目录

0010073 电路分析基础-2

课程编码：0010073

课程名称：电路分析基础-2

英文名称：Circuit Analysis Foundation-2

课程类型：学科基础必修课

学分： 3.0 **总学时：** 48

面向对象：自动化、机器人工程、电子科学与技术（实验班）、微电子科学与工程（实验班）专业本科生

先修课程：电路分析基础-1，高等数学（工），大学物理Ⅰ、线性代数（工）

考核形式： 平时成绩+考试

撰写人：宋建国

课程简介：（250-300 字）

电路分析基础-2 是人工智能与自动化学院为自动化、机器人工程、电子科学与技术（实验班）、微电子科学与工程（实验班）专业本科生开设的学科基础必修课。本课程的任务是使学生掌握正弦交流电路和三相对称电路的计算、交流电路的串并联谐振、非正弦交流电路的一般分析方法、对称三相电路和二端口电路的计算方法。教学内容重点：正弦周期交流电路中相量和交流电功率的概念与计算，交流电路中谐振频率的概念，非正弦交流电路分析中的傅里叶级数求解和时域叠加，互感电路中互感系数和转移阻抗的概念与计算，三相对称电路中三相对称电源和星三角接法的求解，二端口电路中的 Z 参数、Y 参数、T 参数计算。教学内容的难点：正弦周期交流电路中阻抗和相量图的计算与分析，交流电路中品质因数、串联谐振、并联谐振的概念，非正弦交流电路分析中平均功率的计算，互感电路中互感电压的计算，三相对称电路中三相功率的计算。

推荐教材或主要参考书：

[1] 邱关源，罗先觉主编，电路（第 5 版），高等教育出版社，2006

[2] 李翰逊，简明电路分析基础，高等教育出版社，2002

0010073 Circuit Analysis Foundation-2

Course Number: 0010073

Course Title: Circuit Analysis Foundation-2

Course Type: Basic compulsory course

Credit: 3.0 **Total Credit Hours:** 48

Students: Undergraduate students majoring in Automation, Robotic Engineering, Electronic Science and Technology, and Microelectronics Science and Engineering

Prerequisites: Circuit Analysis Foundation-1, advanced mathematics, college physics, linear algebra

Evaluation Method: Course participation + written exams

Writer： Song Jianguo

Course Description:

Circuit Analysis Foundation-2 is a compulsory course of subject basis for Undergraduate majoring in Automation, Robotic Engineering, Electronic Science and Technology, and Microelectronics Science and Engineering in the College of artificial intelligence and automation. The main target of this course is to make students grasp calculation of sinusoidal alternating current (AC) circuit and three-phase symmetrical circuit, series and parallel resonance of AC circuit, general analysis method of non-sinusoidal AC circuit, calculation method of symmetrical three-phase circuit and two port circuit. The teaching contents are mainly covered by the following aspects: concept and calculation of phasor and AC power in sinusoidal periodic AC circuit, concept of resonance frequency in AC circuit, Fourier series and time-domain superposition in non-sinusoidal AC circuit analysis, concept and calculation of mutual inductance coefficient and transfer impedance in mutual inductance circuit, solution of three-phase symmetrical power supply and star-delta connection in three-phase relative symmetric circuit, calculation of Z parameter, Y parameter and T parameter in two-port circuit. The difficulties of teaching contents are described as followings: calculation and analysis of impedance and phasor diagram in sinusoidal periodic AC circuit, concepts of quality factor, series resonance and parallel resonance in AC circuit, calculation of average power in non-sinusoidal AC circuit analysis, calculation of mutual inductance voltage in mutual inductance circuit, calculation of power in three-phase symmetrical circuit.

Recommended Textbooks/References:

1.Guanyuan Qiu, Xianjue Luo, Electric Circuit (5th Edition), *Higher Education Press*, 2006

2.Hanxun Li, Concise Circuit Analysis Foundation, *Higher Education Press*, 2002

0004333 模拟电子技术

课程编码：0004333

课程名称：模拟电子技术

英文名称：Analog Electronic Technology

课程类型：学科基础必修课

学分：3.5　　**学时：**56

面向对象：自动化、机器人工程、电子科学与技术（实验班）、微电子科学与工程（实验班）专业本科生

先修课程：高等数学（工）、大学物理Ⅰ、电路分析基础

考核形式：平时成绩+考试

撰写人：雷飞

课程简介：

模拟电子技术是人工智能与自动化学院为自动化、机器人工程、电子科学与技术（实验班）、微电子科学与工程（实验班）专业本科生开设的学科基础必修课。模拟电子技术是入门性质的技术基础课。模拟电路是多种电子产品、电子设备必不可少的基本组成单元，是物理量在转换成数字信号之前所必经的关键电路，该课程为培养自动化专业人才的电路分析与设计技能奠定基础，为提高其工程应用与创新能力做铺垫。课程主要内容：常用半导体器件原理、基本放大电路、场效管及放大电路、功率放大电路、模拟集成电路基础、反馈放大电路、信号产生电路、直流稳压电源等。重点是各类放大电路的原理分析和计算，难点是负反馈放大器、集成运算放大器等。为较好的掌握本课程，应在理解各类器件的工作原理基础上，熟练掌握晶体管三种基本放大器的分析与计算，继而掌握其它的放大器或模拟电子电路。

推荐教材或主要参考书：

[1] 孙景琪，雷飞，闫慧兰. 模拟电子技术基础. 高等教育出版社，2016 年 7 月

[2] 华成英. 模拟电子技术基础（第五版）. 高等教育出版社，2015 年 7 月

[3] 桑森（Willy M.C.Sansen）著，陈莹梅译. 模拟集成电路设计精粹（电子信息前沿技术丛书）. 清华大学出版社，2020 年 12 月

[4] 康华光. 电子技术基础（模拟部分）. 高等教育出版社，2006 年

[5] Robert L. Boylestad, Louis Nashelsky. Electronic Devices and Circuit Theory(Ninth Edition). 电子工业出版社，2010 年

0004333 Analog Electronic Technology

Course Number: 0004333

Course Title: Analog Electronic Technology

Course Type: Basic compulsory course

Credit: 3.5 **Total Credit Hours:** 56

Students: Undergraduate students majoring in Automation, Robotic Engineering, Electronic Science and Technology, and Microelectronics Science and Engineering

Prerequisites: Advanced mathematics、General Physics、Circuit analysis element

Evaluation Method: Course participation + written exams

Writer： Lei Fei

Course Description:

Analog electronic technology is a compulsory course of subject basis for Undergraduate majoring in Automation, Robotic Engineering, Electronic Science and Technology, and Microelectronics Science and Engineering in the College of artificial intelligence and automation. Analog electronic technology is a basic technical course for beginners. Analog circuit is an essential basic unit of a variety of electronic products and electronic equipment. It is the key circuit that physical quantities must pass before they are converted into digital signals. This course lays the foundation for cultivating circuit analysis and design skills of automation professionals, and paves the way for improving their engineering application and innovation ability. Main contents of the course: principles of common semiconductor devices, basic amplifying circuit, FET and amplifying circuit, power amplifying circuit, analog integrated circuit foundation, feedback amplifying circuit, signal generating circuit, DC regulated power supply, etc. The key point is the principle analysis and calculation of all kinds of amplifier circuits, and the difficulty is the negative feedback amplifier, integrated operational amplifier, etc. In order to master this course, we should be familiar with the analysis and calculation of three basic amplifiers of transistors on the basis of understanding the working principles of various devices, and then master other amplifiers or analog electronic circuits.

Recommended Textbooks/References:

1. Sun Jingqi，Lei fei，Yan Huilan, Analog Electronic Technolog, *Higher Education Press*, 7-2016

2.Hua Chengying, Analog Electronic Technolog（Fifth Edition）, *Higher Education Press*, 7-2015

3. Willy M.C.Sansen Written, Chen Yingmei Translated, The essence of analog integrated circuit design（Electronic information frontier technology series）, *Beijing: Tsinghua University Pres*s, 12-2020

4. Kang Huaguang, Electronic Technology（Part of Analog）, *Higher Education Press*, 2006

5. Robert L. Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory(Ninth Edition),

Electronic Industry Press, 2010

0008127 数字电子技术

课程编码：0008127

课程名称：数字电子技术

英文名称：Digital Electronic Technology

课程类型：学科基础必修课

学分： 3.5 **总学时：** 56

面向对象：自动化、机器人工程、电子科学与技术（实验班）、微电子科学与工程（实验班）专业本科生

先修课程：大学物理Ⅰ、电路分析基础-1、电路分析基础-2

考核形式：平时成绩+期末考试

撰写人：江捷

课程简介：（250-300 字）

数字电子技术是人工智能与自动化学院为自动化、机器人工程、电子科学与技术（实验班）、微电子科学与工程（实验班）专业本科生开设的学科基础必修课。数字电子技术是学科基础必修课，是一门入门性质的技术基础课。本课程的任务是讲述数字电子技术领域的基本概念、基本理论和基本方法，培养学生在该领域的分析、设计、综合与创新能力，了解可编程逻辑器件的基本原理与应用，学习硬件描述语言的设计思路和方法，为后续专业课程的学习打下良好基础。教学内容重点是组合逻辑电路和时序逻辑电路的分析和设计方法，以及典型数字集成电路的功能与应用。教学内容的难点是逻辑门电路的外部特性以及不同系列门电路的接口等。

推荐教材或主要参考书：

[1] 江捷，马志成. 数字电子技术基础. 北京工业大学出版社，2009 年 10 月

[2] 江捷. 数字电子技术基础学习指导（第二版）. 北京工业大学出版社，2018 年 10 月

[3] 阎石. 数字电子技术基础（第六版）. 高等教育出版社，2016 年 4 月

[4] Thomas L. Floyd 著，余璆，熊洁译. 数字电子技术（第十一版）. 电子工业出版社, 2019 年 7 月.

0008127 Digital Electronic Technology

Course Number: 0008127

Course Title: Digital Electronic Technology

Course Type: Basic compulsory course

Credit: 3.5 **Total Credit Hours:** 56

Students: Undergraduate students majoring in Automation, Robotic Engineering, Electronic Science and Technology, and Microelectronics Science and Engineering

Prerequisites: College physics, Circuit Analysis Foundation -1、Circuit Analysis Foundation-2

Evaluation Method: Course participation + Final exam

Writer： Jiang Jie

Course Description:

Digital Electronics Technology is a compulsory course of subject basis for Undergraduate majoring in Automation, Robotic Engineering, Electronic Science and Technology, and Microelectronics Science and Engineering in the College of artificial intelligence and automation. Digital Electronics Technology is one of the subject-based compulsory courses and also an introductory technical one .The tasks of the course are to explain the basic concepts, theories and methods in the field of digital electronic technology, to cultivate students' capabilities of analysis, design, synthesis and innovation in this field. After learning the course, students could understand the basic principles and applications of programmable logic devices, grasp the basic ideas and methods for designing hardware by using hardware description language, which would lay good foundation for the subsequent professional courses. The teaching content would focus on the analysis and design methods of combinational logic circuits and sequential logic circuits, and the functions and applications of those typical digital integrated circuits. The challenges of the content would be the external characteristics of logic gate circuits and the interfaces between different series of gate circuits, etc.

Recommended Textbooks/References:

1.JIANG Jie, MA Zhicheng. Digital Electronic Technique Fundamentals. *Beijing University of Technology Press*, Oct-2009.

2.JIANG Jie. Learning Guild to Digital Electronic Technique Fundamentals (the 2nd edition). *Beijing University of Technology Press*, Oct-2018.

3.YAN Shi. Digital Electronic Technique Fundamentals (the 5th edition). *Higher Education Press*, May-2006.

4.Michael Hassen. Fundamentals of Digital Logic Design with VHDL. *Innovate LLC*, Jan-2013.

0010089 复变函数

课程编码：0010089

课程名称：复变函数

英文名称：Function of the Complex Variable

课程类型：学科基础必修课

学分： 2.0 **总学时：** 36

面向对象：自动化专业本科生

先修课程：高等数学（工）、线性代数（工）

考核形式：平时成绩+考试

撰写人：奥顿

课程简介：（250-300 字）

复变函数是人工智能与自动化学院为自动化专业本科生开设的学科基础必修课。复变函数的理论和方法在数学、自然科学和工程技术中有着广泛应用，是解决诸如电磁学、流体力学、弹性理论中平面问题的有力工具，其基础内容已成为理工科很多专业的必修课程。课程的主要任务：教学过程中采用启发式、理论联系实际等教学方式，使学生掌握复变函数的基本理论，掌握傅里叶变换的主要性质。同时通过本课程的教学，提高学生的数学抽象思维，逻辑推理能力和计算能力。教学内容重点：复数与复变函数，解析函数，级数，留数，傅里叶变换。教学内容难点：解析函数，留数，以及傅里叶变换。

推荐教材或主要参考书：

[1] 西安交通大学高等数学教研室编. 工程数学-复变函数（第四版）. 高等教育出版社，1996 年 5 月

[2] 钟玉泉编. 复变函数论（第五版）. 高等教育出版社，2021 年 3 月

[3] 孙妍，刘向丽，解文龙，黄静静. 复变函数与积分变换. 机械工业出版社，2016 年 1 月

自主查阅和论坛内容相关的学术文献。

0010089 Function of the Complex Variable

Course Number: 0010089

Course Title: Function of the Complex Variable

Course Type: Basic compulsory course

Credit: 2.0 **Total Credit Hours:** 36

Students: Undergraduate students majoring in Automation

Prerequisites: Advanced mathematics, Linear algebra

Evaluation Method: Course participation + exam

Writer： Ao Dun

Course Description:

Function of the Complex Variable is a basic course for undergraduate majoring in automation in the College of artificial intelligence and automation. The theory and method of complex function is widely used in mathematics, natural science and engineering technology. It is a powerful tool to solve plane problems such as electromagnetics, fluid mechanics and elastic theory. Its basic content has become a compulsory course for many majors of science and engineering. The main task of the course is to adopt heuristic and practical teaching methods during the teaching process, so that students can master the basic theory of complex variable functions and master the main properties of Fourier transform. At the same time, through the teaching of this course, students' mathematical abstract thinking, logical reasoning ability, and computational ability will be improved. The course focuses on complex numbers and functions of complex variables, analytical functions, series, residues, Fourier transform. The challenges of the course: Analytic functions, residues, and Fourier transforms.

