Appendix B-6 - Syllabus - Centralized practice

Contents

Competence field	Centralized practice
Curriculum designation	Electronics Process Practice and Electronic Product Assembly and Debugging Practice
Curriculum code	9061615010
Semester(s) in which the curriculum is taught	1st Semester
Person responsible for the curriculum	Lecturer Lin Lin
Lecturer	Associate Professor Zhou Lai Xiu, Professor Hu Saichun, Professor Xiao Weichu, Professor Zhu Qiuxiang, Lecturer Xiong Jie, Lecturer Ye Yong.
Language	Chinese
The relationship between the curriculum and the major	Electronics Process Practice and Electronic Product Assembly and Debugging Practice is an important component of the teaching program for Electronic Information Engineering, playing a crucial role in achieving the professional talent cultivation objectives. Through process internships, students gain an understanding of the characteristics of modern electronic enterprises in terms of production, management, and operation, become familiar with the operational methods of Chinas electronics market, and further comprehend the significant importance of safety awareness and safe production in electronic product manufacturing; linking theory with practice, using the acquired theoretical knowledge to analyze the actual production techniques observed at the internship site, enriching, verifying, consolidating, and deepening theoretical knowledge, thereby enhancing the ability to solve practical engineering problems; the training of electronic product assembly and debugging skills is an indispensable step for students in the Electronic Information Engineering program to develop practical and hands-on abilities, serving as a critical phase for understanding various electronic components and integrating circuit theory with practical application, reinforcing the integration of theoretical knowledge with actual work.
Type of teaching, contact hours	Target students: students majoring in artificial intelligence and electronic information engineering Teaching method: concentrated practice Contact hours: 32 hours Class size: Four classes with about 160 students
Workload	Total workload = 60 hours; Contact hours = 32 hours; Self-study hours = 28 hours;
Credit points	2.0
Requirements according to the examination regulations	After the end of the internship, each student completes an internship report independently. The internship report requires that theory be combined with practice, there are views, arguments, clear organization,

	detailed information, powerful arguments, and correct conclusions.
Prerequisite curriculum	Circuit analysis, analog electronic technology, digital electronic technology
curriculum objectives /expected learning outcomes	**Learning outcomes:** The main task of this course is to train the skills of electronic product assembly and debugging. It is an essential step for students majoring in electronic information engineering to cultivate practical ability and hands-on ability. It is an important link to understand various electronic components and combine circuit theory with practice. It is a reinforcing process to combine theoretical knowledge with practical work.The specific objectives include: 1. Able to communicate effectively and collaborate with team members and organize, coordinate, and direct the teams work as a leader. An engineering project is a system with established operational procedures. Before initiating an engineering project, it is essential to form an implementation team according to the project requirements and conduct detailed division of labor. Adopt a top-down approach to decompose the project into different modules level by level, assign specific responsibilities to each module, then collaborate and divide tasks to ultimately complete the project design efficiently. 2. Able to conduct detailed discussions and arguments on specific professional issues involved in the implementation of engineering projects at group meetings, project briefings, etc., to obtain the optimal solution to problems. For questions raised by external personnel during project implementation, require the group to discuss and accurately express opinions through oral communication, written documents, charts, etc., respond to doubts, and understand the differences in communication with industry peers and the public. 3. Be able to fully consider the application of engineering management and economic decision-making methods in the process of formulating solutions to complex electronic information engineering problems in a multi-disciplinary environment. 4. Be able to fully consider the application of engineering management and economic decision-making methods in the process of formulating solutions to complex electronic information engineering problems in a multi-disciplinary environment.
Contents	**Teaching (32 contact hours , 28 self-study hours)** 1. Through the internship of electronic component production process, master the characteristics and requirements of electronic component production. Understand the development status of electronic component companies. 2. Learn about the production, testing and research and development of electronic components. 3. Through the electronic component production company, I can have a

	preliminary understanding of the general methods of modern electronic enterprise production management and combine the knowledge I have learned with production practice. 4. After the end of the internship, each student shall independently complete an internship report, which requires linking theory with practice, having views, arguments, clear logic, detailed information, strong argumentation and correct conclusion. 5. Take care to observe the working hours of the internship, do not be late, do not leave the internship position in advance, and do not leave the internship unit in advance without permission. 6. Strictly abide by the labor production discipline of the internship unit; no smoking in the factory area is strictly prohibited; no touching of automatic control instruments in the production area is strictly prohibited; no playing around, listening to walkman, reading magazines and other behaviors unrelated to the internship and harmful to safety or having a bad impact on safety are strictly prohibited. 7. Violators of the probationary discipline may be subject to criticism, inspection, supplementary probation or even suspension of probation. 8. Each student will assemble and debug a digital power supply independently under the guidance of the instructor, and complete the internship report.
Study and examination requirements and forms of examination	1. Work performance * 40%. 2. Documented performance * 25%. 3. Response score * 35%.
Media employed	Multimedia computer, projector, Multisim software, digital circuit experiment box, soldering iron, signal generator, DC power supply, multimeter, oscilloscope and so on.
Reading list	1. Textbooks [1] Wu Jianhui. Electronic Information Engineering Practice [M]. Xi an: Xi an University of Electronic Science and Technology Press, 2016.

