Appendix A-3 - Outline of the Internship

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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	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	Graduation thesis/design
Curriculum designation	Graduation comprehensive training
Curriculum code	9061515010
Semester(s) in which the curriculum is taught	8th 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, Assistant Teacher Zhong Peng, etc
Language	Chinese
The relationship between the curriculum and the major	The Comprehensive Training Program for Graduates can train students on how to apply the knowledge they have acquired over the past four years to engineering design or research. Under the guidance of their mentors, students can independently complete all aspects of their graduation projects. Students possess comprehensive abilities including research, information collection, proposal formulation, analysis and calculation, drawing design (in compliance with national standards), experimental testing, programming, translation of foreign data, writing reports (design manuals or papers), and graduation defense. The content integrates practical needs of scientific research and engineering, requiring students to complete engineering topics, research topics, or experimental topics related to electronic information engineering and similar fields.
Type of teaching, contact hours	Target students: Electronic Information Engineering major Teaching method: theoretical teaching, computer and microcontroller practice Contact hours: 448 hours Including: Theoretical teaching, experimental/practical teaching and computer practice are arranged by teachers according to each students specific project. Class size: Each teacher will guide 3-7 students
Workload	Total workload = 900 hours; Contact hours = 448 hours; Self-study hours = 452 hours;
Credit points	30.0
Requirements according to the examination regulations	Students complete the literature translation and project tasks (experiment, design or calculation) required by their tutors; pass the mid-term examination of comprehensive training for graduation; and complete the graduation design (thesis).

Prerequisite curriculum	Complete all required courses (1-7 semesters)
curriculum objectives /expected learning outcomes	**Learning outcomes:** The goal and task of comprehensive training is to enable students to combine theoretical knowledge with skills, analyze and solve practical problems related to electronic information engineering. The specific objectives include: **Knowledge:** Demonstrate understanding of knowledge learned from the project, as well as literature review and research methodology. **Skill:** (1) The ability to independently conduct literature search and research; (2) Show analytical theory and practical ability; (3) Design the main framework of the thesis, develop hardware and software; (4) Drill the ability to comprehensively process and analyze data; (5) The ability to write papers and design instructions. **Ability:** Students should acquire the ability to track professional and related field development trends, delve into learning, obtain comprehensive interdisciplinary knowledge and skills relevant to the course, apply knowledge and modern engineering tools, consider economic, environmental, legal, safety, health, ethical factors in design, possess a certain degree of innovation and engineering literacy, and have teamwork and communication skills.
Contents	**Graduation thesis/design (448 contact hours , 452 self-study hours)** **The first stage: topic selection and undergraduate thesis (paper) guidance (16 self-study hours)** The supervisor of the graduation project must declare the topic one semester before the start of the thesis, fill in the "Approval Form for Graduation Project (Thesis) Topic", and submit it to the college for approval. On this basis, complete the "Graduation Project Task Book" and distribute it to the students at the beginning of the graduation project. **Stage 2: Project research and literature review (64 contact hours , 64 self-study hours)** Under the guidance of the tutor, the students will conduct research on the topics they are engaged in, consult relevant Chinese and foreign scientific and technological literature, complete the translation of foreign language literature, and write a literature review report. **Stage 3: Determine the overall project plan (32 contact hours ,**

	32 self-study hours) Students should formulate an overall plan according to the requirements of the Proposal Task Book under the guidance of their supervisors.The overall plan should include the following contents: the key points, difficulties, and innovations of the project, the basic theories and fundamental skills involved; implementation stages, tasks, technical indicators, and preliminary plans for each stage; external conditions required for implementation, including computers, software, hardware, experimental equipment, instruments, devices, and venues; technical outputs to achieve the ultimate goal of the project, including computer programs, hardware schematics with data, and conclusions of theoretical research. **Phase IV: Implementation of the overall project plan (256 contact hours , 244 self-study hours)** The implementation of the thesis plan is the most critical phase of the entire graduation project.It is carried out in stages according to the overall plan and continuously improved based on actual execution.During this period, due to the different sources and nature of the topics, the supervisor should provide targeted guidance.Particular attention should be paid to the graduation design of this major:the integration of theoretical research and engineering application;rigorous evidence-seeking and bold innovation,as well as the enhancement of computer application and practical experimental skills.The progress of students graduation designs will be evaluated during the mid-term assessment. **Stage 5: Write a thesis for the graduation project (64 contact hours , 64 self-study hours)** The graduation thesis reflects the achievements of the graduation project and should be independently completed by the student under the guidance of a supervisor. The format of the thesis must strictly follow the unified format issued by the schools academic affairs office, and the bachelors thesis and its attachments should be submitted in both paper and electronic versions on time. **Stage 6: modification and defense of undergraduate thesis (32 contact hours , 32 self-study hours)** Upon completion of the bachelors thesis, the supervisor will conduct a review, modification and scoring. Once submitted, the departmental thesis defense panel will designate one or two teachers to evaluate and score the thesis.
Study and examination requirements and forms of examination	The final results include: attendance rate (10%), thesis defense (15%), mid-term assessment (15%), graduation design (thesis) writing (30%), and graduation defense (30%).

	1、Attendance rate (10%): the initiative and ability of students in the whole comprehensive design process will be evaluated, and the tutor will give a score; 2、Thesis defense (15%): The thesis defense group examines the graduation comprehensive training topics submitted by students, reviews the thesis report submitted by students and gives corresponding scores 3、Mid-term assessment (15%): The instructor will review the mid-term assessment form submitted by the student, check the progress of the comprehensive training project for graduation, and give corresponding scores; 4、Writing of graduation design (thesis) (30%): The instructor evaluates the graduation design report submitted by the student and gives corresponding scores; 5、Graduation defense (30%): the defense score of students in the comprehensive design process.
Media employed	Computers, multimedia, laser pointers, blackboards, Keil and Proteus software etc
Reading list	Hunan City College graduation thesis (design) report template