Recommended Textbooks/References:

1. Department of advanced mathematics, Xi'an Jiaotong University. Engineering mathematics complex variable function (Fourth Edition). *Higher education press*, May 1996
2. Zhong Yuquan. Theory of complex function (5th Edition). *Higher education press*, March 2021
3. Sun Yan, Liu Xiangli, Xie Wenlong, Huang Jingjing. Complex variable function and integral transformation. *China Machine Press*, January 2016

0010120 离散数学

课程编码：0010120

课程名称：离散数学

英文名称：Discrete Mathematics

课程类型：学科基础必修课、公共基础必修课

学分： 2.0 **总学时：** 36

面向对象：自动化、机器人工程专业本科生

先修课程：高等数学（工），线性代数（工）

考核形式：平时成绩+考试

撰写人：孔德慧

课程简介：（250-300 字）

离散数学是研究离散结构和离散数量关系的数学分支的统称，是信息学部为自动化专业本科生开设的学科基础必修课，为机器人工程专业本科生开设的公共基础必修课。课程主要内容包括：数理逻辑、集合和关系、图论、及代数结构等。课程的主要任务，一方面关注于离散对象的数学结构及其证明、演算与推理理论研究，为基于二进制编码的计算机相关学科提供理论研究基础；另一方面，将基础数学与应用数学的多个不同分支集成，承担起了理论模型向实用模型转化的纽带功能，因而对培养学生分析、建模、解决问题能力的培养具有重要作用。对于自动化专业的本科生而言，通过该课程的学习，将有助于学生深入洞察应用问题的本质属性，并可进一步选择恰当的离散结构对问题进行模型的表达及求解。

推荐教材或主要参考书：

[1] 贲可荣，袁景凌，谢茜. 离散数学（第三版）. 清华大学出版社，2021 年 2 月

[2] 贲可荣，袁景凌，高志华编著，离散数学解题指导，清华大学出版社，2016 年 11 月

[3] 耿素云，屈婉玲，张立昂. 离散数学（第五版）. 清华大学出版社，2013 年 7 月

[4] 牛连强. 工科离散数学. 电子工业出版社，2017 年 2 月

[5] 肯尼思 H 罗森著，徐六通等译，离散数学及其应用，机械工业出版社，2021 年 1 月

0010120 Discrete Mathematics

Course Number: 0010120

Course Title: Discrete Mathematics

Course Type: Basic compulsory course、Compulsory Common Basic Course

Credit: 2.0 **Total Credit Hours:** 36

Students: Undergraduate students majoring in Automation, Robotic Engineering

Prerequisites: Advanced Mathematics, Linear Algebra,

Evaluation Method: Course participation + written exams

Writer： Kong Dehui

Course Description:

Discrete Mathematics is one of the basic compulsory courses for undergraduate students major in automation and one of the compulsory common basic courses for undergraduate students major in robotic engineering. The main target of this course is to clarify the theories related to the discrete topologies and discrete quantitative relationship. This course is focus, on the one hand, the mathematical structure of discrete objects and its proof, calculus and reasoning theory, which is the theoretical research basis of computer related disciplines based on binary coding; on the other hand, integrating with many different branches of basic mathematics and applied mathematics, as a result undertaking the link function of transforming theoretical model into practical model, which plays an important role in cultivating students' ability of analysis, modeling and problem solving. The teaching contents are mainly covered by the following aspects: mathematical logic, set and relation, graph theory, and algebraic structure. For the undergraduates majoring in automation, the study of this course will help students to have a deep insight into the essential attributes of application problems, and further select the appropriate discrete structure to model and solve the problems.

Recommended Textbooks/References:

1.Ben Kerong, Yuan jingling, Xie Xi. Discrete Mathematics (Third Edition). Tsinghua University Press, February 2021 (in chinese)

2.Ben Kerong, Yuan jingling, Gao Zhihua, discrete mathematics problem solving instruction Tsinghua University Press, November 2016 (in chinese)

3.Geng Suyun, Qu Wanling, Zhang Liang. Discrete Mathematics (Fifth Edition). Tsinghua University Press, July 2013 (in chinese)

4.Niu Lianqiang. Discrete mathematics of engineering. Electronic Industry Press, February 2017 (in chinese)

5.Kenneth h. Rosen, translated by Xu Liutong, et al. Discrete mathematics and its application, China Machine Press, January 2021 (in chinese)

0010686 微机原理与接口技术

课程编号：0010686

课程名称：微机原理与接口技术

英文名称：Microcomputer Principle and Interface Technology

课程性质：学科基础必修课

学分：3.5　　**学时：**56

面向对象：自动化专业本科生

先修课程：数字电子技术、模拟电子技术

考核形式：平时成绩+考试

撰写人：左国玉

课程简介：

微机原理与应用主要是在数字电路等课程的基础以 80x86/Pentium 为背景，通过对计算机系统的内部结构、组成、工作原理等方面的讲授，以及对学生设计能力的训练，使学生从理论和实践上掌握计算机的基本原理、基本组成、微处理器的结构及工作原理、指令系统、汇编语言程序设计、存储器及其接口电路设计、计算机接口技术的概念、数据传输方式以及部分简单智能接口电路的设计及软件编程等，为学习后续课程以及开发、设计、使用计算机应用系统打下良好的基础。

教材及参考书：

[1] 余春暄，左国玉，80x86/Pentium 微机原理及接口技术(第 3 版)，机械工业出版社，2015

[2] 左国玉，余春暄等，80x86 微机原理及接口技术——习题解答与实验指导(第 2 版)，机械工业出版社，2018

[3] 王晓萍 编著，微机原理与接口技术，浙江大学出版社，2019

0010686 Microcomputer Principle and Interface Technology

Course Number: 0010686

Course Title: Microcomputer Principle and Interface Technology

Course Type: Basic compulsory course

Credit: 3.5 **Total Credit Hours:** 56

Students: Undergraduate students majoring in Automation

Prerequisites: Digital Electronics, Analog Electronics

Evaluation Method: Course participation + written exams

Writer： Zuo Guoyu

Course Description:

This course is a basic course for the professional electric undergraduates, and it is also an introductory course for the undergraduates to learn and master the knowledge of computer hardware as well as assembler language design. It can make the students master the related knowledge of computer by means of teaching the internal structure of computer and its working principle. The related knowledge includes the following: the basic principle and components of computer, the structure and working principle of the microprocessor, the instruction set, the assembler language design, the memory and its interface circuit design, the concept of computer interface, data transmission, as well as some simple intelligent interface circuit design and software programming**.**

Recommended Textbooks/References:

1. Yu Chunxuan, Zuo Guoyu, 80x86 / Pentium microcomputer principle and Interface Technology (3rd Edition), *Machinery industry press*, 2015
2. Zuo Guoyu, Yu Chunxuan, et al., 80x86 microcomputer principle and interface technology - exercise solution and experimental guidance (2nd Edition), *Machinery industry press*, 2018
3. Wang Xiaoping, Microcomputer principle and interface technology, *Zhejiang University Press*, 2019

0010149 数据结构与算法

课程编码：0010149

课程名称：数据结构与算法

英文名称：Data Structure and Algorithms

课程类型：学科基础必修课、学科基础选修课

学分： 2.0 **总学时：** 32

面向对象：自动化专业、机器人工程专业本科生

先修课程：高级语言程序设计，高级语言程序设计训练

考核形式：平时成绩+实验+考试

撰写人：杨剑

课程简介：

数据结构与算法是信息学部为自动化专业本科生开设的学科基础必修课，为机器人工程专业本科开设的学科基础选修课。本课程的任务是给学生介绍各种数据在计算机中的存储、传递和转换，使学生掌握数据结构与算法的基础理论和基本方法，提高学生对各种数据结构与算法的程序设计能力，以及提高学生对数据结构与算法的实际运用能力。教学内容重点是线性表、栈和队列、串、二叉树、树、图、排序和查找的相关概念、方法、理论、基本操作和常用算法。教学内容的难点是让学生在理解概念、理论的基础上用 C 语言进行算法实现，并将相关知识应用于解决具体的复杂工程问题之中。

推荐教材或主要参考书：

[1] 严蔚敏 李冬梅 吴伟民. 数据结构（C 语言版）. 人民邮电出版社，2015 年 2 月

[2] 严蔚敏. 数据结构（C 语言版）. 清华大学出版社，2007 年 3 月

[3] 汪友生等. 计算机软件基础. 清华大学出版社，2016 年 12 月

[4] 邓玉洁. 算法与数据结构（C 语言版）. 北京邮电大学出版社，2017 年 8 月

[5] 马克·艾伦·维斯（Mark Allen Weiss）. 数据结构与算法分析：C 语言描述(英文版 原书第 2 版). 机械工业出版社，2019 年 11 月

0010149 Data Structure and Algorithms

Course Number: 0010149

Course Title: Data Structure and Algorithms

Course Type: Basic compulsory course、Basic Elective Course

Credit: 2.0 **Total Credit Hours:** 32

Students: Undergraduate students majoring in Automation, Robotic Engineering

Prerequisites: High level language programming, High level language programming practice training

Evaluation Method: course participation + experiment + written exams

Writer： Yang Jian

Course Description:

Data structure and algorithm is one of the basic compulsory courses for undergraduates major in Automation, and one of the basic elective courses for undergraduates major in robotic engineering. The main target of this course is to clarify the storage, transfer and conversion of various data in the computer, enable students to master the basic theory and method of data structure and algorithm, improve students' programming ability of various data structure and algorithm, and improve students' practical application ability of data structure and algorithm. The teaching content are mainly covered by the following aspects: the concepts, methods, theories, basic operations and common algorithms of linear table, stack and queue, binary tree, tree, graph, sorting and searching. The difficulty of teaching content are described as following: letting students realize the algorithm with C language on the basis of understanding the concept and theory, and applying relevant knowledge to solve specific complex engineering problems.

Recommended Textbooks/References:

1.Weimin Yan, et al., Data structure (C Language Edition). *Posts & Telecom Press*, 2-2015

2.Weimin Yan, Data structure (C Language Edition). *Tsinghua University Press*, 3-2007

3.Yousheng Wang, et al., Fundamentals of computer software. *Tsinghua University Press*, 12-2016

4.Yujie Deng, Algorithm and data structure (C Language Edition). *Beijing University of Posts and Telecommunications Press*, 8-2017

5.Mark Allen Weiss, Data structure and algorithm analysis: C language description (English version, 2nd Edition), *Mechanical Industry Press*, 11-2019

0000131 自动控制原理

课程编码：0000131

课程名称：自动控制原理

英文名称：Principles of Automatic Control

课程类型：学科基础必修课

学分： 4.0 **总学时：** 64

面向对象：自动化专业本科生

先修课程：复变函数，电路分析基础-1，电路分析基础-2，模拟电子技术

考核形式：平时成绩+考试

撰写人：于建均

课程简介：（250-300 字）

自动控制原理是人工智能与自动化学院为自动化专业本科生开设的学科基础必修课。本课程的任务是通过讲述自动控制原理理论知识和解决问题的办法，使学生理解掌握反馈控制的基本思想，掌握自动控制系统的一般分析方法。在此基础上，能够进行并完成一般控制系统的校正设计，进而使学生掌握运用自动控制原理的理论与方法解决实际问题的本领，为后续课程学习打下良好的基础。教学内容重点：自动控制、闭环控制的基本概念、控制系统的数学模型，控制系统的时域、复域、频域分析方法，系统控制器及校正环节的设计，非线性系统以及离散控制系统分析。教学内容难点：掌握反馈控制思想方法；一般物理对象系统传递函数的求取；理解高阶线性定常系统的分析方法及思路；时域、复域、频域的对应关系；系统固有特性、校正装置特性。

推荐教材或主要参考书：

[1] 孙亮，《自动控制原理》第三版， 高等教育出版社，2011 年 6 月

[2] 胡寿松，《自动控制原理》第七版， 科学出版社，2019 年 1 月

0000131 Principles of Automatic Control

Course Number: 0000131

Course Title: Principles of Automatic Control

Course Type: Basic compulsory course

Credit: 4.0 **Total Credit Hours:** 64

Students: Undergraduate students majoring in Automation

Prerequisites: Complex Functions, Circuit Theory Foundation-1, Circuit Theory Foundation-2, Electronics Technique

Evaluation Method: Course participation + written exams

Writer： Yu Jianjun

Course Description:

Principles of Automatic Control is a basic compulsory course for undergraduate students majoring in automation in the School of Artificial Intelligence and Automation. This course aims to make students understand and master the basic idea of feedback control and the general analysis method of automatic control systems by telling the theoretical knowledge of automatic control principles and the solution of problems. On this basis, students can complete the calibration design of general control systems and then enable students to master the theory and methods of automatic control principles to solve practical problems, and lay a good foundation for subsequent courses. Teaching content focus: automatic control, the basic concept of closed-loop control, the mathematical model of control system, time domain, complex domain, frequency domain analysis of control system, the design of system controller and calibration link, nonlinear system and discrete control system analysis. Difficulties of teaching content: mastering the idea and method of feedback control; finding the transfer function of general physical object system; understanding the analysis method and concepts of the higher-order linear constant system; correspondence of time domain, complex domain, and frequency domain; inherent characteristics of system and characteristics of correction device.

Recommended Textbooks/References:

1.Sun Liang, Automatic Control Theory 3th, *Beijing: Higher Education Press*, June-2011

2.Hu Shousong, The Principles of Automatic Control 7th. *Beijing: Science Press*, January-2019

0010116 计算机网络与应用

课程编码：0010116

课程名称：计算机网络及应用

英文名称：Computer network and its application

课程类型：学科基础必修课

学分：3.0　　**总学时：48**

面向对象：自动化专业本科生

先修课程：高级语言程序设计，微机原理与接口技术，信号与系统

考核形式：平时成绩+考试

撰写人：高学金

课程简介：

计算机网络及应用是信息学部为自动化专业本科生开设的公共基础必修课课程类型。本课程是计算机网络技术的入门课程，内容以 Internet 为核心，讲述了计算机网络原理及其协议，即以自顶向下的顺序依次介绍网络层次体系结构、网络协议和网络技术。教学重点内容是应用层协议设计、传输层 TCP/UDP 协议和拥塞控制、网络层 IP 协议及路由选择算法、数据链路层及以太网技术、无线网络技术与移动互联网。教学难点是传输层 TCP/UDP 协议和拥塞控制、网络层 IP 协议及路由选择算法。通过本课程的学习和相关实验训练，使学生了解计算机网络系统的设计步骤及相关内容，为实际工程项目的设计、开发与实施打下基础。

推荐教材或主要参考书：

[1] （美）詹姆斯·F. 库罗斯, （美）基思·W. 罗斯著; 陈鸣译. 计算机网络: 自顶向下（原书第 7 版）. 北京: 机械工业出版社, 2018.05

[2] 谢希仁. 计算机网络（第五版）. 北京:电子工业出版社, 2008.01

0010116 Computer network and its application

Course Number: 0010116

Course Title: Computer network and its application

Course Type: Basic compulsory course

Credit: 3.0 **Total Credit Hours:** 48

Students: Undergraduate students majoring in Automation

Prerequisites: High level language programming, Microcomputer principle and interface technology, Signals and systems

Evaluation Method: Course participation + written exams

Writer： Gao Xuejin

Course Description:

Computer network and its application is one of the basic compulsory courses for undergraduate students major in automation. The main target of this course is to clarify the principle and protocol of computer network, that is to say, it introduces network hierarchy, network protocol and network technology in top-down order. This course is focus on transport layer TCP/UDP protocol and congestion control, network layer IP protocol and routing algorithm. The teaching contents are mainly covered by the following aspects: application layer protocol design, transport layer TCP/UDP protocol and congestion control, network layer IP protocol and routing algorithm, data link layer and Ethernet technology, wireless network technology and mobile Internet. The difficulties of teaching contents are described as followings: Transport layer TCP/UDP protocol and congestion control, network layer IP protocol and routing algorithm.

