《电工电子技术》本科课程教学大纲

一、课程基本信息

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| 课程名称 | （中文）电工电子技术 | | | | | |
| （英文）Electrical and Electronic Technology | | | | | |
| 课程代码 | 2080414 | 课程学分 | | 4 | | |
| 课程学时 | 64 | 理论学时 | 48 | 实践学时 | | 16 |
| 开课学院 | 机电学院 | 适用专业与年级 | | 机械设计及制造自动化专业2年级 | | |
| 课程类别与性质 | 专业基础必修课 | 考核方式 | | 考查 | | |
| 选用教材 | Electrical Engineering Principles and Apllications, edited by Allan R.Hambley, Publishing House of Electronics Industry, Fifth Edition | | | 是否为  马工程教材 | | 否 |
| 先修课程 | 高等数学A 010001（5） | | | | | |
| 课程简介 | This course is an important technical basic course for undergraduate nonelectric classes such as machinery, thermal energy, electromechanical, vehicle and other majors in higher industrial schools. It is an introductory technical basic course in electrical and electronic technology, which is a comprehensive system of analog electronic technology, digital electronic technology, Circuit Analysis Foundation and Electrical Foundation, and is a highly practical course. Its mission is to enable students to acquire basic theories, basic knowledge and basic skills in electrical and electronic technology through the study of this course, to develop students ' ability to analyze and solve problems, to master basic circuit analysis methods, to familiarize themselves with the basic working principles of analog electronic technology and digital electronic technology, This course provides a good basis for further study of some areas of electrical and electronic technology and the professional application of electrical and electronic technology  本课程是高等院校机械工程、热能、机电、车辆等专业本科非电气类专业的重要技术基础课。本课程是电工电子技术的入门技术基础课程，是一门集模拟电子技术、数字电子技术、电路分析基础和电气基础于一体的综合性课程，是一门实践性很强的课程。它的任务是使学生掌握基本理论、基本知识和基本技能。  通过本课程的学习，培养学生分析和解决问题的能力，掌握基本的电路分析方法，熟悉模拟电子技术和数字电子技术的基本工作原理，本课程为进一步学习电气和电子技术的某些领域以及电气和电子技术的专业应用提供了良好的基础。 | | | | | |
| 选课建议与学习要求 | This course is suitable for undergraduate students majoring in mechanical engineering, Automobile Service Engineering as well as in Aviation Maintenance Management. Students are required to have basic knowledge and skills in higher mathematics and college physics, to master the analysis and calculation methods of AC/DC. Students should understand simple Analysis and design method of combinatorial logic circuit; Ability to analyze simple sequential logical circuit.  本课程适合机械设计及制造自动化专业2年级的学生学习 | | | | | |
| 大纲编写人 | IMG_7555（签名） | | 制/修订时间 | | 2025年2月 | |
| 专业负责人 | （签名） | | 审定时间 | | 2025年2月 | |
| 学院负责人 | （签名） | | 批准时间 | | 2025年2月 | |

二、课程目标与毕业要求

（一）课程目标

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| 类型 | 序号 | 内容 |
| 知识目标 | 1 | 掌握电工电子技术方面的基本知识和基本理论，能根据物理形状识别电子电路的元器件，并熟悉其在电子电路图中的符号和功能。 |
| 2 | 熟悉基本电工电子电路结构，可对电路进行初步的定性分析。 |
| 技能目标 | 3 | 综合运用所学知识，正确选用元器件进行模拟、逻辑设计和解决实际问题的能力。 |
| 4 | 具有查阅相关电工电子元器件性能资料的能力 |
| 素养目标  (含课程思政目标) | 5 | 培养自我学习的意识与能力，具备在相关领域跟踪、发展新理论、新知识及新技术的能力 |
| 6 | 培养科学严谨、求真务实的学习态度和工作作风，及创新精神和工匠精神 |