Competence field	Centralized practice
Curriculum designation	Analog Unit Circuit Simulation and Development Comprehensive Practical Training Internship
Curriculum code	9061615020
Semester(s) in which the curriculum is taught	3th Semeste
Person responsible for the curriculum	Professor Jiang Dongchu
Lecturer	Professor Jiang Dongchu, Associate Professor Zhu Qiuxiang, Associate Professor Zhou Laixiu and Associate Professor He Fei
Language	Chinese
The relationship between the curriculum and the major	"Comprehensive Practical Training and Internship in Analog Unit Circuit Simulation and Development" is one of the concentrated practices for students majoring in Electronic Information Engineering, serving as a practical teaching component of the Analog Electronics course. It is a comprehensive training program designed for students to learn Analog Electronics courses. Through teacher guidance, students independently undertake a series of processes including designing, simulating, manufacturing, debugging, and writing design summaries or design specifications for a specific project. This program enables students to apply the theories and practices learned in Digital Electronics courses closely together, independently addressing practical issues in production and life, and creating small-scale analog electronic systems.
Type of teaching, contact hours	Target students: Electronic Information Engineering major Teaching method: concentrated practice Contact hours: 32 hours Class size: Four classes with about 160 students
Workload	Total workload = 50 hours; Contact hours = 32 hours; Self-study hours = 28 hours;
Credit points	2.0
Requirements according to the examination regulations	Students who have completed their work with an attendance rate of more than two-thirds can take the test.
Prerequisite curriculum	Advanced mathematics, university physics, circuit analysis
curriculum objectives /expected learning outcomes	**Learning outcomes:** The main task of this course is to enable students to apply the theories and practices learned in the analog electronic technology course closely together, independently solve practical problems in production and life, and create small analog electronic systems. The purpose is to cultivate students ability to connect theory with practice and design and manufacture by themselves, laying a good foundation for students to design more complex electronic circuits with programmable

	capabilities in the future. Specific objectives include: 1. Be able to establish a preliminary model for the selected topic, and determine the framework structure and functional division of the model as well as reasonable scalability functions. 2. Implement each functional module separately and then integrate them in the design process during which it is essential to consider achieving more functions reducing the number of component types used and the cost-effectiveness of these components; choose appropriate computer simulation software to simulate each functional module and refine and optimize based on the simulation results finally producing the circuit board for testing. 3. Able to communicate effectively and collaborate with team members, and organize, coordinate, and direct the teams work as a leader. An engineering project is a system with established operational procedures. Before initiating an engineering project, it is essential to first form an implementation team according to the project requirements and conduct detailed division of labor. Adopt a top-down approach to decompose the project into different modules level by level, assign specific responsibilities to each module, and then collaborate to efficiently complete the project design. 4. Be able to fully consider the application of engineering management and economic decision-making methods in the process of formulating solutions to complex electronic information engineering problems in a multi-disciplinary environment.
Contents	**Teaching (32 contact hours, 28 self-study hours)** 1. Be proficient in using Multisim12 software methods to simulate circuits and master the method of analyzing simulation results; 2. Familiar with various electronic components, can read out the parameters correctly, complete welding, learn to deal with various problems such as tin beads, less solder joints, insufficient solder quantity, false welding; 3. Complete the welding of direct plug components; master the welding steps and methods of manual welding of direct plug resistors, diodes, crystal oscillators, IC sockets, connectors, ceramic capacitors, bipolar junction transistors, push switches, digital displays, light-emitting diodes, double row direct plugs, electrolytic capacitors, switches, and terminals; 4. Design and make unit circuits, debug and measure parameters and performance of unit circuits; 5. Complete the practice report of "Simulation of Unit Circuit Simulation and Development Comprehensive Practice".
Study and examination requirements and forms of examination	1. Works (50%). 2. Response score (25%). 3. Internship report (25%).

Media employed	Multimedia computer, projector, Multisim software, analog circuit experiment box, soldering iron, signal generator, DC power supply, multimeter, oscilloscope and so on.
Reading list	1. Textbooks [1] Cheng Chunyu. Simulation Electronic Technology Experiment and Course Design[M]. Beijing: China Machine Press, 2016. [2] Guo Yongzhen. Simulation Electronic Technology Experiment and Course Design Guide[M]. Nanjing: Southeast University Press, 2007.