Recommended Textbooks/References:

1. James F. Kurose, Keith W. Ross; translated by Chen MingYi. Computer Networking: A Top-Down Approach, Seventh Edition. Beijing: Mechanical Industry Press, 2018.05
2. Xie Xiren. Computer Network (Fifth Edition). Electronic Industry Press, 2008.01

0010118 智能检测与网联技术

课程编码：0010118

课程名称：智能检测与网联技术

英文名称：Intelligent and Networked Detection Technologies

课程类型：学科基础必修课

学分： 3.0 **总学时：** 48

面向对象：自动化专业本科生

先修课程：电路分析基础-1，电路分析基础-2，模拟电子技术，数字电子技术，自动控制原理，微机原理与接口技术

考核形式： 平时成绩+考试

撰写人：詹璟原

课程简介：（250-300 字）

智能检测与网联技术是信息学部为自动化专业本科生开设的学科基础必修课。本课程的任务是通过系统讲授检测技术的基本概念、基本原理和方法以及智能网联化检测技术的基础知识，培养学生综合运用理论和技术手段设计自动检测系统的能力，为实际自动化工程项目的设计、开发与实施奠定基础。教学内容重点包括检测技术的基础知识，各种常用传感器的工作原理、测量电路以及应用，测量误差分析和测量数据的基本处理算法，无线传感网技术相关的基本理论及其应用。教学内容的难点是梳理不同类型传感器的工作原理，并将应用背景、信号转换方法与选用的传感器紧密结合起来。

推荐教材或主要参考书：

[1] 蔡萍, 赵辉, 施亮. 现代检测技术. 机械工业出版社, 2016 年

[2] 周杏鹏, 孙永荣, 仇国富. 传感器与检测技术. 清华大学出版社, 2010 年

[3] 刘红丽. 传感与检测技术（第 2 版）. 北京: 国防工业出版社, 2012 年

[4] 徐科军. 传感器与检测技术（第 4 版）. 北京: 电子工业出版社, 2016 年

[5] 李邓化, 彭书华, 许晓飞. 智能检测技术及仪表（第二版）. 科学出版社, 2018 年

[6] 孙利民, 张书钦, 李志, 杨红等. 无线传感器网络: 理论及应用, 清华大学出版社, 2018 年

0010118 Intelligent and Networked Detection Technologies

Course Number: 0010118

Course Title: Intelligent and Networked Detection Technologies

Course Type: Basic compulsory course

Credit: 3.0 **Total Credit Hours:** 48

Students: Undergraduate students majoring in Automation

Prerequisites: Circuit Analysis Foundation-1，Circuit Analysis Foundation-2，Analog Electronic Technology，Digital Electronic Technology，Principle of Automatic Control，Microcomputer principle and interface technology

Evaluation Method: Course participation + written exams

Writer： Zhan Jingyuan

Course Description:

"Intelligent and Networked Detection Technologies" is one of the basic compulsory courses for undergraduate students majoring in automation. The main target of this course is to clarify the basic concepts, basic principle and methods of detection technology as well as the basic knowledge of intelligent and networked detection technology, and thus to train students to be capable of designing automatic detection system by using theory and technology comprehensively, so as to lay a foundation for the design, development and implementation of real automation projects. The teaching contents are mainly covered by the following aspects: the basic knowledge of detection technology, working principle, measuring circuits and applications of various common sensors, measurement error analysis and basic processing algorithms of measurement data, and basic theory and applications of wireless sensor network technology. The difficulties of teaching contents are to clarify the working principle of different types of sensors, and then to combine the application background and signal conversion method with the selected sensor.

Recommended Textbooks/References:

1.CAI Ping, ZHAO Hui, SHI Liang, Modern Detection Technology, *Mechanical Industry Press*, 2016

2.ZHOU Xingpeng, SUN Yongrong, Qiu Guofu, Sensor and detection technology, *Tsinghua University Press*, 2010

3.LIU Hongli, Sensor and detection technology (the 2nd Edition), *Beijing: National Defense Industry Press*, 2012

4.XU Kejun, Sensor and detection technology (the 4th Edition), *Beijing: Electronic Industry Press*, 2016

5.LI Denghua, PENG Shuhua, XU Xiaofei, Intelligent detection technology and instrument (the 2nd Edition), *Science Press*, 2018

6.SUN Limin, ZHANG Shuqin, LI Zhi, YANG Hong, et al, Wireless sensor networks: Theory and applications, *Tsinghua University Press*, 2018

0010696 现代控制理论

课程编码：0010696

课程名称：现代控制理论

英文名称：Modern Control Theory

课程类型：学科基础必修课

学分： 2.0 **总学时：** 32

面向对象：自动化专业本科生

先修课程：高等数学（工）、线性代数（工）、自动控制原理

考核形式：平时成绩+考试

撰写人：陈阳舟、龚道雄

课程简介：（250-300 字）

现代控制理论是信息学部为自动化专业本科生开设的学科基础必修课。本课程以线性状态空间模型为基础，系统地阐述了控制系统的一些基本的分析方法和控制设计思想，是控制类后续课程的基础。

本课程的任务是使自动化专业的本科生掌握现代控制理论的基本知识、基础理论和基本方法，学会用状态空间设计和分析自动控制系统，具有完成一般控制系统分析和设计任务的能力，为后续课程学习打下良好的基础。教学内容重点包括：控制系统的状态空间数学模型，控制系统的运动分析、能控性和能观测性、李雅普洛夫稳定性、系统的极点配置、解耦控制、线性二次型最优控制、全维观测器的设计等。难点包括：系统建模、模型标准化、运动分析和计算、能控标准型和能观测标准型、李雅普诺夫函数、控制器和观测器设计等。

推荐教材或主要参考书：

[1] 张嗣瀛，高立群，现代控制理论，清华大学出版社，2017 年；

[2] 高立群，郑艳，井元伟，现代控制理论习题集，清华大学出版社，2007 年；

[3] R.L. Williams and D.A. Lawrence, Linear State-Space Control Systems, John Wiley & Sons, 2007

0010696 Modern Control Theory

Course Number: 0010696

Course Title: Modern Control Theory

Course Type: Basic compulsory course

Credit: 2.0 **Total Credit Hours:** 32

Students: Undergraduate students majoring in Automation

Prerequisites: Advanced Mathematics, Linear Algebra, Principle of Automatic Control

Evaluation Method: Course participation + written exams

Writer： Chen Yangzhou, Gong Daoxiong

Course Description:

"Modern Control Theory" is one of the basic compulsory courses for undergraduate students major in automation. The main target of this course is to clarify some basic analysis approaches and control design methods of control system based on the state space method. This course focuses on the linear state-space model as well as corresponding analysis and control design methods of continuous/discrete time-invariant linear systems. The teaching contents include the following aspects: modeling and standardization of state-space model, system analysis (state trajectory analysis, controllability and observability, stability analysis based on Lyapunov stability theorem), controller design (pole placement, stabilization, linear quadratic regulator) and state observer design. The difficulties of teaching contents include: modeling and its standardization, motion analysis, controllability canonical form and observability canonical form, Lyapunov function, controller and observer design.

Recommended Textbooks/References:

1.ZHANG Siying, GAO Liqun, Modern Control Theory, Tsinghua University Press, 2017

2.GAO Liqun, ZHENG Yan, JING Yuanwei, Exercise for Modern Control Theory, Tsinghua University Press, 2007

3.R.L. Williams and D.A. Lawrence, Linear State-Space Control Systems, John Wiley & Sons, 2007

0008114 电子技术实验-1

课程编码：0008114

课程名称：电子技术实验-1

英文名称：The Electronic Technology Experiment-1

课程类型：实践环节必修课

学分： 1.0 **总学时：** 32

面向对象：自动化、机器人工程、电子科学与技术（实验班）、微电子科学与工程（实验班）专业本科生

先修课程：模拟电子技术, 数字电子技术

考核形式：平时成绩+考试

撰写人：石婷

课程简介：（250-300 字）

电子技术实验-1 是信息学部为自动化、机器人工程、电子科学与技术（实验班）、微电子科学与工程（实验班）专业本科生开设的实践环节必修课。本课程的任务是通过电子实验知识、概念的学习，实验操作能力的培养，使学生加深对相关理论知识的理解，初步具备进行电子技术实验的能力。通过本课程，学生能够学会电子元器件、集成电路的识别、测试和使用知识，掌握常用电子设备和工具的使用方法，在完成几个单元实验的过程中，加深对理论知识的理解，建立实验的概念，为今后进行综合性设计和专业实验奠定坚实的基础。通过对实验中出现或可能出现的故障的分析和排除，培养学生分析问题、分解问题和解决问题的方法。教学内容重点是基础实验操作。教学内容的难点是焊接技术、电子设备元器件、单元实验。

推荐教材或主要参考书：

[1] 华成英，模拟电子技术基本教程，清华大学出版社，2018 年 7 月；

[2] 林涛、林彬、杨照辉，数字电子技术基础，清华大学出版社，2018 年 1 月；

[3] 摆玉龙，电子技术实验教程，清华大学出版社，2015 年 12 月；

0008114 The Electronic Technology Experiment-1

Course Number: 0008114

Course Title: The Electronic Technology Experiment-1

Course Type: Practice compulsory course

Credit: 1.0 **Total Credit Hours:** 32

Students: Undergraduate students majoring in Automation, Robotic Engineering, Electronic Science and Technology, and Microelectronics Science and Engineering

Prerequisites: Analog Electronics, Digital Electronics

Evaluation Method: Course participation + written exams

Writer： Shi Ting

Course Description:

Electronic Technology Experiment-1 is a practice compulsory course of information department for undergraduates majoring in automation, robotic engineering, electronic science and technology, and microelectronics science and engineering. The goal of this course is to deepen students' understanding of relevant theoretical knowledge. Make students have the initial ability to conduct electronic technology experiments through the study of theoretical knowledge of electronic experimental and the cultivation of experimental operation ability. Through this course, students can learn about the identification, testing and use of electronic components and integrated circuits, and master to use common electronic devices and tools. In the process of completing several typical experiments, students have deeper understanding of theoretical knowledge and build the concept of experimentation, which lays a solid foundation for comprehensive design and professional experiments in the future. Through the analysis and elimination of faults that appear or may occur during the experiment, students are cultivated to analyze, decompose and solve problems.

Teaching content focus: Basic experimental operation.

Difficulties in teaching content: Welding technology, Electronic equipment components, Unit experiments.

Recommended Textbooks/References:

1.Chengying Hua, Fundamentals of Analog Electronics, *Tsinghua University Press*, 07-2018

2.Tao Lin, Bin Lin, Zhaohui Yang, Fundamentals of Digital Electronics, *Tsinghua University Press*, 01-2018

3.Yulong Bai, The Course of Electronic Technology Experiment, *Tsinghua University Press*, 12-2015

0008115 电子技术实验-2

课程编码：0008115

课程名称：电子技术实验-2

英文名称：The Electronic Technology Experiment-2

课程类型：实践环节必修课

学分： 1.5 **总学时：** 48

面向对象：自动化专业、机器人工程专业本科生

先修课程：模拟电子技术, 数字电子技术

考核形式：平时成绩+考试

撰写人：石婷

课程简介：（250-300 字）

电子技术实验-2 是信息学部为自动化、机器人工程专业本科生开设的实践环节必修课。本课程的任务是通过讲课和实验，使学生进一步熟悉电子原材料的知识和电子仪器的使用方法，熟练掌握电子技术实验的方法，在设计实现综合型模块化题目的过程中，学会测量、记录、分析和调试，提高学生解决实际问题的能力，获得感知，积累经验。

教学内容重点：分别完成一个基于数字电子技术和模拟电子技术的课题设计。

教学内容的难点：学生综合运用电子技术知识解决工程问题的综合能力。

推荐教材或主要参考书：

[1] 华成英，模拟电子技术基本教程，清华大学出版社，2018 年 7 月；

[2] 林涛、林彬、杨照辉，数字电子技术基础，清华大学出版社，2018 年 1 月；

[1] 姚福安，徐向华，电子技术实验，清华大学出版社，2015 年 8 月；

0008115 The Electronic Technology Experiment-2

Course Number: 0008115

Course Title: The Electronic Technology Experiment-2

Course Type: Practice compulsory course

Credit: 1.5 **Total Credit Hours:** 48

Students: Undergraduate students majoring in Automation and Robotic Engineering

Prerequisites: Analog Electronics, Digital Electronics

Evaluation Method: Course participation + written exams

Writer： Shi Ting

Course Description:

Electronic Technology Experiment-2 is a practice compulsory course of information department for undergraduates majoring in automation and Robotic Engineering. The goal of this course is to make students further familiar with knowledge of electronic raw materials, the use of electronic instruments and master the method of electronic technology experiment through lectures and experiment. In the process of designing and implementing integrated modular topics, students learn how to measure, record, analyze and debug, improve the ability of solving practical problems, gain perception and accumulate experience.

Teaching content focus: Course design based on digital electronic technology and analog electronic technology.

Difficulties in teaching content: The comprehensive ability of students to solve engineering problems using electronic technical knowledge.