（二）课程支撑的毕业要求

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| |  | | --- | | LO2 Professional Competence: By acquiring the essential theoretical knowledge and professional skills required in the field of Mechanical Design, Manufacturing, and Aviation Maintenance Management, students will develop strong humanistic literacy, professional ethics, and innovative consciousness. They will embrace the spirit of craftsmanship, characterized by a commitment to excellence, and will possess robust employability, entrepreneurial capabilities, and the ability for sustainable development. | | Automation Control Competence: Students will master the theories and methods of automatic control, enabling them to design and implement automation control systems. | | Aviation Equipment Assembly Capability: Students will be able to correctly select and use electronic maintenance equipment, testing instruments, and measuring devices, and will possess the ability to assemble aviation equipment. | |
| |  | | --- | | LO4 Selfdirected Learning: Students will be able to determine their own learning objectives based on environmental needs and proactively achieve these objectives through methods such as information collection, analysis, discussion, practice, questioning, and creation. | | Learning Resource Management: Students will be able to gather and obtain the necessary learning resources to achieve their goals. They will implement learning plans, reflect on them, and continuously improve to meet their learning objectives. | |
| |  | | --- | | LO6 Collaborative Innovation: Students will maintain good cooperative relationships within a group, actively participate in collective activities, and excel in both selfmanagement and team management. They will be adept at thinking from multiple perspectives and proposing new ideas by integrating their knowledge and practical experience. | | Innovative Problemsolving: Students will be able to address complex or realworld problems using innovative approaches or a variety of methods. | |
| |  | | --- | | LO7 Information Application: Students will possess a certain level of information literacy and will be able to apply information technology and tools to solve problems in their work. | | Computer Proficiency: Students will be proficient in using computers and will master commonly used office software. | |

（三）毕业要求与课程目标的关系

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| --- | --- | --- | --- | --- |
| 毕业要求 | 指标点 | 支撑度 | 课程目标 | 对指标点的贡献度 |
| LO2专业能力 | 3 | M | 1. Master the basic knowledge and fundamental theories in electrical and electronic technology, and be able to identify electronic components based on their physical shapes. Be familiar with their symbols and functions in electronic circuit diagrams. | 50% |
| 5 | H | 2. Integrate the acquired knowledge to correctly select components for analog and logic design, and develop the ability to solve practical problems. | 50% |
| LO4自主学习 | 2 | L | 3. Develop the capability to consult performance specifications of relevant electrical and electronic components. | 100% |
| LO6协同创新 | 3 | M | 4. Cultivate the awareness and ability for selflearning, and possess the capacity to track and develop new theories, knowledge, and technologies in related fields. | 100% |
| LO7信息应用 | 3 | M | 5. Foster a scientific, rigorous, and pragmatic learning attitude and work style, as well as a spirit of innovation and craftsmanship. | 100% |