Competence field	Centralized practice
Curriculum designation	Digital Unit Circuit Simulation and Development Comprehensive Practical Training Internship
Curriculum code	9061615030
Semester(s) in which the curriculum is taught	4th Semester
Person responsible for the curriculum	Associate Professor Zhou Lai Xiu
Lecturer	Associate Professor Zhou Lai Xiu and Professor Tan Yue
Language	Chinese
The relationship between the curriculum and the major	"Digital Unit Circuit Simulation and Development Comprehensive Practical Training Internship" is one of the concentrated practices for the Electronic Information Engineering major, it is a practical teaching component of the Digital Electronics Technology course, serving as a comprehensive training for students to learn digital electronics technology courses. It involves a series of processes guided by instructors, enabling students to independently design, simulate, manufacture, debug, and write design summaries or design specifications for a specific project. This process helps students apply the theories and practices learned in digital electronics technology courses, enabling them to independently solve practical problems in production and life, and create small-scale electronic systems.
Type of teaching, contact hours	Target students: Electronic Information Engineering major Teaching method: concentrated practice Contact hours: 32 hours Class size: Four classes with about 160 students
Workload	Total workload = 60 hours; Contact hours = 32 hours; Self-study hours = 28 hours;
Credit points	2.0
Requirements according to the examination regulations	Students who have completed their work with an attendance rate of more than two-thirds can take the test.
Prerequisite curriculum	Advanced mathematics, circuit analysis, analog electronic technology, digital electronic technology
curriculum objectives /expected learning outcomes	**Learning outcomes:** The main task of this course is to enable students to apply the theories and practices learned in digital electronic technology courses closely together, independently solve practical problems in production and life, and create small-scale electronic systems. The purpose is to cultivate students ability to connect theory with practice and design and manufacture by themselves, laying a good foundation for designing more complex electronic circuits with programmable capabilities in the future. Specific objectives include:

	1. Be able to establish a preliminary model for the selected topic, and determine the framework structure and functional division of the model as well as reasonable scalability functions. 2. Implement each functional module separately and then integrate them in the design process, it is essential to consider achieving more functions, reducing the number of component types used, and the cost-effectiveness of the components; choose appropriate computer simulation software to simulate each functional module and refine and optimize based on the simulation results, finally fabricate the circuit board for testing. 3. Able to communicate effectively and collaborate with team members, and organize, coordinate, and direct the teams work as a leader. An engineering project is a system with established operational procedures. Before initiating an engineering project, it is essential to first form an implementation team according to project requirements and conduct detailed division of labor. Adopt a top-down approach to decompose the project into different modules level by level, assign specific responsibilities to each module, then collaborate and divide tasks, ultimately completing the project design efficiently. 4. Be able to fully consider the application of engineering management and economic decision-making methods in the process of formulating solutions to complex electronic information engineering problems in a multi-disciplinary environment.
Contents	**Teaching (32 contact hours, 28 self-study hours)** 1. Familiar with various electronic components, can read out their parameters correctly; 2. Complete welding, will deal with various problems such as tin beads, less solder joints, insufficient solder quantity, false welding; 3. Complete the welding of direct plug components; master the welding steps and methods of manual welding of direct plug resistor, diode, crystal oscillator, IC socket, connector, ceramic capacitor, bipolar junction transistor, push switch, digital tube, light-emitting diode, double row direct plug, electrolytic capacitor, switch and terminal block; 4. Design and make unit circuits, debug and measure parameters and performance of unit circuits. 5. Complete the internship report of "Digital Unit Circuit Simulation and Development Comprehensive Practice".
Study and examination requirements and forms of examination	1. Works (50%). 2. Response score (25%). 3. Internship report (25%).
Media employed	Multimedia computer, projector, Multisim software, digital circuit experiment box, soldering iron, signal generator, DC power supply, multimeter, oscilloscope, etc.

Reading list	1. Textbooks [1] You Jia. Digital Electronic Technology Experiment and Course Design (2nd Edition)[M]. Beijing: China Machine Press, 2017. [2] Xu Xiaojun. Digital Electronic Technology Experiment and Course Design Guide (2nd Edition)[M]. Nanjing: Southeast University Press, 2014.

Competence field	Centralized practice
Curriculum designation	Microcontroller System Comprehensive Practical Training Internship
Curriculum code	9061415010
Semester(s) in which the curriculum is taught	4th Semester
Person responsible for the curriculum	Professor Li Wenguo
Lecturer	Professor Li Wenguo, Professor Xiao Weichu, Professor Tan Yue and assistant professor Liu Xiongjie
Language	Chinese
The relationship between the curriculum and the major	This course design is a comprehensive and design-oriented experiment for the course "Principles and Applications of Microcontrollers," which can serve as a supplement and enhancement to classroom teaching and regular in-class experiments. Through the study of the course "Principles and Applications of Microcontrollers," students have initially mastered the basic principles of the 51 microcontroller, as well as fundamental principles and applications of parallel ports, serial ports, interrupts, and timing. However, in-class experiments mainly rely on the experimental guidebook, which limits the full utilization of students autonomous design and hands-on skills. By designing experiments for the course "Principles and Applications of Microcontrollers," students can enhance their autonomous learning, consolidate their learning outcomes, improve their practical abilities and creative thinking in applying microcontroller technology comprehensively, lay a solid foundation for subsequent specialized courses, and cultivate their comprehensive application capabilities of professional knowledge, aligning with employment demands.
Type of teaching, contact hours	Target students: Electronic Information Engineering major Teaching method:theoretical teaching + practical teaching Contact hours: 32 hours Including: Theoretical teaching: 16 hours Practical teaching: 16 hours Class size: Four classes with about 160 students
Workload	Total workload = 90 hours; Contact hours = 32 hours; Self-study hours = 58 hours;
Credit points	3.0
Requirements according to the examination regulations	Only students who are present 90% of the time and complete 90% of their homework can take the exam.
Prerequisite curriculum	Advanced mathematics, circuit analysis, analog electronic technology, digital electronic technology, C language programming, data structure,