Recommended Textbooks/References:

1.Chengying Hua, Fundamentals of Analog Electronics, *Tsinghua University Press*, 07-2018

2.Tao Lin, Bin Lin, Zhaohui Yang, Fundamentals of Digital Electronics, *Tsinghua University Press*, 01-2018

3.Fuan Yao, Xianghua Xu, The Electronic Technology Experiment, *Tsinghua University Press*, 08-2015

0010750 嵌入式系统综合实践

课程编码：0010750

课程名称：嵌入式系统综合实践

英文名称：Embedded System Practice

课程类型：实践环节必修课

学分：2.0　**总学时：**60

面向对象：自动化专业、机器人工程专业本科生

先修课程：电路分析基础-1，电路分析基础-2，模拟电子技术，数字电子技术，微机原理与接口技术，高级语言程序设计

考核形式：平时成绩+实验+小课题实践开发考试

撰写人：陈双叶

课程简介：

“嵌入式系统综合实践”是信息学部为自动化专业和机器人工程专业本科生开设的实践环节必修课程。本课程的任务是使学生掌握必需的嵌入式系统设计理论、主流嵌入式系统硬件架构和嵌入式软件编程的技术、方法和工具,基本具备本领域分析问题解决问题的能力, 具备一定的工程实践能力,成为从事嵌入式系统设计与开发的应用型人才。

课程除要求学生掌握嵌入式系统的基本概念、理论及嵌入式系统的设计开发方法外，重点要求学生掌握面向实际应用需求的嵌入式系统软硬件设计技术，掌握分析、解决具体问题的思路和方法。继电工基础、模拟电子技术、数字电子技术、微机原理、C 语言程序设计方法等课程后，本课程从系统级要求学生以 ARM 嵌入式处理器为核心，综合利用所学专业课知识，针对每一特定问题设计具体的应用系统并通过实践验证，提高学生综合利用所学专业知识解决实际问题的能力。知识包括：GPIO 原理与综合应用；NVIC 原理与应用；TIMER 定时器原理与应用，USART 串行通讯原理与应用；PWM 原理与应用；A/D 与 D/A 原理、接口技术与综合应用；IIC 总线技术原理与应用；SPI 总线技术原理与应用；嵌入式系统综合创新课题设计。

推荐教材或主要参考书：

[1] 苏李果，宋丽著. STM32 嵌入式技术应用开发全案例实践. 北京: 人民邮电出版社, 2020.4

[2] 冯新宇著. ARM Cortex-M3 嵌入式系统原理及应用——STM32 系列微处理器体系结构、编程与项目实战. 北京: 清华大学出版社, 2020.6

[3] 王文成，胡应坤，胡智著. ARM Cortex-M4 嵌入式系统开发与实战. 北京: 北京航空航天大学出版社, 2021.4

[4] 王祖麟，陈明计，严寒亮，张斌等著，周立功编. ARM 嵌入式系统基础教程（第 2 版）. 北京: 北京航空航天大学出版社, 2018.9

[5] 喻金钱等编著. STM32F 系列 ARM Cortex-M3 核微控制器开发与应用. 北京: 清华大学出版社, 2011.4

[6] 廖义奎编著. STM32F207 高性能网络型 MCU 嵌入式系统设计. 北京: 北京航空航天大学出版社, 2012.9

[7] STM32F103XX 数据手册，意法半导体，2007.

[8] STM32F2XX 用户手册，意法半导体，2010.

0010750 Embedded System Practice

Course Number: 0010750

Course Title: Embedded System Practice

Course type: Practice compulsory course

Credit: 2.0 **Total Credit Hours:** 60

Students: Undergraduate students major in Automation and Robotic Engineering

Prerequisites: Fundamentals of circuit analysis, Analog electronic technology, Digital electronic technology, Microcomputer Principle and Interface Technology, High Level Language Programming

Evaluation Method: Usual performance, Experiment & Examination

Writer： Chen Shuangye

Course Description:

"Embedded system design and practice" is a Practice compulsory course offered by the Department of information science for undergraduates majoring in automation and robotic engineering. The task of this course is to enable students to master the necessary embedded system design theory, mainstream embedded system hardware architecture and embedded software programming technologies, methods and tools, basically have the ability to analyze and solve problems in this field, have certain engineering practice ability, and become application-oriented talents engaged in embedded system design and development.

In addition to requiring students to master the basic concepts and theories of embedded systems, as well as the design and development methods of embedded systems, the course focuses on requiring students to master the software and hardware design techniques of embedded systems that meet practical application needs, and to master the ideas and methods of analyzing and solving specific problems. After courses such as Electrical Fundamentals, Analog Electronic Technology, Digital Electronic Technology, Microcomputer Principles, and C Language Programming Methods, this course requires students to use ARM embedded processors as the core at the system level, comprehensively utilize their professional course knowledge, design specific application systems for each specific problem, and improve their ability to comprehensively use their professional knowledge to solve practical problems through practical verification. Knowledge includes: GPIO principles and comprehensive applications; NVIC principles and applications; TIMER timer principle and application, USART serial communication principle and application; PWM principle and application; A/D and D/A principles, interface technology, and comprehensive applications; The principle and application of IIC bus technology; The principle and application of SPI bus technology; Design of integrated innovation project for embedded systems.

Recommended Textbooks/References:

1. Su Liguo, Song Li. The Full Case Practice of Application and Development of STM32 Embedded Technology. Beijing: People's Posts and Telecommunications Press, April 2020.

2. Feng Xingyu. Arm Cortex-M3 Embedded System Principle and Application -- STM32 Series Microprocessor Architecture, Programming and Project Practice. Beijing: Tsinghua University Press, June 2020.

3. Wang Wencheng, Hu Yinkun, Hu Zi. Arm Cortex-M4 Embedded System Development and Actual Combat. Beijing: Beijing University of Aeronautics and Astronautics Press, April 2021.

4. Wang Zulin, Chen Mingji, Yan Hanliang, Zhang Bin, et al., edited by Zhou Ligong. ARM Embedded System Basic course (2nd Edition). Beijing: Beijing University of Aeronautics and Astronautics Press, September 2018.

5. Yu Jingqian et al. The Development and Application of STM32F Series Arm Cortex-M3 Core Microcontroller. Beijing: Tsinghua University Press, April 2011.

6. Liao Yikui. The Design of STM32F207 High Performance Network MCU Embedded Sstem. Beijing: Beijing University of Aeronautics and Astronautics Press, September 2012.

7. STM32F103xx Data Book, STMicroelectronics, 2007.

8. STM32F2xx user manual, STMicroelectronics, 2010.

0007260 认识实习

课程编码：0007260

课程名称：认识实习

英文名称：Cognitive Practice

课程类型：实践环节必修课

学分： 1.0 **总学时：** 30

面向对象：自动化专业、机器人工程专业本科生

先修课程：新生研讨课

考核形式： 平时成绩+报告

撰写人：奥顿

课程简介：（250-300 字）

认识实习是人工智能与自动化学院为自动化、机器人工程专业本科生开设的实践环节必修课，旨在学生学习专业课之前，让学生初步了解专业相关行业特色，及对专业知识的需求，激发学生学习专业课程的兴趣，增强学生学习的主观能动性，是学生在专业课学习中能够联系行业实际应用，为专业知识的学习奠定基础。认识实习通过报告、参观等活动，使学生了解专业相关的公司企业工作环境、工作内涵等，了解相关企业的市场情况及其与国内外同类企业的竞争能力，了解国内外行业的发展趋势，从而培养学生的社会责任感、职业道德和国际化视野。增强学生对专业前景的感知，为后继更好地规划学业，规划人生，奠定基础。

推荐教材或主要参考书：

[1] 戴先中，赵光宙. 自动化学科概论（第二版）. 高等教育出版社，2016 年 6 月

[2] 中国科学技术协会. 自动化学科路线图. 中国科学技术出版社，2020 年 10 月

0007260 Cognitive Practice

Course Number: 0007260

Course Title: Cognitive Practice

Course Type: Practice compulsory course

Credit: 1.0 **Total Credit Hours:** 30

Students: Undergraduate students majoring in Automation and Robotic Engineering

Prerequisites: Freshman Seminar

Evaluation Method: Course participation + report paper

Writer： Ao Dun

Course Description:

Cognition practice is a compulsory practical course for automation and robotic engineering undergraduates in the College of artificial intelligence and automation. It aims to enable students to preliminarily understand the characteristics of relevant industries and their needs for professional knowledge before learning professional courses, stimulate students' interest in learning professional courses and enhance students' subjective initiative in learning. It is that students can contact the practical application of the industry in the study of professional courses, so as to lay the foundation for the study of professional knowledge. Through reports, visits and other activities, students can understand the working environment and work connotation of companies and enterprises related to their majors, understand the market situation of relevant enterprises and their competitiveness with similar enterprises at home and abroad, and understand the development trend of industries at home and abroad, so as to cultivate students' sense of social responsibility, professional ethics and international vision. Enhance students' perception of professional prospects and lay a foundation for future generations to better plan their studies and life.

Recommended Textbooks/References:

1.Dai Xianzhong, Zhao Guangzhou, Introduction to automation (Second Edition). *Higher education press,* June 2016

2.China Association for science and technology, Road map of automation discipline. *China Science and Technology Press*, October 2020

0008436 检测技术实验

课程编码：0008436

课程名称：检测技术实验

英文名称：Detecting Technology Experiment

课程类型：实践环节必修课

学分： 1.0 **总学时：** 32

面向对象：自动化专业本科生

先修课程：电路分析基础-1，电路分析基础-2，模拟电子技术，数字电子技术

考核形式： 平时成绩+实际操作

撰写人：孙琰君

课程简介：（250-300 字）

检测技术实验课是信息学部为自动化专业本科生开设的实践类课程类型。本课程的任务是让学生在掌握信息的获取、变换、处理、传输和显示等方面的原理的同时，加强动手实验环节，在解决实际问题的过程中达到理论结合实践，牢固掌握系统的组成、原理、性能指标和评价方法等。教学内容重点：在了解各种传感器的原理、结构、转换电路掌握的基础上，通过实验分析、验证，掌握常用非电量测量方法的选择原则。教学内容的难点：检测系统的综合运用。

推荐教材或主要参考书：

[1] 检测与过控教研室，检测技术实验指导书，北京工业大学，2011 年 8 月

[2] 梁森，自动检测技术及应用，机械工业出版社，2006.10

[3] 张宏建，自动检测技术与装置，化工出版社，2004-7

[4] 樊尚春，传感器技术及应用，北京航空航天大学出版社，2004-8

[5] 张国忠，检测技术，中国计量出版社，1997-6

0008436 Detecting Technology Experiment

Course Number: 0008436

Course Title: Detecting Technology Experiment

Course Type: Practice compulsory course

Credit: 1.0 **Total Credit Hours:** 32

Students: Undergraduate students majoring in Automation

Prerequisites: Fundamentals of circuit analysis, Analog electronic technology, Digital electronic technology

Evaluation Method: Course participation + Real Practice

Writer： Sun Yanjun

Course Description:

Detecting Technology Experiment is one of the experimental courses for undergraduate students major in Automation. The main target of this course is to make the students to master not only the principle of information acquisition, transformation, processing, transmission and display, but also strengthen the practical experiment in the process of solving practical problems. So that students by combining theory and practice, can firmly grasp the system composition, principle, performance indicators and evaluation methods. This course is focus on the basis of understanding the principle ,structure and conversion circuit of various detection elements ,master the selection principle of common nonelectric quantity measurement methods through experimental analysis and verification . The difficulties of teaching contents are described as followings: comprehensive application of detection system.

Recommended Textbooks/References:

1.Teaching & Research Section of Detection & Process Control, Detection Technology Experiment Guide Book, Beijing University of Technology, 2011 August

2.Liang Sen, Automatic Detection Technology and Application, Mechanical Industry Press,2006.10

3.Zhang Hongjian, Automatic Detection Technology and Device, Chemical Industry Press,2004-7

4.Fan Shangchun, Sensor Technology and Applications, Beihang University Press,2004-8

5.Zhang Guozhong, Detection Technology, China Metrology Publishing House,1997-6

0007256 工作实习

课程编码：0007256

课程名称：工作实习

英文名称：Professional Practice

课程类型：实践环节必修课

学分： 4.0 **总学时：** 120

面向对象：自动化专业、机器人工程专业本科生

先修课程：新生研讨课，认识实习，模拟电子技术，数字电子技术，微机原理与接口技术，高级语言程序设计，自动控制原理

考核形式： 平时成绩+报告

撰写人：奥顿

课程简介：（250-300 字）

工作实习是人工智能与自动化学院为自动化、机器人工程专业本科生开设的实践环节必修课。学生通过为期四周的企业实习，熟悉企业文化和规章制度，强化人际交往能力和劳动纪律，了解企业运行模式，体会产品设计、生产或推广过程中需要考虑的成本、质量、品牌或法律问题等。熟悉自动化领域对人才知识构架的需求，为将来更好地适应社会和工作奠定基础。

推荐教材或主要参考书：

教材或参考资料根据实际实习内容选择

0007256 Professional Practice

Course Number: 0007256

Course Title: Professional Practice

Course Type: Practice compulsory course

Credit: 4.0 **Total Credit Hours:** 120

Students: Undergraduate students majoring in Automation and Robotic Engineering

Prerequisites: Freshman Seminar, Cognitive Practice, Analog electronic technology, Digital electronic technology, Microcomputer Principle and Interface Technology, High Level Language Programming, Automatic control principle

Evaluation Method: Course participation + report paper

Writer： Ao Dun

Course Description:

Work practice is a compulsory practical course for automation and robotic engineering undergraduates in the College of artificial intelligence and automation. Through a four week enterprise internship, students are familiar with the enterprise culture, rules and regulations, strengthen interpersonal communication ability and labor discipline, understand the enterprise operation mode, and experience the cost, quality, brand or legal issues that need to be considered in the process of product design, production or promotion. Be familiar with the demand for talent knowledge framework in the field of automation, so as to lay a foundation for better adapting to society and work in the future.

Recommended Textbooks/References:

Textbooks/Reference selected based on the actual practice content

0008111 毕业设计

课程编码：0008111

课程名称：毕业设计

英文名称：Graduation Design

课程类型：实践环节必修课

学分： 8.0 **总学时：** 480

面向对象：自动化专业、机器人工程专业本科生

先修课程：新生研讨课，模拟电子技术，数字电子技术，微机原理与接口技术，高级语言程序设计，自动控制原理，认识实习，工作实习

考核形式： 平时成绩+报告

撰写人：奥顿

课程简介：（250-300 字）

毕业设计是人工智能与自动化学院为自动化、机器人工程专业本科生开设的实践环节必修课，是本科教育阶段最后、但也是最重要的环节之一。它通过一个真实或虚拟课题的立项、调研、实施、总结（毕业论文）、汇报（毕业答辩），在对学生专业知识与实践能力进行综合考核基础上，完成对本专业学生专业相关工程项目能力的训练。 通过具有一定复杂性的自动化工程实际问题的解决，培养学生综合运用所学知识、理论和技能，问题抽象、建模、分析和解决的能力。通过考虑工程实践中的约束条件而设计方案，培养学生的学生独立思考、团队协作能力，及社会责任感和创新能力。通过毕业论文的撰写，使学生掌握科技论文撰写规范，强化学生归纳、总结与文字表达的能力。

推荐教材或主要参考书：

教材或参考材料根据具体课题选择

0008111 Graduation Design

Course Number: 0008111

Course Title: Graduation Design

Course Type: Practice compulsory course

Credit: 8.0 **Total Credit Hours:** 480

Students: Undergraduate students majoring in Automation and Robotic Engineering

Prerequisites: Freshman Seminar, Analog electronic technology, Digital electronic technology, Microcomputer Principle and Interface Technology, High Level Language Programming, Automatic control principle, Cognitive Practice, Professional Practice

Evaluation Method: Course participation + report paper

Writer： Ao Dun

Course Description:

Graduation design is a practical compulsory course set up by the College of artificial intelligence and automation for undergraduates majoring in automation and robotic engineering. It is the last but also one of the most important links in the undergraduate education stage. It completes the training of students' professional related engineering project ability on the basis of comprehensive assessment of students' professional knowledge and practical ability through the project establishment, investigation, implementation, summary (graduation thesis) and report (graduation defense) of a real or virtual subject. Through the solution of practical problems in automation engineering with certain complexity, cultivate students' ability to comprehensively use their learned knowledge, theory and skills and abstract, model, analyze and solve problems. The scheme is designed by considering the constraints in engineering practice to cultivate students' ability of independent thinking, teamwork, social responsibility and innovation. Through the writing of graduation thesis, students can master the writing standard of scientific and technological thesis and strengthen their ability of induction, summary and written expression.