三、课程内容与教学设计

（一）各教学单元预期学习成果与教学内容

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| Unit 1: Basic Circuit Theory and Analysis Methods  Expected Learning Outcomes:  1. Analyze and calculate simple DC circuits using basic theorems.  2. Communicate with students about simple circuits.  Teaching Content:  1. Understand circuit models and physical quantities.  2. Master Ohm's Law, Kirchhoff's Laws, and equivalent transformations of voltage and current sources.  3. Grasp the concepts of branches, nodes, and loops.  4. Understand the meanings of active and passive twoterminal networks, Thevenin's Theorem, and circuit equivalence.  5. Apply mesh current, nodal voltage methods, superposition, and Thevenin's Theorem for circuit analysis.  Teaching Difficulties:  1. Understanding and applying Kirchhoff's Laws.  2. Choosing and applying different circuit analysis methods.  Unit 2: AC Circuit Analysis and Transient Processes  Expected Learning Outcomes:  1. Calculate simple AC series/parallel circuits using basic AC circuit knowledge.  2. Analyze the transient response of RC circuits to square waves.  Teaching Content:  1. Understand the three elements of sinusoids and AC circuit power.  2. Grasp transient process concepts, circuit time constants, dynamic circuit equations, and initial conditions.  3. Understand switching laws, transient processes, differentiator, and integrator circuits for RC and RL circuits.  4. Use the threeelement method for firstorder circuit transient analysis to solve transient voltages and currents.  Teaching Difficulties:  1. Basic concepts of sinusoidal AC.  2. Transient processes in RC circuits.  Unit 3: Ideal Operational Amplifiers  Expected Learning Outcomes:  1. Know the basic concepts, voltage transfer characteristics, and main parameters of opamps.  2. Master the basic analysis methods for ideal opamps.  3. Understand feedback concepts, types, and the impact of negative feedback on amplifier performance.  4. Perform proportional and addition/subtraction operations.  Teaching Content:  1. Understand basic opamp operations.  2. Analyze ideal opamp circuits.  3. Apply opamps to various circuits.  Teaching Difficulties:  1. Addition and subtraction operations.  2. Feedback concepts and the impact of negative feedback.  Unit 4: Integrated Gate Circuits and Combinational Logic Circuits  Expected Learning Outcomes:  1. Identify different gate circuit symbols.  2. Use TTL gate circuits.  3. Simplify logic functions.  4. Analyze and design combinational logic circuits; use encoders and decoders.  Teaching Content:  1. Understand basic logic gates.  2. Understand TTL gate circuits.  3. Apply basic Boolean algebra algorithms.  4. Analyze and design combinational logic circuits.  5. Integrate binary encoders and decoders.  Teaching Difficulties:  1. Analyzing and designing combinational logic circuits.  2. Binary encoders and decoders.  单元一：电路的基本理论和基本分析方法  预期学习成果：  1. 能够使用基本定理进行简单的直流电路分析和计算.  2. 能够基于简单电路与学生交流.  教学内容：  1. 理解电路模型和物理量.  2. 掌握欧姆定律；基尔霍夫定律；电压源和电流源的等效变换法.  3. 理解分支、节点、回路的概念.  4. 理解有源二端口网络、无源二端口网络、戴维南定理和电路等效变换方法的含义.  5. 运用支路电流法、节点电压法、叠加原理和戴维南定理的电路分析计算方法.  教学难点：   1. 基尔霍夫定律的理解与应用 2. 几种不同电路分析方法的应用选择和适用范围. 单元二：交流电路分析和电路的瞬态过程   预期学习成果：  1. 能够使用交流电路的基本知识进行简单的交流串并联电路计算.  2. RC电路对方波的瞬态响应分析  教学内容：  1. 理解正弦量的三要素和交流电路功率的概念  2. 理解电路瞬态过程的概念、电路时间常数的物理意义、动态电路方程和初始条件.  3. 理解RC和RL电路的换相规律、瞬态过程、微分电路和积分电路.  4. 运用一阶电路暂态分析的三要素法，求解暂态电压和电流.  教学难点：  1. 正弦交流电的基本概念  2. RC电路的过渡过程。  单元三：理想运算放大器  预期学习成果：  1. 了解运算放大器的基本概念、电压传输特性和主要参数.  2. 掌握理想运算放大器的基本分析方法。.  3. 了解反馈的概念，了解反馈类型和负反馈对放大器性能的影响。  4. 能够进行比例运算、加减运算  教学内容：  1. 理解运算放大器的基本操作.  2. 运用理想运算放大器电路进行分析.  3. 运用运算放大器到各种应用电路中.  教学难点：   1. 加减运算。   2、反馈的概念和负反馈对放大器性能的影响  单元四：集成门电路和组合逻辑电路  预期学习成果：  1、能够识别不同的门电路符号；  2、能够使用TTL门电路；  3、能够简化逻辑功能。  4、能够进行组合逻辑电路的分析和设计；使用编码器和解码器进行编码和解码的能力。  教学内容：  1、理解基本的逻辑门电路；  2、理解TTL门电路；  3、运用逻辑代数的基本算法；  4、进行组合逻辑电路的分析与设计；  5、综合集成二进制编码器和二进制解码器  教学难点：  1、组合逻辑电路的分析与设计  2、二进制编码器和二进制解码器 |

（二）教学单元对课程目标的支撑关系

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| --- | --- | --- | --- | --- | --- | --- |
| 课程目标  教学单元 | 1 | 2 | 3 | 4 | 5 | 6 |
| Unit 1: Basic Circuit Theory and Analysis Methods | √ | √ | √ |  |  | √ |
| Unit 2: AC Circuit Analysis and Transient Processes | √ | √ | √ |  |  | √ |
| Unit 3: Ideal Operational Amplifiers |  | √ | √ |  |  | √ |
| Unit 4: Integrated Gate Circuits and Combinational Logic Circuits |  | √ | √ | √ | √ | √ |