	microcontroller principle and application.
curriculum objectives /expected learning outcomes	**Learning outcomes:** The main task of this course is to make students deeply understand the principle and application of microcontroller, master the interface technology of microcontroller system and external components interaction, and design a small example. The specific objectives include. The specific objectives include: **Knowledge:** 1. can use various components to design and make AT89S52 microcomputer peripheral circuits, write peripheral drivers, and master the testing methods of various technical parameters of electronic products. 2. Through explaining the comprehensive problems of given intelligent vehicles, master the interface technology of external interaction, such as ADC, DAC, PWM, DMA, etc., and be able to apply these technologies for data acquisition and processing. 3. Design and implement a comprehensive example project based on microcontroller through a small team of 1-3 people. **Skill:** 1. Learn to use the microcontroller development environment and tools, such as Keil, for program writing, compilation, burning and debugging; 2. Can design and implement intelligent vehicles based on microcontroller, such as motor rotation, the use of different sensor modules and button input processing; 3. Master the application of microcontroller in embedded system, and be able to complete hardware interface design and software programming for self-selected topics. **Ability:** 1. To cultivate students ability to comprehensively use professional knowledge to solve practical problems, improve students comprehensive quality, enhance students engineering practice ability and employment competitiveness; 2. This course design gives a comprehensive problem of intelligent car to cultivate students ability to think independently, solve problems and design products; 3. Through the study and application of these knowledge, students are trained to develop a scientific work attitude and good working habits, and learn to think deeply when they succeed in the process of engineering design, and remain calm when they are frustrated.
Contents	**Theoretical teaching (16 contact hours, 18 self-study hours)** 1. Pilot stage: (4 contact hours, 4 self-study hours) (1) Project requirement analysis; (2) Project effect demonstration;

	(3) Technical analysis is needed; (4) Development environment and development board usage. 2. Stage I: (4 contact hours, 6 self-study hours) (1) Develop the use of this schematic; (2) I/O interface principle; (3) LED principle; (4) Key principle; 3. Stage II: (8 contact hours, 8 self-study hours) (1) Principle of external interruption; (2) Timer principle; (3) Serial communication experiment; **Practical teaching (16 contact hours, 40 self-study hours)** (1) Implementation stage of intelligent vehicle comprehensive project; (5 contact hours, 15 self-study hours) (2) Implementation of extended functions and innovative ideas; (3 contact hours, 5 self-study hours) (3) Teams of 1-3 people are formed to select a practical project and use the microcontroller minimal system board as the main control chip to realize the function of the practical project; (5 contact hours, 15 self-study hours) (4) Listen to professional lectures, physical demonstrations, defense and acceptance, and write course design reports. (3 contact hours, 5 self-study hours)
Study and examination requirements and forms of examination	The final results include: 1. Basic requirements for class (20%): no late, early withdrawal, absence without reason; 2. Physical demonstration and defense acceptance (30%): the physical objects designed in the course are demonstrated and defended; 3. Writing of practice report (50%): content of practice and experience and summary of practice training.
Media employed	Keil and Proteus software, microcontroller experiment box, multimedia, laser pointer, blackboard etc.
Reading list	**Teaching material:** [1]Yang Huaixian, Huang Huixian et al. Principles and Applications of Microcontroller[M], Xiangtan University Press, 2013. **Reference book:** [1]Guo Tianxiang, New Concept 51 Microcontroller C Language Tutorial (2nd Edition)[M]. Electronic Industry Press, 2018. [2]Xie Weicheng, Yang Jiaguo et al. Principles and Applications of Microcontroller and C51 Programming. Beijing: Tsinghua University Press, 2019. [3]Ma Zhongmei et al. C Language Application Design of Microcontroller. Beijing University of Aeronautics and Astronautics

	Press, 2021. **Other information:** PPT of comprehensive course design theory teaching of "Principle and Application of Microcontroller"

Competence field	Centralized practice
Curriculum designation	Electronic System Engineering Practice Internship
Curriculum code	9061615040
Semester(s) in which the curriculum is taught	5th Semester
Person responsible for the curriculum	Professor Li Wenguo
Lecturer	Professor Li Wenguo, Associate Professor Hu Saichun, Lecturer Xiong Jie and Lecturer Zhang Lincheng
Language	Chinese
The relationship between the curriculum and the major	This practical training internship is a comprehensive and design-oriented experiment for the course "Electronic System Design" which can serve as a supplement and enhancement to classroom teaching and regular in-class experiments. Through the study of "Electronic System Design" course students have initially mastered the basic principles of STM32 microcontrollers as well as the principles of GPIO buttons serial communication external interrupts and timing. However in-class experiments mainly rely on experimental manuals making it difficult to fully leverage students autonomous design and hands-on abilities. Through comprehensive practical training internships in electronic system design students can enhance their autonomous learning consolidate their learning outcomes improve their practical skills and creative thinking in applying STM32 microcontroller technology lay a solid foundation for subsequent specialized course studies and cultivate their comprehensive application capabilities of professional knowledge aligning with employment demands.
Type of teaching, contact hours	Target students: Electronic Information Engineering major Teaching method: theoretical teaching + practical teaching Contact hours: 32 hours Including: Theoretical teaching: 16 hours Practical teaching: 16 hours Class size: Four classes with about 160 students
Workload	Total workload = 90 hours; Contact hours = 32 hours; Self-study hours = 58 hours;
Credit points	3.0
Requirements according to the examination regulations	Only students who are present 90% of the time and complete 90% of their homework can take the exam.
Prerequisite curriculum	Advanced mathematics, circuit analysis, analog electronic technology, digital electronic technology, C language programming, data structure,