Recommended Textbooks/References:

Textbooks/References selected according to specific topics

0010113 运动控制系统

课程编码：0010113

课程名称：运动控制系统

英文名称：Motion Control System

课程类型：学科基础选修课

学分： 3.5 **总学时：** 56

面向对象：自动化专业本科生

先修课程：自动控制原理，电路分析基础-1，电路分析基础-2，模拟电子技术，数字电子技术，微机原理与接口技术，高级语言程序设计

考核形式： 平时成绩+考试

撰写人：綦慧

课程简介：

“运动控制系统”是信息学院部为自动化专业本科生开设的学科基础选修课。本课程的任务是主要以交、直流电动机及驱动负载为控制对象，以功率变换装置为驱动执行机构，应用自动控制理论和功率电子学的相关知识，对各种交、直流调速系统的工作原理、性能分析和工程设计等方面进行讲授。教学内容重点在于围绕交、直流传动技术，讲授运动控制系统的运行性能分析和工程设计方法。教学内容的难点在于交流变频调速系统的性能分析与实现。要求学生掌握并能够综合运用所学理论知识，具备一定的工程分析和应用能力。

推荐教材或主要参考书：

[1] 杨耕. 电机与运动控制系统. 清华大学出版社，2014 年 3 月

[2] 阮毅. 运动控制系统. 清华大学出版社，2006 年 9 月

[3] 班华. 运动控制系统. 电子工业出版社，2019 年 1 月

0010113 Motion Control System

Course Number: 0010113

Course Title: Motion Control System

Course Type: Basic Elective Course

Credit: 3.5 **Total Credit Hours:** 56

Students: Undergraduate students majoring in Automation

Prerequisites: Automatic control principle，Fundamentals of circuit analysis, Analog electronic technology, Digital electronic technology, Microcomputer Principle and Interface Technology, High Level Language Programming

Evaluation Method: Course participation + written exams

Writer： Qi Hui

Course Description:

Motion Control System is one of the Information courses for undergraduate students Major in Automation. The main target of this course is to clarify the working principle, performance analysis and engineering design of AC and DC driving system. This course is focus on the motion control system performance analysis and engineering design methods. The teaching contents are mainly covered by the following aspects: DC driving system with single closed-loop speed control, DC driving system with double closed-loop speed &current control, AC variable-frequency driving system with constant voltage/frequency. The difficulties of teaching contents are described as followings: the AC variable frequency driving performance analysis and its realization. So the students are required to master and be able to comprehensively use the theoretical knowledge to get the engineering analysis and application ability.

Recommended Textbooks/References:

1.Yang Geng, Machine and Motion Control System. *Tsinghua University Press*, March 2014

2.Ruan Yi, Motion Control System. *Tsinghua University Press*, September 2006

3.Ban Hua, Motion Control System. *Electronic Industry Press*, January 2019

0001998 过程控制系统Ⅰ

课程编码：0001998

课程名称：过程控制系统Ⅰ

英文名称：Process Control SystemsⅠ

课程类型：学科基础选修课

学分：3.0　　**学时：**48

面向对象：自动化专业本科生

先修课程：自动控制原理，检测技术

考核形式：平时成绩+考试

撰写人：严爱军

课程简介：

过程控制系统 I 是信息学部为自动化专业本科生开设的学科基础选修课。本课程的任务是介绍过程控制系统的组成、特点及发展状况；对工业生产过程被控对象的数学模型讨论了建模方法；介绍了 PID 控制器的设计、选型与参数整定方法；论述了调节阀的流量特性、设计及选型；讨论了常用的复杂控制系统，如串级控制、补偿控制、比值控制、均匀控制、分程控制、选择性控制和解耦控制等系统的结构、分析、设计方法等；论述了计算机过程控制系统的组成与类型；最后介绍了过程控制的几个应用实例。通过本课程的学习和相关实验训练，使学生了解过程控制系统的设计步骤及相关内容，为实际自动化工程项目的设计、开发与实施打下基础。教学内容重点：过程建模、简单控制系统、复杂控制系统。教学内容的难点：机理法建模、简单控制系统设计、串级控制系统设计。

推荐教材或主要参考书：

[1] 严爱军, 张亚庭, 高学金. 过程控制系统. 北京：北京工业大学出版社, 2010 年 3 月.

[2] 慕延华，华臻，林忠海. 过程控制系统. 北京：清华大学出版社，2018 年 7 月.

[3] 俞金寿, 孙自强. 过程控制系统. 北京：机械工业出版社, 2008 年 8 月.

0001998 Process Control Systems Ⅰ

Course Number: 0001998

Course Title: Process Control Systems Ⅰ

Course Type: Basic Elective Course

Credit: 3.0 **Total Credit Hours:** 48

Students: Undergraduate students majoring in Automation

Prerequisites: Principle of Automation control, Measurement Technique

Evaluation Method: Course participation + written exams

Writer： Yan Aijun

Course Description:

Process Control Systems I is one of the basic elective courses for undergraduate students Automation in information control class. The main target of this course is to introduce the composition, characteristics and development of the process control system. It discusses the mathematical modeling method of the controlled object in the industrial production process and presents the design, selection and parameter tuning methods of PID controller; the control valve flow characteristics, design and selection are discussed; the structure, analysis and design methods of the system such as cascade control, compensation control, ratio control, homogeneous control, sequence control, selective control and decoupling control are also discussed; then several typical advanced control methods are introduced; moreover, the composition and types of computer process control system are discussed; at the end of the paper, some applied examples of process control are introduced. Through the study of this course and related experimental training, making students understand the process control system design steps and relevant contents，which lay the foundation for the design, development and implementation of the actual automation engineering project. The teaching contents are mainly covered by the following aspects: process modeling, simple control systems, and complex control systems. The difficulties of teaching contents are described as followings: process modeling by mechanism, simple control system design, and cascade control system design.

Recommended Textbooks/References:

1. Yan Aijun, Zhang Yating, Gao Xuejin. Process Control System. Beijing: Beijing Industrial University Press. 2010.

2. Mu Yanhua, Hua Zhen, Lin Zhonghai. Process Control System. Beijing: Tsinghua University Press, 2018.

3. Yu Jinshou, Sun Ziqiang. Process Control System. Beijing: Mechanical Industry Press. 2008.

0010097 运动控制实验

课程编码：0010097

课程名称：运动控制实验

英文名称：Motion Control Experiment

课程类型：学科基础选修课

学分： 1.5 **总学时：** 48

面向对象：自动化专业本科生

先修课程：模拟电子技术，数字电子技术，自动控制原理，运动控制系统

考核形式： 平时成绩+考试

攥写人：郑榜贵

课程简介：（250-300 字）

运动控制实验是信息学部为自动化专业本科生开设的学科基础选修课。通过本课程教学，要求学生理解交直流电机的结构和工作原理、交直流调速系统的原理和控制方法，掌握交直流调速系统的控制方案设计和系统软硬件调试方法。培养学生理论联系实际，应用电子技术、自动控制原理和运动控制系统等相关知识，验证分析交直流调速系统，以加深对所学理论知识的理解，掌握一定的工程设计方法。通过对交直流调速系统的单元部件测试、参数测定、控制器设计、系统仿真和调试，提高学生独立操作的实验设计能力，培养学生分析问题、解决问题和编制实验报告的能力。

推荐教材或主要参考书：

[1] 自动化实验中心，电机驱动与运动控制实验指导书

[2] 杨耕. 电机与运动控制系统. 清华大学出版社，2014 年 3 月

0010097 Motion Control Experiment

Course Number: 0010097

Course Title: Motion Control Experiment

Course Type: Basic Elective Course

Credit: 1.5 **Total Credit Hours:** 48

Students: Undergraduate students majoring in Automation

Prerequisites: Analog Electronic Technology, Digital Electronic Technology, Principle of automatic control, Motion Control System

Evaluation Method: Course participation + Final exams

Writer： Zheng Banggui

Course Description:

Motion Control Experiment is one of the basic elective courses for undergraduate students Major in Automation. Through the course teaching, students are required to understand the structure and working principle of AC and DC motor, the principle and control method of AC and DC speed regulating system, and master the control scheme design and system software and hardware debugging method of AC and DC speed regulating system. The students should be trained to connect theory with practice, and apply the relevant knowledge such as electronic technology, automatic control principle and motion control system to verify and analyze AC and DC speed regulating system, so as to deepen the understanding of the theoretical knowledge learned and master certain engineering design methods. Through the unit component test, parameter measurement, controller design, system simulation and debugging of AC and DC speed regulating system, the students' independent experimental design ability is improved, and the students' ability to analyze problems, solve problems and prepare experimental reports is cultivated.

Recommended Textbooks/References:

1. Automation Experiment Center, Experimental Instruction for Motion Control

2. Yang Geng, Machine and Motion Control System. *Tsinghua University Press*, March 2014

0010676 网络化控制系统设计

课程编码：0010676

课程名称：网络化控制系统设计

英文名称：Networked Control System Lab

课程类型：实践环节选修课

学分： 2.0 **总学时：** 60

面向对象：自动化专业本科生

先修课程：自动控制原理, 现代控制理论

考核形式：平时成绩+报告+答辩

撰写人：傅安琪

课程简介：

网络化系统管控是信息学部为自动化专业本科生开设的实践环节选修课，是一门综合设计实验课程。该课程将提供数个网络化控制系统应用平台，例如智能水分布系统、智能水输送系统，以供学生开展实验研究工作。学生将利用所学专业知识、掌握的文献检索能力，结合给定控制目标和实验平台相关材料，对实验平台系统进行系统建模和设计多种控制器并解决实际控制中出现的问题。实验结束后，学生需要撰写报告并展示工作成果，接受答辩。学生通过该课程，可以巩固加深所学的专业知识，提升解决实际问题和学术交流的能力，从而为进一步学术深造或是走向社会参加相关工作打下良好基础。

推荐教材或主要参考书：

[1] 郑大钟. 线性系统理论. 清华大学出版社，2002.10

[2] Andrew R. TeelRicardo G. SanfeliceRafal Goebel. Hybrid Control Systems. Springer，2011

[3] Alberto Bemporad, Maurice Heemels, Mikael Johansson. Networked Control Systems. Springer，2010

[4] F. Bullo, Lectures on Network Systems, Kindle Direct Publishing，2019

0010676 Networked Control System Lab

Course Number: 0010676

Course Title: Networked Control System Lab

Course Type: Practice elective course

Credit: 2.0 **Total Credit Hours:** 60

Students: Undergraduate students majoring in Automation

Prerequisites: Automatic Control, Modern Control Systems

Evaluation Method: Course participation + technical report + class defense

Writer： Fu Anqi

Course Description:

Networked Control System Lab is one of the practice elective course for undergraduate students Major in Automation. This course is organized by Faculty of Information Technology. This course is about control synthesis of several networked control systems, such as smart water distribution systems and smart water delivery systems. In this course, some materials about the testbeds and control objectives are given to the students first. The students are supposed to use these materials, together with what they have learnt during the past two years about systems and control, to achieve pre-given control objectives. During this procedure, the students will practice modeling the systems, identifying the parameters, designing several controllers, and analyzing the results. Afterward, the students will write technical reports about the whole procedure and the results, and present their reports in the class and receive defenses. After this course, the students are supposed to improve their discipline knowledges and practical skills greatly; meanwhile, their academic communication skill will be improved. All these would make the students be ready for the next stage's study and for the future's work.

Recommended Textbooks/References:

1.Dazhong Zheng. Linear System Theory. Tsinghua University Press，2002

2.Andrew R. TeelRicardo G. SanfeliceRafal Goebel. Hybrid Control Systems. Springer，2011

3.Alberto Bemporad, Maurice Heemels, Mikael Johansson. Networked Control Systems. Springer，2010

4.F. Bullo, Lectures on Network Systems, Kindle Direct Publishing，2019

0010088 多智能体系统控制设计

课程编码：0010088

课程名称：多智能体系统控制设计

英文名称：Design and Control of Multi-agent Systems

课程类型：实践环节选修课

学分：2.0　**总学时：**60

面向对象：自动化专业本科生

先修课程：智能控制技术，先进控制理论

考核形式：平时成绩+综合方案大报告

撰写人：辛乐

课程简介：（250-300 字）

多智能体系统控制设计是信息学部为自动化专业本科生开设的实践环节选修课。本课程的任务是配合智能控制技术、先进控制理论等课程，在实际应用环境中分析与解决多智能体协同控制算法性能的降低，甚至稳定性被破坏等问题，从而激发学生研究兴趣，增强学生创新实践能力。本课程的教学内容重点是通过学生自主动手设计无人驾驶控制系统、传感系统等模块，自主开发自动驾驶、环境识别、多车协同等算法。本课程教学内容的难点主要包括，建立关于 ROS 基本概念的认知体系，同时强化 ROS 编程操作流程，以及加强学生关于机器学习等智能技术的自主学习能力以及开发实践能力。

推荐教材或主要参考书：

[1] 胡春旭编著. ROS 机器人开发实践. 机械工业出版社. 2018

[2] 蔡自兴，陈白帆，刘丽珏等. 多移动机器人协同原理与技术. 北京：国防工业出版社，2011

[3] Lentin Joseph. Robot Operating System for Absolute Beginners: Robotics Programming Made Easy. Apress Press. 2018.

0010088 Design and Control of Multi-agent Systems

Course Number: 0010088

Course Title: Design and Control of Multi-agent Systems

Course Type: Practical elective course

Credit: 2.0 **Total Credit Hours:** 60

Students: Undergraduate students majoring in Automation

Prerequisites: Intelligent control technology, Advanced control theory

Evaluation Method: Course participation + Comprehensive report

Writer： Xin Le

Course Description:

Design and Control of Multi-agent System is one of the practical elective courses for undergraduate students Major in automation. The main target of this course is to analyze and solve the problems of multi-agent cooperative control algorithm, including performance reduction, even the stability is destroyed in the practical application environment, so as to stimulate students' interest in research and enhance students' innovative practice ability. This course is focus on the autonomous design of autonomous driving control system, sensor system and other modules by students, and the independent development of autonomous driving, environment recognition, multi vehicle cooperation and other algorithms. The difficulties of teaching contents mainly include the establishment of a cognitive system about the basic concepts of ROS, the strengthening of ROS programming operation process, and the strengthening of students' autonomous learning ability and development practice ability about intelligent technologies such as machine learning.

Recommended Textbooks/References:

1.Hu Chunxu. Robot Development and Practice base on ROS. China Machine Press, 2018

2.Cai Zixing, Chen Baifan, Liu lijue. Cooperative principle and technology of multiple mobile robots. Beijing: National Defense Industry Press, 2011

3.YoonSeok Pyo, HanCheol Cho, RyuWoon Jung, TaeHoon Lim. ROS Robot Programming：From the basic concept to practical programming and robot application. ROBOTIS Press. 2017.

