, assignments, extended learning, etc.		
Credit points	3.5		
Recommended prerequisites	*Network Management*, *Network Vulnerability Scanning Practice*		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Students proficiently master Linux system management	R6. Engineering and Sustainable Development

	skills, can reasonably design and analyze engineering projects based on the background of network engineering, accurately assess the impact of new technologies and materials on engineering projects, ensure compliant operations, and comprehensively enhance network engineering practice and innovation capabilities.	

CLO-2-2	Students will understand the essence of teamwork, possess team spirit, be able to assume different roles in network engineering practice, and effectively improve project management and Linux server application capabilities.	R8. Individual and Team
CLO-3-3	Students can combine network engineering principles with economic decision-making methods, effectively analyze the economic and investment decisions of engineering projects, control costs, optimize	R10. Project Management

		solutions, and enhance comprehensive project management capabilities in the Linux environment.	
Content	Linux Server Management and Application is a compulsory course for the network engineering major and a highly practical course; it plays an important role in forming students' professional capabilities and improving their practical standards. The main task of this course is to train students to flexibly use today's mainstream operating systems to build network environments, carry out network management, set up various network services, and develop and port software under different platforms, cultivate students' ability to comprehensively apply 所学 knowledge for comprehensive practice, and ultimately enable students to improve their ability to analyze problems and use computer skills to solve practical problems. The knowledge modules are as follows: 1. Linux Environment Installation and VIM Usage (Weight: 5/32, Level: Comprehension) 2. Basic Linux File Operations (Weight: 3/32, Level: Comprehension + Memory + Analysis) 3. Advanced Linux File Operations (Weight: 3/32, Level: Comprehension + Application + Memory + Analysis) 4. Linux File Security (Weight: 3/32, Level: Comprehension + Application + Memory + Analysis + Creation) 5. Advanced Linux Operations (Weight: 5/32, Level:		

	Comprehension + Application + Memory + Analysis) 6. User and User Group Management (Weight: 3/32, Level: Comprehension + Application + Memory + Analysis + Creation) 7. Shell Programming (Variables, Branches) (Weight: 5/32, Level: Comprehension + Application + Memory + Analysis + Creation) 8. Shell Programming (Loops, Functions) (Weight: 5/32, Level: Comprehension + Evaluation)
Study and examination requirements and forms of examination	Final assessment (50%) + classroom participation (20%) + after-class assignments (10%) + chapter tests (20%)
Reading list	[1] Pan Jun. *Linux Server Configuration and Management* [M]. Beijing: China Railway Publishing House, 2021. [2] Xia Liqin. *Linux Network Server Configuration and Management* [M]. Liaoning: Dalian University of Technology Press, 2021. [3] Liu Zhenyu, et al. *Linux Server Building and Management Case Tutorial* [M]. Shanghai: Shanghai Jiao Tong University Press, 2019. [4] Gu Runlong, et al. *Linux Operating System and Application Technology* [M]. Beijing: Aviation Industry Press, 2020. [5] Heima Programmer. *Linux System Management and Automated Operation and Maintenance* [M]. Beijing: Tsinghua University Press, 2019. [6] Zhao Chunping, Miao Zhifeng. Application Research of Ansible in Batch Deployment of Preparatory Tasks for "Linux Server Management" Course [J]. *Equipment Manufacturing*

	Technology, 2023, (10): 130-134. [7] Qu Mingqiang. Application Research of Server Virtualization Technology in Server Resource Management [J]. *Computer Knowledge and Technology*, 2017, 13(14): 22-24. DOI: 10.14004/j.cnki.ckt.2017.1515.
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Network comprehensive application

Module name	Network comprehensive application		
Semester	Fall		
Contact person	Wang Zhaofang		
Language	Chinese		
Relation to curriculum	compulsory, 7 th semester		
Type of teaching, contact hours	Lecture method, group discussion method, laboratory experiment method, project-based learning method; 4 class hours/week		
Work load	1. Total hours: 130 hours = 32 lecture hours + 98 self-study hours, completed in 16 weeks. 2. Instruction: 4 hours and 200 minutes of lectures per week on average, including practical teaching, discussions, drills, etc. 3. Self-study: 5 hours and 250 minutes of extracurricular study per week on average, including preview, assignments, extended learning, etc.		
Credit points	5		
Recommended prerequisites	Mobile Communication and Wireless Network Practice		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Programme Learning Objective(PLOs)**
	CLO-1-1	Students will recognize basic principles, identify and analyze network engineering problems, derive effective conclusions	R2. Problem Analysis

		through literature research and professional collaboration, and enhance the ability to solve complex network problems.	
	CLO-2-2	Students will learn to use modern tools to solve network engineering problems, develop prediction models, understand technical limitations, and effectively improve practical problem-solving and information technology application capabilities.	R5. Use of Modern Tools
	CLO-3-3	Students will master network engineering communication skills, be able to write professional reports, clearly present solutions, effectively respond to inquiries, have an international perspective, and communicate in cross-cultural contexts.	R9. Communication
Content	Comprehensive Network Application is based on computer networks and focuses on introducing knowledge of network engineering and network management from a practical perspective. It can be divided into four parts: network		

	engineering design, equipment management, system management, and network management, covering comprehensive cabling, network planning, routing and switching principles, network service establishment, network tool usage, network management platform usage, network protocols fundamentals, network fault detection, and other knowledge.The knowledge modules are as follows: 1. Basic Configuration of Switching Networks (Weight: 9/32, Level: Comprehension) 2. Routing Network Configuration (1) (Weight: 10/48, Level: Comprehension + Memory + Analysis) 3. Routing Network Configuration (2) (Weight: 10/48, Level: Comprehension + Application + Memory + Analysis) 4. Simple Enterprise Network Design (Weight: 10/48, Level: Comprehension + Application + Memory + Analysis + Creation) 5. Cognition of Enterprise-level Network Architecture and Cabling Systems (Weight: 9/48, Level: Comprehension + Application + Memory + Analysis)
Study and examination requirements and forms of examination	Final assessment (50%) + classroom participation (20%) + after-class assignments (10%) + chapter tests (20%)
Reading list	[1] Zhao Xiaolin, Song Yuwei. Network Planning Technology Tutorial [M]. Beijing: National Defense Industry Press, 2022. [2] Wang Da. Huawei Switch Learning Guide [M]. Beijing: Posts & Telecom Press, 2023. [3] Wang Da. Huawei Router Learning Guide [M]. Beijing: Posts & Telecom Press, 2021.

	[4] Yang Wenhu, Li Ting. Network Interconnection Technology and Training [M]. Beijing: Posts & Telecom Press, 2022. [5] Duan Yongfu, Zhang Yuanrui. Computer Network Planning and Design [M]. 2nd ed. Hangzhou: Zhejiang University Press, 2019. [6] Zhang Chunrong, Shi Xiaoqiu, Liu Jun. Network Interconnection Technology [M]. Beijing: Publishing House of Electronics Industry, 2023. [7] Shi Xuelin. Network Planning and Design [M]. Beijing: Tsinghua University Press, 2019. [8] Wang Liwei. Research on Optimization of Intelligent Building Network Cabling System Based on BIM Technology [J]. Intelligent Building and Smart City, 2023, 45(06): 88-91+95. [9] Lu Xinyuan. Application and Design of Integrated Network Cabling [J]. Information and Computer (Theoretical Edition), 2021, 33(08): 146-148.
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