	microcontroller principle and application, electronic system design, etc.
curriculum objectives /expected learning outcomes	**Learning outcomes:** The main task of this module is to make students deeply understand the principle and application of STM32 microcontroller, master the interface technology of STM32 microcontroller system and external components interaction, and design a small example. The specific objectives include: **Knowledge:** 1. Can use various components to design and make STM32 microcontroller peripheral circuits, write peripheral drivers, and master the testing methods of various technical parameters of electronic products. 2. Through the comprehensive project of multi-functional mobile wireless data acquisition instrument based on STM32, students can master the interface technology of external interaction, such as ADC, DAC, PWM, etc., and be able to apply these technologies for data acquisition and processing. 3. Design and implement a comprehensive example project based on STM32 microcontroller in the form of a small team of 1-3 people. **Skill:** 1. Learn to use the microcontroller development environment and tools, such as Keil, to write, compile, burn and debug programs; 2. Can design and implement multi-functional mobile wireless data acquisition instrument based on STM32, such as data acquisition, use of different sensor modules and button input processing; 3. Master the application of microcontroller in embedded system, and be able to complete hardware interface design and software programming of self-selected topics. **Ability:** 1. To cultivate students ability to comprehensively apply professional knowledge to solve practical problems, improve students comprehensive quality, enhance students engineering practice ability and employment competitiveness; 2. Through the comprehensive practical training project of multi-functional mobile wireless data acquisition instrument based on STM32, students are trained to think independently, solve problems and design products; 3. Through the study and application of these knowledge, students are trained to develop a scientific work attitude and good working habits, understand the values of life in the process of engineering design, learn to think deeply when they succeed, and remain calm when they are frustrated.
Contents	**Theoretical teaching (16 contact hours, 18 self-study hours)** 1. Pilot stage: (4 contact hours, 4 self-study hours)

	(1) Project requirement analysis; (2) Project effect demonstration; (3) Technical analysis is needed; (4) Development environment and development board usage. 2. Stage I: (4 contact hours, 6 self-study hours) (1) Develop the use of this schematic diagram; (2) GPIO interface principle; (3) Key principle; (4) The principle of sensor use required by the project; 3. Stage II: (8 contact hours, 8 self-study hours) (1) External interrupt principle; (2) Timer principle; (3) Principle of serial communication; **Practical teaching (16 contact hours, 40 self-study hours)** (1) Multi-functional mobile wireless data acquisition instrument comprehensive project implementation stage; (5 contact hours, 15 self-study hours) (2) Implementation of extended functions and innovative ideas; (3 contact hours, 5 self-study hours) (3) 1-3 people form a team, choose a practical project, and use STM32 microcontroller as the main control chip to realize the function of the practical project; (5 contact hours, 15 self-study hours) (4) Physical demonstration, defense and acceptance, and write the course design report. (3 contact hours, 5 self-study hours)
Study and examination requirements and forms of examination	1. Basic requirements for class (20%): no late, early withdrawal, absence without reason; 2. Physical demonstration and defense acceptance (30%): physical demonstration of the physical objects done in practical training and internship, and defense acceptance; 3. Writing of practice report (50%): internship content and practice training experience, summary.
Media employed	Keil and Proteus software, STM32 microcontroller development board, multimedia, laser pointer, blackboard, etc.
Reading list	**Teaching material:** [1]Zhang Yang. Atomic teaches you to play STM32 (library function version)[M], Beijing University of Aeronautics and Astronautics Press, 2015 . **Reference book:** [1]Xiang Peisu, STM32 Microcontroller Principles and Applications[M]. Tsinghua University Press, 2022. **Other information:** PPT of comprehensive practical training theory teaching for Electronic System Design