0010096 过程控制系统设计

课程编码：0010096

课程名称：过程控制系统设计

英文名称：Process Control System Design

课程类型：实践环节选修课

学分： 1.0 **总学时：** 32

面向对象：自动化专业本科生

先修课程：自动控制原理，智能检测与控制技术，过程控制系统

考核形式： 平时成绩+考试

撰写人：韩华云

课程简介：（250-300 字）

过程控制系统设计是人工智能与自动化学院为自动化专业本科生开设的实践环节选修课。本课程的任务是引导学生深入理解自动控制理论与方法，明确检测技术的应用对象，分析复杂控制系统，设计并实现过程控制方案，掌握 PID 和前馈控制规律。教学内容包括：掌握过程控制系统中的单回路控制系统、串级控制系统、比值控制系统和前馈控制系统的基本概念、基本理论、基本方法；在系统级上认识自动控制理论与方法以及检测技术的应用对象，提升面向过程的自动控制系统的实践水平，增强系统分析能力。教学内容难点包括：掌握基本实验方法，通过简单控制系统、串级控制系统、比值控制系统和前馈控制系统的设计与整定，构建过程控制系统，实现过程控制的性能指标。

推荐教材或主要参考书：

[1] 严爱军，张亚庭，高学金，过程控制系统，北京工业大学出版社，2010 年 03 月.

[2] 胡寿松，自动控制原理，科学出版社，2019 年 02 月.

[3] 付华，徐耀松，王雨虹，智能检测与控制技术，电子工业出版社，2015 年 03 月.

0010096 Process Control System Design

Course Number: 0010096

Course Title: Process Control System Design

Course Type: Practice elective course

Credit: 1.0 **Total Credit Hours:** 32

Students: Undergraduate students majoring in Automation

Prerequisites: Principle of Automatic Control, Intelligent Detection and Control Technology, Process Control System

Evaluation Method: Course participation + written exams

Writer： Han Huayun

Course Description:

"Process Control System" is one of the practice elective courses for undergraduate students Major in Automation. The main target of this course is to guide students to deeply understand the theory and methods of automatic control, clarify the application objects of detection technology, analyze complex control systems, design and implement process control schemes, and master PID and feedforward control laws. The teaching contents are mainly covered by the following aspects: 1) mastering the basic concepts, basic theories and basic methods of the single-loop control system, cascade control system, ratio control system and feedforward control system in the process control system; 2) understanding the automatic control theory and method as well as detection at the system level, while devoting to improving the practice level of the process-oriented automatic control system and enhancing the system analysis ability of students. The difficulties of teaching contents are described as followings: mastering the basic experimental methods, constructing a process control system through the design and setting of a simple control system, a cascade control system, a ratio control system, and a feedforward control system to realize the performance index of process control.

Recommended Textbooks/References:

1.Aijun Yan, Yating Zhang, Xuejin Gao, Process Control System, *Beijing University of Technology Press*, March 2010.

2.Shousong Hu, Principle of Automatic Control, *Science Press*, February 2019.

3.Hua Fu, Yaosong Xu, Yuhong Wang, Intelligent Detection and Control Technology, *Publishing House of Electronics Industry*, March 2015.

0004924 信号与系统III

课程编码：0004924

课程名称：信号与系统III

英文名称：Signals and SystemsIII

课程类型：专业选修课、学科基础选修课

学分： 2.0 **总学时：** 32

面向对象：自动化专业、机器人工程专业本科生

先修课程：高等数学（工）、线性代数（工）

考核形式：平时成绩+考试

撰写人：代桂平

课程简介：（250-300 字）

信号与系统III是信息学部人工智能与自动化学院为自动化专业本科生开设的专业选修课、机器人工程专业的学科基础选修课。本课程的任务是讨论信号的分析方法以及线性时不变系统对信号的各种求解方法，通过一定的实例分析，向学生介绍一些工程应用中非常重要的概念、理论和方法。教学内容重点：学生应该能够掌握基本的信号分析的基本理论和方法，掌握线性时不变系统的各种描述方法，掌握线性时不变系统的时域和频域分析方法，掌握有关系统的稳定性、频响、因果性等工程应用中的一些重要结论。通过这门课程的学习，提高学生的分析问题和解决实际问题的能力。教学内容的难点：系统频域分析方法。

推荐教材或主要参考书：

[1] 郑君里，应启珩，杨为理，信号与系统（第 3 版），高等教育出版社，2011 年 3 月

[2] 奥本海姆，刘树棠译，信号与系统（第 2 版），电子工业出版社， 2013 年 9 月

[3] 张延华，刘鹏宇，信号与系统（第 2 版），机械工业出版社，2017 年 6 月

0004924 Signals and SystemsⅢ

Course Number: 0004924

Course Title: Signals and SystemsⅢ

Course Type: Professional elective courses、Basic Elective Course

Credit: 2.0 **Total Credit Hours:** 32

Students: Undergraduate students majoring in Automation, Robotic Engineering,

Prerequisites: Advanced mathematics、Linear algebra

Evaluation Method: Course participation + written exams

Writer： Dai Guiping

Course Description:

Signals and Systems is one of the professional elective courses for undergraduate students Major in Automation and one of the basic elective courses for undergraduate students major in robotic engineering.. The main target of this course is to discuss signal analysis methods and various solutions of linear time invariant system to signals. Through certain case analysis, some very important concepts, theories and methods in engineering application are introduced to students. Key teaching content: students should be able to master the basic theory and method of signal analysis, various description methods of linear time invariant system, time-domain and frequency-domain analysis methods of linear time invariant system, and some important conclusions in engineering applications such as system stability, frequency response and causality. Through the study of this course, improve the students' ability to analyze and solve practical problems. The difficulty of teaching content: system frequency domain analysis method.

Recommended Textbooks/References:

1.Zheng Junli, Ying Qiheng, Yang Weili, signals and systems (3rd Edition), higher education press, 3-2011

2.Oppenheim, translated by Liu Shutang, signals and systems (Second Edition), electronic industry press, 9-2013

3.Zhang Yanhua, Liu pengyu, signals and systems (Second Edition), china machine press, 6-2017

0007753 数字信号处理

课程编码：0007753

课程名称：数字信号处理

英文名称：Digital Signal Processing

课程类型：专业选修课

学分： 2.5 **总学时：** 40

面向对象：自动化、机器人工程专业本科生

先修课程：信号与系统，微机原理与接口技术，复变函数与积分变换

考核形式：平时成绩+考试

撰写人：李明爱

课程简介：

数字信号处理是信息学部为自动化和机器人工程专业本科生开设的一门人工智能选修课。本课程的任务是让学生掌握数字信号处理的基本理论、方法和技术。教学内容重点：包括离散时间信号、离散傅里叶变换及其快速计算算法、离散时间系统分析、数字滤波器(含IIR、FIR 滤波器)的设计与实现四个方面，并能够建立基本的数字信号处理模型，运用快速傅立叶变换（FFT）与数字滤波器两个主要工具进行信号的频谱分析、信号滤波和数字信号系统的分析。教学内容的难点：包括离散信号的频谱分析与频谱混叠，离散傅里叶级数与离散傅里叶变换的概念及相关关系，周期卷积、圆周卷积和线性卷积的区别与联系，IIR 数字滤波器的频率变换设计法，及 FIR 数字滤波器的窗函数设计法。

推荐教材或主要参考书：

[1] 胡广书. 数字信号处理导论（第 2 版）. 清华大学出版社，2013.5

[2] 陈后金，薛健，胡健, 李艳凤. 数字信号处理（第 3 版）. 高等教育出版社，2018.7

[3] 吴镇扬. 数字信号处理（第 3 版）. 高等教育出版社，2016.7

0007753 Digital Signal Processing

Course Number: 0007753

Course Title: Digital Signal Processing

Course Type: optional course

Credit: 2.5 **Total Credit Hours:** 40

Students: Undergraduate students majoring in Automation and Robotic Engineering

Prerequisites: Signal and System, Microcomputer Principle and Application, Complex Variable Functions and Integral Transformation

Evaluation Method: Course participation + written exams

Writer： Li Mingai

Course Description:

Digital Signal Processing is one of the optional courses for undergraduate students majoring in automation and robotic engineering. The main target of this course is to clarify the fundamental theory, method and technology of Digital Signal Processing. This course is focus on the analysis of discrete time signals and discrete time systems. The teaching contents are mainly covered by the following aspects: discrete time signal, Discrete Fourier Transform (DFT) and its fast computation algorithm, analysis of discrete system, design and implementation of Infinite Impulse Response (IIR) and Finite Impulse Response (FIR) digital filers. The difficulties of teaching contents are described as followings: spectral analysis and spectral aliasing, the relation between Discrete Fourier Series (DFS) and DFT, the differences among periodic convolution, circular convolution and linear convolution, the frequency transformation method for designing IIR filters and the window function method for designing FIR filters.

Recommended Textbooks/References:

1.Guanshu Hu. Intruduction of Digital Signal Processing (the second edition). *Tsinghua University* Press, 05-2013

2.Houjin Chen, Jian Xue, Jian Xue and Yanfeng Li. Digital Signal Processing (the third edition), *Higher Education* Press, 07-2018

3.Zhenyang Wu. Digital Signal Processing (the third edition), *Higher Education* Press, 07-2016

0010674 通信原理（双语）

课程编码：0010674

课程名称：通信原理（双语）

英文名称：Principle of Communications

课程类型：专业选修课

学分： 2.0 **总学时：** 32

面向对象：自动化专业本科生

先修课程：高等数学（工）、线性代数（工）

考核形式：平时成绩+考试

撰写人：傅安琪

课程简介：

通信原理是信息学部为自动化专业本科生开设的专业选修课。本课程的任务是结合自动化专业背景，介绍通信技术中物理层通信的最基本原理，使学生能了解通信的基本问题和内容，建立起点到点通信系统的基本知识框架，为解决自动化领域复杂工程问题提供良好的知识基础。学生应掌握的基本知识有：信道、模拟调制系统、数字基带传输、数字带通传输、模拟信号的数字传输、数字信号的最佳接收、同步原理、通信网，以及通信系统在自动化中的应用。通过本课程的学习，学生能够了解和掌握不同的通信技术的工作原理和特点，以及使用方法；能够针对涉及到通信交叉领域的自动化领域复杂工程问题，选用满足需求的通信技术，并使用相关工具进行适配，使用相关模拟仿真工具进行分析和预测。

推荐教材或主要参考书：

[1] 樊昌信. 通信原理 第 6 版. 国防工业出版社，2009 年 5 月

[2] 周炯槃. 通信原理 第 3 版. 北京邮电大学出版社，2008 年 8 月

[3] Leon W. Couch. Digital and Analog Communication Systems. Pearson，2013

0010674 Principle of Communications

Course Number: 0010674

Course Title: Principle of Communications

Course Type: Professional elective course

Credit: 2.0 **Total Credit Hours:** 32

Students: Undergraduate students majoring in Automation

Prerequisites: Linear Algebra, Calculus

Evaluation Method: Course participation + written exams

Writer： Fu Anqi

Course Description:

Principle of Communications is one of the professional electives courses for undergraduate students Major in Automation. This course is organized by Faculty of Information Technology. The main target of this course is to clarify the basic principles of communications. With this course, students are supposed to have a basic idea of the problems and contents about the physical layer of communications and thus has a frame of point-to-point communications. As a result, the students can have basic ideas about communications when facing complex and cross-discipline control engineer problems. This course focus on modulation and demodulation. The teaching contents are mainly covered by the following aspects: channels, analog modulation systems, digital baseband transmission, digital band transmission, digital transmission of analog signals, best reception of digital signals, synchronization principle, communication network, and applications of communications in networked control systems. After this course, the students can specify different communication technologies, and their applications. With the help of related toolboxes, students can analyze the communications in a control system and estimate its performances.

Recommended Textbooks/References:

1.Changxin Fan, Principle of Communications, National Defense Industry Press, 2009

2.Jiongpan Zhou, Principle of Communications, Beijing University of Posts and Telecommunications Press, 2008

3.Leon W. Couch. Digital and Analog Communication Systems. Pearson, 2013

0010052 C++程序设计

课程编码：0010052

课程名称：C++程序设计

英文名称：Programming principle and practice using C++

课程类型：专业选修课

学分： 2.0 **总学时：** 32

面向对象：自动化专业本科生

先修课程：高级语言程序设计、数据结构与算法、微机原理与接口技术

考核形式：平时成绩+实验+综合设计+考试

撰写人：李家军

课程简介：

“C++程序设计”是信息学部为自动化专业本科生开设的专业选修课程，本课程的任务是讲解面向对象分析与设计方法、c++语言面向对象程序设计的基础知识以及 Windows 程序设计基础的有关基本概念、基本原理和基本技术、MFC 编程方法，通过 Viusal c++集成开发环境的编程实践训练，培养学生结合实际问题背景应用所学理论知识及开发工具给出设计方案并具体实现的研究开发能力。要求学生掌握面向对象分析与设计、面向对象程序设计的基本概念、基本方法和基本技术。具体知识包括：UML 基本图形符号，用况图，类图，交互图，状态机图，类，继承，虚函数，窗口，窗口函数，事件驱动，设备上下文，GDI+，画笔，画刷，映射模式。具体技能包括利用 Visual studio IDE 创建应用程序项目，制作对话框、菜单等资源文件，以及编程调试的基本技能等。

教学内容的重点是：C++语言面向对象编程基础、Windows 程序设计基础、MFC 或.NET 窗体程序设计；教学难点是：如何将分立的原理知识点综合应用于具体任务的编程实践

推荐教材或主要参考书：

[1] C++面向对象与 Windows 程序设计技术（电子版本） 2019 年 9 月 李家军（作者将随教学年度更新教学内容保持与当前技术发展同步）

[2] Qt5 编程入门（第 2 版） 霍亚飞 程梁 北京航空航天大学出版社 2019 年 10 月

[3] Visual C++面向对象与可视化程序设计（第 4 版）》 黄维通 解辉 编著 高等教育出版社 2016 年 6 月；

[4] C++程序设计基础（第 5 版）上 周霭如 林伟健 编著 电子工业出版社 2016 年 5 月

[5] C++程序设计基础（第 5 版）下 徐红云 周霭如 黄小兵 编著 电子工业出版社 2016 年 5 月

[6] Professional C++,4th Edition，Marc Gregoiry ,影印版，徐志超等，清华大学出版社 2019 年 6 月

0010052 Programming principle and practice using C++

Course Number: 0010052

Course Title: Programming principle and practice using C++

Course Type: Professional elective course

Credit: 2.0 **Total Credit Hours:** 32

Students: Undergraduate students majoring in Automation

Prerequisites: Programming principle using High level programming language C , Data structure and Algrithm, Micro-computer principle and interface technology

Evaluation Method: Course participation + program design reports+project design report +Written Exam

Writer： Li Jiajun

Course Description:

Programming principle and practice using C++ is one of the speciality courses for undergraduate students Major in Automation. The main target of this course is to clarify the methodlogy of Object-oriented analysis and design ,Object-oriented programming principle using C++,the fundamental working principle of Window form program running on Microsoft Windows operating system, as well as MFC-based Visual C++ programming esentials. This course is focus on the training of the ability of solving practical design problem by comprehensive use of basics C++ Object-oriented programming language and the principle of Windows Form programming with the Visual studio IDE tool or equivalent development platform . The teaching contents are mainly covered by the following aspects: UML notations, use case diagram,interaction diagram,class diagram,object diagram,state machine diagram,class, object,inheritance, virtual function and dynamic binding,window and its handle,window procedure,event-driven programming mode, device context,graphics device programming interface plus,pen,brush,mapping mode between logical window and physical viewport. The concret techniques include creating appropriate project in visual studio IDE and editing source program,making resources such as dialog modal and menus,toolbar visually as well as debuging skills. The difficulties of teaching contents are described as followings:How to integrate each side of theoretical knowledge elements into a effective solution to change the design requirement into a runnable program..