（三）课程教学方法与学时分配

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| --- | --- | --- | --- | --- | --- |
| 教学单元 | 教与学方式 | 考核方式 | 学时分配 | | |
| 理论 | 实践 | 小计 |
| 1 | (1) Emphasize the diversity of teaching methods to motivate students' enthusiasm for learning;  (2) The questioning method, which guides students to think;  (3) The demonstration method, which is intuitive and easy to understand;  (4) The multimedia method, which is vivid and illustrative with text and images;  The summarization and generalization method, which strengthens the connections between different pieces of knowledge. | (1) Random questioning in class to confirm each student's level of understanding of the knowledge.  (2) Facetoface oral defense, where students' ability to solve practical problems is assessed through their explanations of specific problemsolving processes.  (3) Quizzes and assignments. | 12 | 4 | 16 |
| 2 | (1) Emphasize the diversity of teaching methods to stimulate students' enthusiasm for learning.  (2) The questioning method, which guides students to think.  (3) The demonstration method, which is intuitive and easy to accept.  (4) The multimedia method, which is vivid and illustrative with text and images.  (5) The summarization and generalization method, which strengthens the connections between different pieces of knowledge. | (1) Random questioning in class to assess each student's grasp of the knowledge.  (2) Facetoface oral defense, where students' ability to solve practical problems is evaluated through their explanations of specific problemsolving processes.  (3) Quizzes and assignments. | 12 | 4 | 16 |
| 3 | (1) Focus on the diversity of teaching methods to motivate students' enthusiasm for learning.  (2) The questioning method, which guides students in thinking.  (3) The demonstration method, which is intuitive and easy to accept.  (4) The multimedia method, which is vivid and illustrative with text and images.  (5) The summarization and generalization method, which strengthens the connections between different pieces of knowledge. | (1) Random questioning in class to assess each student's level of understanding of the knowledge.  (2) Facetoface oral defense, where students' ability to solve practical problems is evaluated through their explanations of specific problemsolving processes.  (3) Quizzes and assignments. | 12 | 4 | 16 |
| 4 | (1) Emphasize the diversity of teaching methods to enhance students' enthusiasm for learning.  (2) The questioning method, which guides students in thinking.  (3) The demonstration method, which is intuitive and easy to accept.  (4) The multimedia method, which is vivid and illustrative with text and images.  (5) The summarization and generalization method, which strengthens the connections between different pieces of knowledge. | (1) Random questioning in class to check each student's understanding of the knowledge.  (2) Facetoface oral defense, where students' ability to solve practical problems is assessed through their explanations of how they address specific issues.  (3) Quizzes and assignments. | 12 | 4 | 16 |
| 合计 | | | 48 | 16 | 64 |

（四）课内实验项目与基本要求

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| 序号 | 实验项目名称 | 目标要求与主要内容 | 实验  时数 | 实验  类型 |
| 1 | Verification of Thevenin's Theorem | 1. Learn to use electrical instruments and methods for measuring voltage, current, and resistance.  2. Find the branch current by measuring the opencircuit voltage and equivalent internal resistance, and verify Thevenin's Theorem. | 4 | 验证型 |
| 2 | Response of RC Networks to Rectangular Pulses | 1. Learn to use signal generators and oscilloscopes.  2. Observe the output waveforms of differentiator and integrator circuits.  3. Adjust the time constant of an RC circuit by changing the capacitance.  4. Study the response of an RC circuit with different time constants to rectangular pulses. | 4 | 验证型 |
| 3 | Applications of Integrated Operational Amplifiers | 1. Measure and perform proportional operations, and use the characteristics of integral operations in the linear region to perform addition and subtraction operations.  2. Utilize the characteristics of integrated operations in the nonlinear region to understand the principles of signal amplification and the reasons for voltage signal comparison. | 4 | 验证型 |
| 4 | Testing the Logical Functions of Logic Gates | 1. Gain a deeper understanding of the functions and measurement methods of logic gate circuits.  2. Learn how to connect and debug combinational logic circuits. | 4 | 验证型 |
| 实验类型：①演示型 ②验证型 ③设计型 ④综合型 | | | | |

四、课程思政教学设计

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| 课程教学过程中在教、学、成果评价三个层次上融入思政元素，通过展示我国在电工电子技术领域的成就和贡献，激发学生的爱国情怀和创新意识；通过介绍工匠精神在电子技术领域的应用，培养学生的职业素养和社会责任感。  深学细悟习近平新时代中国特色社会主义思想，深刻把握这一重要思想的科学体系、核心要义、实践要求，有效发挥专业课的立德树人作用，从器件、电路以及电子系统设计等方面进行思政元素的挖掘，给出具体的课程思政教学案例，把学习成效转化为日常的教学工作，引导学生健康成长。 |

五、课程考核

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| 总评构成 | 占比 | 考核方式 | 课程目标 | | | | | | 合计 |
| 1 | 2 | 3 | 4 | 5 | 6 |
| X1 | 30% | Test 1 | 20 | 30 | 30 | 10 | 5 | 5 | 100 |
| X2 | 30% | Test 2 | 20 | 30 | 30 | 10 | 5 | 5 | 100 |
| X3 | 30% | Experiments and reports | 15 | 15 | 20 | 20 | 10 | 20 | 100 |
| X4 | 10% | Ordinary grades (including classroom discussion and speech, attendance, etc.) | 25 | 25 | 20 | 10 | 10 | 10 | 100 |

六、其他需要说明的问题

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| 无 |