Competence field	Centralized practice
Curriculum designation	Embedded System Comprehensive Practical Training Internship
Curriculum code	9061615070
Semester(s) in which the curriculum is taught	6th Semester
Person responsible for the curriculum	Lecturer Zhang Lincheng
Lecturer	Lecturer Zhang Lincheng, Professor Li Wenguo, Associate Professor Cui Zhi and Assistant Professor Liu Xiongjie
Language	Chinese
The relationship between the curriculum and the major	The course "Embedded System Comprehensive Practical Training Internship" is a concentrated practical course for students majoring in Electronic Information Engineering, serving as a crucial component for deepening their learning and enhancing their skills. The training covers multiple aspects including ARM architecture principles, embedded C language programming, hardware interface design, and system debugging. Its objective is to enable students to learn the fundamentals of embedded systems from both software and hardware application perspectives, understand the working principles and cutting-edge trends of embedded systems, master their application theories and technologies, and independently complete system design based on ARM microcontrollers, including hardware circuit construction and software programming implementation. Ultimately, through this practical training, students will acquire the basic qualities and practical abilities required for embedded system development, laying a solid foundation for their future career development. This not only involves enhancing technical skills but also cultivating comprehensive qualities such as teamwork and project management, enabling students to adapt to the rapidly changing industry demands.
Type of teaching, contact hours	Target students: Electronic Information Engineering major Teaching method: experiment Contact hours: 32 Experimental/practical teaching: 32 hours Class size: four classes with about 1 60 students
Workload	Total workload = 90 hours; Contact hours = 32 hours; Self-study hours = 58 hours;
Credit points	3.0
Requirements according to the examination regulations	Only students who have an attendance rate of more than 2/3 and have met the requirements of the project can participate in the defense.
Prerequisite curriculum	Computer fundamentals, microcontroller principles and applications, microcomputer principles and applications, embedded Linux operating system, C language programming.

curriculum objectives /expected learning outcomes	**Learning outcomes:** The main task of this course is to enable students to fully grasp the basic principles hardware architecture and software development process of ARM embedded systems; through practical operation students will skillfully use ARM microcontrollers for project development enhancing their programming debugging and system optimization capabilities; meanwhile cultivating students practical operational problem-solving and teamwork skills ensuring that they can flexibly apply their knowledge in real projects accumulating valuable experience for future careers in embedded system development comprehensively improving personal professional qualities and competitiveness. Specific objectives include: **Knowledge:** Understand the basis of ARM based embedded systems, ARM microprocessor architecture, C/C++ programming language, embedded Linux operating system principles, hardware interface technology, circuit design and debugging. **Skill:** 1、Be able to use ARM embedded hardware platform and Ubuntu operating system and other software and hardware tools to complete the design, development and debugging of embedded application products. Improve embedded system design and development capabilities, including requirements analysis, system design, code writing and testing. 2、Cultivate students skills in systematic debugging and optimization as well as teamwork and project management abilities. Through practice, students will be able to independently complete the development, testing, and maintenance of embedded system projects. This will enable students to master embedded technology while focusing on application, adopting a product-oriented approach, and understanding the interdisciplinary applications of electronic technology, computer technology, and software engineering. Students will establish an overall mindset and process for product development, applying theory to practice, and laying a technical foundation for their future careers. **Ability:** 1. Be able to understand and master the basic methods of development and design of the most popular or newly launched new processors and other related chips, software debugging tools, operating systems and application software. 2. Be able to design reasonable experimental steps according to the experimental scheme, be able to correctly use the relevant development board of ARM hardware platform, complete the design and

	development of related applications under Linux operating system platform, be able to debug and analyze the experimental results, and get reasonable and effective conclusions. 3. Have the ability to summarize, organize and express the purpose, principle, content, steps and results of experiments, as well as analysis. Be able to write experimental reports and design documents for embedded systems and applications. 4. Have the ability to analyze and solve problems, as well as team spirit and communication skills. Through the training, students will be able to independently design and implement embedded system projects, comprehensively improve their professional skills and comprehensive quality.
Contents	**Practical training (32 contact hours , 58 self-study hours)** 1. Learning embedded development system hardware knowledge (4 contact hours, 4 self-study hours) 2. Cross-development environment setup (VMware virtual machine installation, SourceInsight installation, VNC and other tools installation) (4 contact hours, 6 self-study hours) 3. Embedded Linux Operating System Practice (basic commands, Vi file operation, shell programming, makefile, etc.) (8 contact hours, 16 self-study hours) 4. Project development and practice (16 contact hours and 32 self-study hours) (1) Implementation phase of comprehensive embedded system project; (4 contact hours, 6 self-study hours) (2) Implementation of extended functions and innovative ideas; (2 contact hours, 4 self-study hours) (3) Three to four people will form a team, choose a practical project, and use ARM processor as the main control chip to realize the function of the practical project; (8 contact hours , 16 self-study hours) (4) Physical demonstration, defense and acceptance, and write the course design report. (2 contact hours, 6 self-study hours)
Study and examination requirements and forms of examination	1. Attendance rate (10%): Basic requirements for the course (no late arrival, no early departure, no absence without reason). 2. Classroom interaction (10%): answering questions in class, etc 3. Physical demonstration and defense acceptance (40%): The physical objects done in the practice and internship are demonstrated and defended; 4. Writing of practical report (40%): practical content, experience and summary of practical training.
Media employed	Multimedia computer, projector, laser pen, blackboard, chalk, Linux operating system and Arm development board, ARM embedded comprehensive experimental box, etc
Reading list	Reference material

	[1] ARM Embedded Linux System Development-From Beginner to Master, edited by Li Yafeng et al. Tsinghua University Press [2] Embedded Linux System Development Technology-ARM based, Zhang Jikun / Zhang Xiaoquan, Peoples Post and Telecommunications Press.