Recommended Textbooks/References:

1.Lee Jiajun C++ Object-oriented Programming methodlogy and the Windows Programming design technology. (Electronic edition). Beijing University of technology September 2019(will be updated to keep with the advances of Microsoft visual studio timely).

2.Huo yafei,Chen Liang The introduction to Qt 5 programming , BaiHang University

Press,Ocober 2019

3.Huang Weitong,Xie Hui. Visual C++ Object-oriented and Visual programming (4th Editon). High Education Press, oct2016

4.Zhou airu,Lin WeiJian,The Fundamental of C++Programming 5th (Part A)Edition,May,2016

5.Xu HongYun,Zhou airu,Huang xiaobing The Fundamental of C++Programming 5th (Part B)Edition,May,2016

6.Marc Gregoire Professional C++,4th Edition, Willey Press , April 2018

0010064 智能优化方法

课程编码：0010064

课程名称：智能优化方法

英文名称：Intelligent Optimization Methods

课程类型：专业选修课

学分：2.5　**总学时：**40

面向对象：自动化专业本科生

先修课程：高等数学（工）、线性代数（工）、现代控制理论、人工智能导论

考核形式：平时成绩+期末成绩

撰写人：王鼎

课程简介：（250-300 字）

智能优化方法是面向自动化专业本科高年级学生开设的专业选修课，主要讲授智能优化的设计基础和实现方法。本课程的任务是介绍基本的最优化理论、计算方法及 MATLAB 实现，包括主要的经典优化方法，例如梯度法、牛顿法、最小二乘法、约束优化等，以及一些先进的智能优化方法，例如神经动态规划、遗传算法、粒子群算法等。教学内容的重点是经典优化与智能优化基本方法的介绍，难点是相关优化方法的算法特性分析。本课程将说明传统优化方法发展到智能优化方法的重要性，也将讨论这些算法的基本思想、设计步骤、改进方向以及 MATLAB 应用实例，为解决人工智能与自动化领域的复杂科学与工程问题提供有效的方法指导，也是进行信息科学与技术研究与开发的关键环节。

推荐教材或主要参考书：

[1] 孙志强, 白圣建, 郑永斌, 刘伟. 最优化导论(第四版). 电子工业出版社, 2015 年 10 月. 译自 Edwin K. P. Chong, Stanislaw H. Zak. An Introduction to Optimization (Fourth edition)

[2] 包子阳, 余继周, 杨杉. 智能优化算法及其 MATLAB 实例(第 2 版). 电子工业出版社, 2018 年 1 月

[3] 宋巨龙, 王香柯, 冯晓慧. 最优化方法. 西安电子科技大学出版社, 2012 年 9 月

[4] 李董辉, 童小娇, 万中. 数值最优化算法与理论(第二版). 科学出版社, 2010 年 2 月

[5] 王鼎. 不确定动态系统智能评判学习与控制. 科学出版社, 2020 年 1 月

0010064 Intelligent Optimization Methods

Course Number: 0010064

Course Title: Intelligent Optimization Methods

Course Type: Professional elective course

Credit: 2.5 **Total Credit Hours:** 40

Students: Undergraduate students majoring in Automation

Prerequisites: Advanced Mathematics, Linear Algebra, Modern Control Theory, Introduction to Artificial Intelligence

Evaluation Method: Course participation + Final grade

Writer： Wang Ding

Course Description:

The course ‘‘Intelligent Optimization Methods’’, which includes the design bases and implementation approaches of intelligent optimization, is one of the Professional elective courses for undergraduate students major in Automation. The main target of this course is to clarify the basic optimization theory, computational methods, and MATLAB examples, involving the main classical optimization schemes, such as gradient method, Newton method, least square method, constrained optimization, etc. and several advanced intelligent optimization strategies, such as neural dynamic programming, genetic algorithm, particle swarm algorithm, etc. This course focuses on introducing the basic methods of classical and intelligent optimization, while the main difficulty is the algorithm property analysis of the related optimization approaches. In this course, the importance of developing intelligent optimization methods after the classical ones is shown. In addition, the derivation, basic idea, design steps, main improvements, and MATLAB examples are displayed, respectively. By studying this course, it is helpful to provide guides for solving complex science and technology problems in artificial intelligence and automation. In addition, it can be regarded as a core of the research and development of information science and technology.

Recommended Textbooks/References:

1. Zhiqiang Sun, Shengjian Bai, Yongbin Zheng, Wei Liu. An Introduction to Optimization (Fourth edition). Publishing House of Electronics Industry, October 2015. Translate from: Edwin K. P. Chong, Stanislaw H. Zak. An Introduction to Optimization (Fourth edition)

2. Ziyang Bao, Jizhou Yu, Shan Yang. Intelligent Optimization Algorithms with MATLAB Examples (Second edition). Publishing House of Electronics Industry, January 2018

3. Julong Song, Xiangke Wang, Xiaohui Feng. Optimization Methods. Xidian University Press, September 2012

4. Donghui Li, Xiaojiao Tong, Zhong Wan (Second edition). Numerical Optimization Algorithm and Theory. Science Press, February 2010

5. Ding Wang. Intelligent Critic Learning and Control for Uncertain Dynamic Systems. Science Press, January 2020

0010087 多元回归技术

课程编码：0010087

课程名称：多元回归技术

英文名称：Multiple Regression Technology

课程类型：专业选修课

学分： 2.5 **总学时：** 40

面向对象：自动化专业本科生

先修课程：高等数学（工）、线性代数（工）、概率论与数理统计（工）

考核形式：平时成绩+课堂汇报+期末报告

撰写人：高慧慧

课程简介：（250-300 字）

多元回归技术是信息学部为自动化专业本科生开设的实践环节选修课，是数据自动化选修课组的课程之一。本课程的任务是适应数据自动化的发展态势和需求，在数据分析实例中系统讲授论述多元回归分析的基本理论和技术应用，拓宽学生思维，培养学生应用回归技术等相关知识和理论，分析和解决自动化领域复杂问题的能力。教学内容重点：回归分析概述、一元线性回归、多元线性回归、回归诊断、模型选择、参数估计方法的改进、非线性回归、广义线性模型以及前沿回归方法等。教学内容的难点：如何建立适用于不同需求的有效回归模型，并对结果进行分析解释。

推荐教材或主要参考书：

[1] 何晓群，刘文卿. 应用回归分析（第 5 版）. 中国人民大学出版社，2019 年 7 月

[2] 刘超. 回归分析——方法、数据与 R 的应用. 高等教育出版社，2019 年 10 月

[3] [美] Samprit Chatterjee，Ali S.Hadi 著. 例解回归分析. 郑忠国，许静 译. 机械工业出版社，2013 年 8 月

0010087 Multiple Regression Technology

Course Number: 0010087

Course Title: Multiple Regression Technology

Course Type: Professional elective course

Credit: 2.5 **Total Credit Hours:** 40

Students: Undergraduate students majoring in Automation

Prerequisites: Advanced Mathematics (Engineering), Linear Algebra (Engineering), Probability Theory and Mathematical Statistics (Engineering)

Evaluation Method: Course participation + Course report + Final report

Writer： Gao Huihui

Course Description:

Multiple Regression Technology is one of the professional elective courses for undergraduate students Major in Automation, and one of the courses in the elective group of data automation. The main target of this course is to adapt to the development trend and needs of data automation, and systematically clarify the basic theories and technical applications of multiple regression analysis in data analysis examples. The focus of this course is to broaden students' thinking, and cultivate students' ability to apply regression technology and other related knowledge and theories to analyze and solve the complex problems in the field of Automation. The teaching contents are mainly covered by the following aspects: overview of regression analysis, unary linear regression, multiple linear regression, regression diagnosis, model selection, improvement of parameter estimation methods, nonlinear regression, generalized linear models, and frontier regression methods, etc. The difficulties of teaching contents are described as followings: establishment of different kinds of effective regression models suitable for different needs, and analysis and explanation of the model results.

Recommended Textbooks/References:

1.He Xiaoqun, Liu Wenqing. Applied Regression Analysis (5th Edition). *Renmin University of China Press*, July 2019

2.Liu Chao. Regression Analysis—Methods, Data and the Application of R. *Higher Education Press*, October 2019

3.Samprit Chatterjee, Ali S. Hadi. Regression analysis by example. Zheng Zhongguo, Xu Jing Translation. *Mechanical Industry Press*, August 2013

0010739 信息物理系统建模与仿真

课程编码：0010739

课程名称：信息物理系统建模与仿真

英文名称：Cyber-Physical Systems: Modeling and Simulation

课程性质：专业选修课

学分： 2.0 **总学时：** 32

面向对象：自动化专业本科生

先修课程：智能检测与网联技术、现代控制理论、计算机网络与应用

考核形式：平时成绩+大作业

撰写人：张利国

课程简介：（250-300 字）

《信息物理系统建模与仿真》是信息学部为自动化专业本科生开设的专业选修课。信息物理系统是信息资源和物理世界充分融合且深度协作的新一代网络化智能系统，具有广泛的应用前景。本课程系统讲授信息物理系统的建模与仿真的基本原理、方法与应用，使学生掌握系统基础理论知识，培养学生综合运用理论与方法对信息物理应用系统进行建模、分析与控制设计的能力，为复杂工程项目的设计、开发与实施奠定基础。教学内容重点包括物理过程模型、有限状态机、计算、物理与信息变量之间的转换、数字网络、反馈控制设计等基础知识。教学内容的难点是将系统建模的基本原理与工程应用紧密结合，使学生能够设计集计算、通信与控制一体的实际信息物理系统。

推荐教材或主要参考书：

[1] Danda B. Rawat, Joel J.P.C. Rodrigues, Ivan Stojmenovic. Cyber-Physical Systems: From Theory to Practice. CRC Press, 2016.

[2] Houbing Song, Danda B. Rawat, Sabina Jeschke, Christian Brecher. Cyber-Physical Systems: Foundations, Principles and Applications. Academic Press, 2017.

[3] Rajeev Alur. Principles of Cyber-Physical Systems. MIT Press, 2015.

0010739 Cyber-Physical Systems: Modeling and Analysis

Course Number: 0010739

Course Title: Cyber-Physical Systems: Modeling and Simulation

Course Type: Professional selective course

Credit: 2.0 **Total Credit Hours:** 32

Students: Undergraduate students majoring in Automation

Prerequisites: Intelligent Detection and Networking Technology, Modern Control Theory, Computer Network and Application

Evaluation Method: Course participation + Project

Writer： Zhang Liguo

Course Description:

Cyber-Physical Systems: Modeling and Simulation is one of the professional elective courses for undergraduate students majoring in Automation. Cyber-physical system (CPS for short) is a new generation of networked intelligent system based on the integration and deep cooperation between information resources and the physical world, which has wide application prospects. This course systematically introduces the basic principles, methods, and applications of CPSs, and thus to make students master the relevant theoretical knowledge of CPSs, and to train students to be capable of modelling, analyzing, and control design of CPSs, so as to lay a foundation for the design, development and implementation of complex engineering projects. The teaching contents are mainly covered by the following aspects: models of physical process, finite state machines, computation, converters between physical and cyber variables, digital networks, and feedback control design. The difficulties of teaching contents are to combine the basic principles of CPSs with engineering applications, so as to make students be capable of designing practical CPSs that integrate computing, communication and control.

Recommended Textbooks/References:

1.Danda B. Rawat, Joel J.P.C. Rodrigues, Ivan Stojmenovic. Cyber-Physical Systems: From Theory to Practice. CRC Press, 2016.

2.Houbing Song, Danda B. Rawat, Sabina Jeschke, Christian Brecher. Cyber-Physical Systems: Foundations, Principles and Applications. Academic Press, 2017.

3.Rajeev Alur. Principles of Cyber-Physical Systems. MIT Press, 2015.

0010108 机器学习与模式识别

课程编码：0010108

课程名称：机器学习与模式识别

英文名称：Machine Learning and Pattern Recognition

课程类型：专业选修课

学分： 3.5 **总学时：** 56

面向对象：自动化专业本科生

先修课程：高等数学（工），线性代数（工），概率论与数理统计（工），高级语言程序设计

考核形式：平时成绩+考试

撰写人：施云惠、李敬华

课程简介：（250-300 字）

机器学习与模式识别是信息学部为自动化专业本科生开设的专业选修课程类型。本课程的任务是以理论为基础，以工程应用为目标，充分培养学生理论与实际相结合的能力、分析问题、解决问题和编程实践的能力。通过本课程的学习，将使学生掌握机器学习与模式识别的基本概念、基本原理和基本方法，特别是回归、分类、聚类、特征表示等常用算法的主要思想和应用方法。教学内容重点：线性回归、支持向量机、贝叶斯分类器、K 均值聚类、神经网络、主成分分析与降维以及稀疏表示算法的原理和应用。教学内容的难点：对算法思想的理解、算法的数学模型建模、参数求解及性能分析。

推荐教材或主要参考书：

[1]. 周志华，机器学习，清华大学出版社，2016 年 1 月

[2]. Cristopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006 年

[3]. Aurelien Geron. Hands-On Machine Learning with Scikit-Learn & TensorFlow, Oreilly, 2017 年 3 月

0010108 Pattern Recognition and Machine Learning

Course Number: 0010108

Course Title: Pattern Recognition and Machine Learning

Course Type: Professional elective course

Credit: 3.5 **Total Credit Hours:** 56

Students: Undergraduate students majoring in Automation

Prerequisites: Advanced mathematics, Linear algebra, Probability and statistics, Advanced Language Programming

Evaluation Method: Course participation + written exams

Writer： Shi Yunhui, Li Jinghua

Course Description:

Pattern Recognition and Machine Learning is one of the professional elective courses for undergraduate students Major in Automation. The main target of this course is to clarify basic concept, basic foundation and basic method of Pattern Recognition and Machine Learning for engineering application, especially the main idea and application of commonly used methods including regression, classification, clustering and feature representation, which is useful for cultivating the students' ability of analyzing and solving problems for engineering application. The teaching contents are mainly covered by the following aspects: linear regression, support vector machine, Bayes classifier, K-means clustering, neural network, principal component analysis and dimension reduction, and sparse representation. The difficulties of teaching contents are described as followings: the idea, mathematical modeling process, parameters solution and performance analysis for each method.