Competence field	Centralized practice
Curriculum designation	Graduation Internship
Curriculum code	9061615060
Semester(s) in which the curriculum is taught	7th Semester
Person responsible for the curriculum	Professor Li Wenguo
Lecturer	Professor Jiang Dongchu, Professor Li Wenguo, Professor Tan Yue, Professor Li Jiasheng, Associate Professor He Fei, Associate Professor Deng Yaqi, Lecturer Xiong Jie, Assistant Teacher Liu Xiongjie, Assistant Teacher Li Maolin and Assistant Teacher Zhong Peng
Language	Chinese
The relationship between the curriculum and the major	Graduation internship is a comprehensive practical training session for students majoring in Electronic Information Engineering after completing their specialized courses, serving as a crucial component of the curriculum and playing a vital role in achieving the professional talent cultivation objectives. Through graduation internships, students apply the theoretical knowledge they have learned to analyze the actual production technologies observed at the internship site, thereby enriching, verifying, consolidating, and deepening their theoretical knowledge, appreciating the necessity of textbook knowledge, and enhancing their ability to solve practical engineering problems.
Type of teaching, contact hours	Target students: Electronic Information Engineering major Teaching method: practical teaching Contact hours: 56 hours Including: Practical teaching: 384 hours Class size: Four classes with about 160 students
Workload	Total workload: 540 hours Contact hours: 384 hours Self-study hours: 156 hours
Credit points	18.0
Requirements according to the examination regulations	Complete all practical tasks, complete and submit the graduation internship report manual
Prerequisite curriculum	Circuit analysis, analog electronic technology, digital electronic technology, signal and system, digital signal processing, communication principle, C++ programming, data structure, microcontroller principle and application, etc.
curriculum objectives /expected learning outcomes	**Learning outcomes:** **Knowledge:** 1. Understand the characteristics of production, management and operation of modern electronic information enterprises, be familiar

	with relevant market operation methods, and further understand the important role of safety awareness and production safety in product production; 2. Through internship in workshops and teams, they will come into contact with factory managers, technicians and operators, and learn their excellent qualities and related professional knowledge and skills. 3. Get a comprehensive training and cultivation of ability, and independently complete the development and production of a photoelectric system based on microcontroller under the guidance of engineers in a limited internship time, and complete PCB plate making, software and hardware design and system debugging.. **Skill:** 1. By developing and manufacturing an electronic system based on a microcontroller and learning the production process, students master the characteristics and requirements of electronic product manufacturing. Through studying C++ and JAVA, each intern independently completes the design of a software system. Through internships, students gain an understanding of the international and domestic development status of electronic products and their manufacturing processes. 2. Learn and understand the debugging, testing and research and development of electronic products, and independently complete the development and production of electronic systems based on microcontroller. 3. Get a preliminary understanding of the general management and production management of modern electronic information enterprises, combine the knowledge learned with the actual production, and master the design and system debugging of information system software and hardware. **Ability:** 1. In the process of internship, through the understanding of the actual production process and the conversation with technical personnel, we will cultivate the ambition, sense of mission and pragmatic spirit for the career in the national IT industry, so as to lay a foundation for better adaptation from student to worker; 2. Through observation and analysis of the production process of electronic products, understand the application of professional knowledge in production practice, and deepen the intuitive understanding of electronic product production; 3. Connect theory with practice, use the theoretical knowledge learned to analyze the actual production technology seen in the internship place, so as to enrich, verify, consolidate and deepen the theoretical knowledge, experience the necessity of book knowledge, and improve the ability to solve practical engineering problems;

	4. Understand the operation and management mode of the enterprise, gain working experience and team cooperation ability. 5. Graduation internship lays a good foundation for students to graduate and find jobs.
Contents	**Practical teaching (384 contact hours, 156 self-study hours)** 1. Internship preparation (40 contact hours, 26 self-study hours) (1) Understand the product development and production situation of the internship company through the Internet; (2) Learn enterprise safety knowledge, factory discipline and rules comprehensively, and clarify the discipline of internship; (3) Hold a mobilization meeting for the internship, clarify the internship tasks and put forward the requirements for the internship; (4) Do other preparatory work before the internship. 2. Internship content (344 contact hours, 130 self-study hours) (1) Invite company leaders and engineering and technical personnel to give special technical lectures (factory education, safety education, production process teaching, research and development of electronic products, modern factory production organization and management, etc.); (2) Read the technical operation procedures and related technical data of the production workshop carefully, and observe and learn the production process directly under the guidance of technical personnel arranged by the internship unit; (3) Learn and master practical production operation skills under the guidance of technical personnel arranged by the internship unit; (4) Learn the R&D process of electronic products under the guidance of R&D engineers in the internship unit. (5) Through the development and production process of an intelligent system based on a microcontroller and the study of production technology, master the characteristics and production requirements of electronic product manufacturing. Understand the international and domestic development status of products and production processes from companies such as Guangdong Embedded, Software Evaluation Center, Auskon, and Keret. (6) Learn and understand the debugging, testing and research and development of electronic products, and independently complete the design, development and production of the system based on microcontroller. (7) Have a preliminary understanding of the general methods of modern enterprise management and production management, combine the knowledge learned with the actual production, and effectively master the design and system debugging technology of PCB plate, software and hardware.

	(8) Understand the operation and management mode of enterprises through the internship company.
Study and examination requirements and forms of examination	The final results include: 1. Basic requirements (20%): no late arrival, early departure, absence without reason; 2. Mid-term inspection (20%): during the internship period, the internship situation will be randomly checked, and the internship situation will be exchanged with the on-site and enterprise mentors; 3. Physical demonstration and defense acceptance (30%): the physical objects done in the internship are demonstrated and defended; 4. Writing of practice report (30%): internship content and practical training experience and summary.
Media employed	Multimedia-assisted teaching, practical teaching in enterprise workshops
Reading list	[1] National Quality Standards for Undergraduate Teaching of Electronic Information in Higher Education Institutions. National Standardization Committee. March 2017.

Competence field	Centralized practice
Curriculum designation	Graduation education
Curriculum code	9061815010
Semester(s) in which the curriculum is taught	8th Semester
Person responsible for the curriculum	Professor Li Wenguo
Lecturer	Professor Li Wenguo, Professor Jiang Dongchu, Professor Tan Yue, Associate Professor Hu Saichun and Assistant Professor Liu Xiongjie
Language	Chinese
The relationship between the curriculum and the major	The Practical Course of "Graduation Education" aims to enable students to establish correct values, moral views, and socialist concepts of honor and disgrace through activities such as ideals and beliefs education, employment situation and policy education, entrepreneurship education, integrity education, mental health education, safety law education, gratitude education, integrity education, job adaptation education, and professional ethics education. It guides students to form the modern employment perspective of "employment first, then career selection, and finally entrepreneurship," enhancing graduates awareness of "integrity as the foundation, integrity in career, and integrity in life." Through activities such as mental health education, gratitude education, integrity education, safety law education, job adaptation education, and professional ethics education, it guides graduates to master effective methods of self-psychological regulation, cultivate good psychological qualities, promote the deeds of outstanding graduates, foster a strong sense of graduation sentiment, enhance their integrity awareness, self-discipline awareness, and legal awareness, and strengthen the spirit of serving the people, collectivism, and dedication. At the same time, it helps students correctly understand the workplace, enabling them to confidently enter the professional world and comprehensively improve their employment capabilities.
Type of teaching, contact hours	Target students: Electronic Information Engineering major Teaching methods: class theme activities, department-wide meetings, class meetings, students go to relevant departments to handle school departure procedures, graduation defense in each major location, graduation ceremony, etc. Contact hours: 1 week Class size: four classes with about 160 students
Workload	Total workload = 64 hours; Contact hours = 32 hours; Self-study hours = 28 hours;
Credit points	2.0
Requirements according to the examination	Only by attending the graduation education activities organized by the school on time, submitting all the required materials as required, and

regulations	having no major violations of school rules and regulations or illegal acts, can the students pass the examination.
Prerequisite curriculum	Complete all semester courses of this major
curriculum objectives /expected learning outcomes	**Learning outcomes:** Through participating in the activities of this course, students can establish correct values, moral views and modern career views, enhance their awareness of integrity, clean government and legal system, strengthen their spirit of collectivism and dedication, and cultivate their ability of self-psychological adjustment and employment ability. **The specific objectives include:** 1. Understand the requirements of graduation internship and graduation design in electronic information engineering, and enhance the adaptability to enter the society; 2. Establish correct values, moral views and socialist views of honor and disgrace, strengthen the education of students professional ethics and norms, and cultivate students legal spirit; 3. Be able to regulate their own psychology, have good psychological quality, establish the correct learning concept, develop the habit of lifelong learning, and comprehensively improve their employment ability.
content	**Practice teaching hours (32 contact hours, 28 self-study hours)** 1. Conduct class theme activities to educate students on ideals and beliefs, integrity and gratitude; (8 contact hours, 4 self-study hours) 2. Conduct employment situation and policy, job adaptation and professional ethics education for students through the whole department conference; (4 contact hours, 4 self-study hours) 3. Conduct safety law and discipline education, integrity education and mental health education through class meetings; (4 contact hours, 4 self-study hours) 4. Students shall go to the relevant departments to handle the departure procedures; (8 self-study hours) 5. Graduation thesis defense will be conducted in each major location; (8 contact hours, 8 self-study hours) 6. Graduation ceremony (university-wide and college-wide). (8 contact hours)
Study and examination requirements and forms of examination	**Assessment method and proportion (%):** 1. Practice performance (40%); 2. Practice effect (40%); 3. Practical materials (20%). **Content of examination:** 1. What are your ideas for the later internship and graduation design; 2. Understanding of values, ethics and professional ethics; 3. Whether to develop a lifelong learning habit.

	Evaluation method scoring criteria: Graduation education results are assessed in two levels: qualified and unqualified: Qualified: attend all graduation activities organized by the school on time, submit all required documents as required, and have no major violations of school rules and regulations or illegal behavior. Unqualified: more than one third of the graduation links organized by the school have not participated or have not submitted all the materials due to regulations as required, or have committed major violations of school discipline and rules, or have committed serious disciplinary violations.
Media employed	Multimedia computer, projector, laser pen, blackboard, chalk.