Recommended Textbooks/References:

1.Zhou zhihua, Machine Learning, Tsinghua University Press, 1-2016.

2.Cristopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.

3.Aurelien Geron. Hands-On Machine Learning with Scikit-Learn & TensorFlow, Oreilly, 3- 2017.

0010115 智能机器人系统

课程编码：0010115

课程名称：智能机器人系统

英文名称：Intelligent Robot Systems

课程性质：专业选修课

学分：3.0　　**总学时：**48

面向对象：自动化专业本科生

先修课程：线性代数（工）、大学物理Ⅰ、自动控制原理、高级语言程序设计、运动控制系统

考核形式：平时成绩 30%+期末考试 70%

撰写人：余攀

课程简介：

《智能机器人系统》是信息学部为自动化专业的本科生开设的专业选修课，以顺应当前机器人技术的快速发展以及人才的迫切需求。它是一门涉及自动控制、计算机编程、传感器技术、人工智能等的多学科融合技术课程。通过课程的学习，要求学生理解掌握机器人基础原理，掌握机器人的数学建模方法。在此基础上，能够对机器人系统进行轨迹规划和运动控制，培养学生综合运用所学专业知识解决实际工程问题的能力，为从事机器人工程领域的工作奠定基础。教学内容重点包括空间描述及变换、机器人运动学和动力学分析、轨迹规划、机器人运动控制、智能机器人系统的基本结构和组成等。教学内容难点有机器人运动学和动力学、轨迹规划和机器人运动控制。实验内容包括空间描述与变换、机器人正运动学/逆运动学、轨迹规划。

推荐教材及参考书：

[1] 实宗英. 机器人智能控制电子课件. 清华大学自动化系, 2012

[2] 蔡自兴, 谢斌. 机器人学（第三版）. 清华大学出版社，2015

[3] Craig J.J. 机器人学导论（中文版）. 北京: 机械工业出版社，2005

[4] Nika S.-B. 机器人学导论-分析、系统及应用. 北京: 电子工业出版社, 2004

[5] Spong Mark W, Vidyasagar M. Robot Dynamics and Control. John Wiley & Sons, 2008

0010115 Intelligent Robot Systems

Course Number: 0010115

Course Title: Intelligent Robot Systems

Course Type: Professional elective course

Credit: 3.0 **Total Credit Hours:** 48

Students: Undergraduate students majoring in Automation

Prerequisites: Linear Algebra、College Physics、Automatic Control Theory、Computer Programming、Motion Control System

Evaluation Method: Usual performance (30%) + Final exam (70%)

Writer： Yu Pan

Course Description:

《Intelligent Robot Systems》is one of the professional elective courses for undergraduate students majoring in Automation, to comply with the current rapid development of robotics technology and the urgent need for talents. It is a multi-disciplinary technology course involving Automation, Computer programming, Sensor technology, Artificial Intelligence, etc. The main target of this course is to clarify intelligent robot systems, enable students having a complete understanding of robots and their control systems, and help to build a foundation of robotic engineering. The capacity to solve practical problems is also cultivated. The teaching contents are mainly covered by the following aspects: spatial description and transformation, robotic kinematics and dynamics, trajectory planning, robotic motion control, basic structure and composition of intelligent robot systems. The difficulties of teaching contents are described as followings: robotic kinematics and dynamics, trajectory planning, and robotic motion control. The experimental contents include spatial description and transformation, robotic kinematics/inverse kinematics experiment, and robotic path planning.

Recommended Textbooks/References:

1. Shi Zongying. Electronic Courseware for Robot Intelligent Control. Department of Automation, Tsinghua University, 2012

2. Cai Zixing, Xie Bin. Robotics (Third Edition). Tsinghua University Press, 2015

3. Craig J.J. Introduction to Robotics (Chinese Edition). Beijing: Mechanical Industry Press, 2005

4. Nika S-B. Introduction to Robotics-Analysis, System and Application. Beijing: Electronic Industry Press, 2004

5. Spong Mark W, Vidyasagar M. Robot Dynamics and Control. John Wiley & Sons, 2008

0010067 大数据处理技术

课程编码：0010067

课程名称：大数据处理技术

英文名称： Big data processing technology

课程类型：专业选修课

学分： 2.5 **总学时：** 40

面向对象：自动化专业本科生

先修课程：高级语言程序设计

考核形式：平时成绩+课程设计

撰写人：张勇

课程简介：（250-300 字）

大数据处理技术是信息学部为自动化专业本科生开设的专业选修课程。本课程的主要任务是讲授大数据处理架构和基本实现，注重培养学生的动手能力。本课程的主要目的是培养学生如何利用 Hadoop 生态圈技术构建大数据系统架构并进行开发。通过本课程的教学，使学生加深对 Hadoop 技术的理解，并能使用 Hadoop 技术构建大数据系统架构。主要内容包括：围绕 Hadoop 生态圈相关系统介绍大数据处理架构，主要介绍 Hadoop 集群的搭建、分布式文件系统、分布式计算框架及其相关辅助系统，并以公交一卡通大数据为例介绍大数据系统的构建并进行开发。

推荐教材或主要参考书：

[1]. 黑马程序员. Hadoop 大数据技术原理与应用. 清华大学出版社. 2019.5

0010067 Big data processing technology

Course Number: 0010067

Course Title: Big data processing technology

Course Type: Professional elective course

Credit: 2.5 **Total Credit Hours:** 40

Students: Undergraduates majoring in Automation

Prerequisites: High-level Language Programming

Evaluation Method: Course participation + curriculum design

Writer： Zhang Yong

Course Description:

Big data processing technology is one of the professional elective courses offered for undergraduate students who majored in Artificial Intelligence. The main task of this course is to address the processing framework and basic realization of big data technoloy, which focuses on cultivating students' hands-on ability. The main purpose of this course is to train students how to use the Hadoop ecosystem technology to build a big data system architecture and do further data mining. Through the teaching of this course, students will deepen their understanding of Hadoop technology and be able to use Hadoop technology to build a big data system architecture. The teaching contents are mainly covered by the following aspects: the construction of big data processing framework according to related systems of the Hadoop ecosystem, the construction of Hadoop cluster, HDFS distributed file system, MapReduce distributed computing framework, related auxiliary systems, and construction as well as development of big data system by taking public transportation card big data as an example.

Recommended Textbooks/References:

1. Heima programmer. Principles and applications of Hadoop big data technology. Tsinghua University Press. 2019.5

0000815 智能控制技术

课程编码：0000815

课程名称：智能控制技术

英文名称：Intelligent Control Technology

课程类型：专业选修课

学分：2.0　**总学时：**32

面向对象：自动化、机器人工程专业本科生

先修课程：高等数学（工）、线性代数（工）、自动控制理论

考核形式：平时成绩+考试

撰写人：李晓理

课程简介：（250-300 字）

智能控制技术是信息学部为自动化和机器人工程专业本科生开设的专业限选课程。本课程的任务是学习智能控制的理论基础及相关技术。教学内容重点：模糊控制系统设计及神经网络结构及相应的控制器设计。在模糊控制系统设计中，首先学习由模糊集、模糊运算、模糊规则、模糊化、解模糊、模糊推理方法等知识点构成的模糊数学，接着学习模糊控制器及模糊控制系统设计；神经网络控制方面，首先学习感知器、反向传播网络的结构设计及神经网络训练方法，并通过具体生产过程控制问题学习神经网络控制系统的设计、仿真及开发。教学内容的难点：模糊控制器的设计，神经网络的权值学习与控制器设计。

推荐教材或主要参考书：

[1] 张乃尧, 阎平凡编著. 神经网络与模糊控制. 北京: 清华大学出版社, 1998 年 10 月

[2] 孙增圻,邓志东,张再兴编著.智能控制理论与技术.北京：清华大学出版社,2011 年 9 月

[3] 刘金琨编著.智能控制.北京：电子工业出版社,2009 年 7 月

[4] 罗兵,甘俊英,张建民编著.智能控制技术.北京：清华大学出版社,2011 年 3 月.

[5] 刘杰 等编著，智能控制与 MATLAB 实用技术. 北京：科学出版社， 2019 年 7 月

0000815 Intelligent Control Technology

Course Number: 0000815

Course Title: Intelligent Control Technology

Course Type: Professional elective course

Credit: 2.0 **Total Credit Hours:** 32

Students: Undergraduate students majoring in Automation and Robotic Engineering

Prerequisites: Advanced Mathematic, Linear Algebra, Principle of Automatic Control

Evaluation Method: Course participation + written exams

Writer： Li Xiaoli

Course Description:

Intelligent Control Technology is one of the Specialized Elective courses for undergraduate students major in automation and robotic engineering. The main target of this course is to clarify the theoretical basis and related technologies of intelligent control. This course is focus on fuzzy control system design, neural network structure and corresponding controller design. The teaching contents are mainly covered by the following aspects: first for the design of fuzzy control system(fuzzy mathematics of fuzzy sets, fuzzy operations, fuzzy rules, fuzziness, defuzzification, fuzzy reasoning methods and other knowledge points, and the design of fuzzy controller and fuzzy control system), then for the aspect of neural network control (the structure design of perceptron, back-propagation network and neural network training method, and design, simulation and development of neural network control system for specific production process control problems). The difficulties of teaching contents are described as followings: the design of fuzzy controller, the weight learning of neural network and the design of controller.

Recommended Textbooks/References:

1. Zhang Naiyao, Yan Pingfan. Neural Network and Fuzzy Control. Beijing: Tsinghua University Press, 1998,10.
2. Sun Zengqi, Deng Zhidong, Zhang Zaixing. Intelligent Control Theory and Technology. Beijing: Tsinghua University Press, 2011,9.
3. Liu Jinkun. Intelligent Control . Beijing: Publishing House of Electronics Industry, 2009,7.
4. Luo Bing, Gan Junying,Zhang Jianmin. Intelligent Control Technology. Beijing: Tsinghua University Press, 2011,3.
5. Liu Jie et al, Intelligent control and MATLAB practical technology. Beijing: Science Press, 2019，7

0010695 先进控制理论

课程编码：0010695

课程名称：先进控制理论

英文名称：Advanced Control Theory

课程类型：专业选修课

学分： 2.0 **总学时：** 32

面向对象：自动化、机器人工程专业本科生

先修课程：自动控制原理，现代控制理论

考核形式：平时成绩+考试

撰写人：于建均

课程简介：（250-300 字）

先进控制理论是信息学部为自动化专业以及机器人工程专业本科生开设的专业选修课。本课程的任务旨在巩固、深化、拓展学生自动控制系统的理论知识与技能，培养训练学生综合运用控制的理论与方法进行反馈控制系统分析与设计的能力，使学生较为全面了解、掌握当前在工程应用中成功或颇具前景的控制方法，为学生在本专业领域的进一步发展打下良好的理论基础与技能。教学内容重点：控制系统数学模型，控制系统的性能分析，输出反馈控制系统设计与校正，状态反馈系统设计，非线性控制系统分析与设计，数字控制系统分析与设计。教学内容的难点：掌握先进控制理论的思想方法；一般物理对象系统的数学模型的建立；综合运用先进的控制理论与方法进行控制系统的分析与设计。

推荐教材或主要参考书：

[1] 孙亮.自动控制原理（第三版）. 高等教育出版社，2011.06

[2] 多尔夫（美），毕晓普（美）.现代控制系统(第十二版)(英文版).电子工业出版社，2012 年 7 月

[3] 胡寿松. 自动控制原理(第七版).科学出版社，2019 年 2 月

[4] 于建均. 控制理论学习指导与习题精解. 北京工业大学出版社，2007 年 6 月

0010695 Advanced Control Theory

Course Number: 0010695

Course Title: Advanced Control Theory

Course Type: Professional elective course

Credit: 2.0 **Total Credit Hours:** 32

Students: Undergraduate students majoring in Automation and Robotic Engineering

Prerequisites: Automatic Control Theory, Modern Control Theory

Evaluation Method: Course participation + written examination

Writer： Yu Jianjun

Course Description:

Advanced Control Theory is one of the elective courses offered by the Faculty of Information Technology for undergraduate students Major in both Automation and Robotic Engineering. The main target of this course is to consolidate, deepen and expand the students' theoretical knowledge and skills of automatic control system, to cultivate and train the students' ability of analyzing and designing feedback control system, so that the students can comprehensively understand and master the successful or promising control methods for current engineering application, and lay a good theoretical foundation and skills for their further professional development. The main teaching contents include: the mathematical model of control system, control system performance analysis, output feedback control system design and correction, state feedback system design, nonlinear control system analysis and design, digital control system analysis and design. The difficulties of teaching contents include: to master the thoughts of the advanced control theory; to construct the mathematical model of any general physical object system; to apply the advanced control theories and methods for analyzing and designing any control system.

Recommended Textbooks/References:

1.Sun Liang, Principles of Automatic Control (Third Edition), Higher Education Press, 2011.06

2.Dorf (United States), Bishop (United States), Modern Control System (Twelfth Edition) (Chinese Edition), Electronic Industry Press, July 2012

3.Hu Shousong, Principles of Automatic Control (Seventh Edition). Science Press, February 2019

4.Yu Jianjun, Control theory study guidance and detailed exercises, Beijing University of Technology Press, June 2007

0009394 新生研讨课

课程编码：0009394

课程名称：新生研讨课

英文名称： Freshman Seminar

课程类型：自主课程

学分： 1.0 **总学时：** 16

面向对象：自动化专业本科生

先修课程：无

考核形式： 平时成绩+考试

撰写人：乔俊飞

课程简介：（250-300 字）

新生研讨课是人工智能与自动化学院为自动化专业本科生开设的自主课程。新生研讨课采用小班教学模式，授课方式包括课堂集中讲授、专题讨论、工程实践讲座、自动化技术调研等，一般应由本专业知名教授承担讲授任务。课程没有固定教材，内容涵盖自动化技术发展简史，自动化技术的作用与影响，自动化专业知识体系，自动化前沿技术与发展动态等。通过该课程的学习，使学生了解自动化专业的概貌和自动化技术的发展趋势，为后续专业学习奠定基础。

推荐教材或主要参考书：

[1] 戴先中，赵光宙. 自动化学科概论（第二版）. 高等教育出版社，2016 年 6 月

[2] 万百五. 自动化（专业）概论. 武汉理工大学出版社，2010 年 8 月

[3] 中国科学技术协会. 自动化学科路线图. 中国科学技术出版社，2020 年 10 月

0009394 Freshman Seminar

Course Number: 0009394

Course Title: Freshman Seminar

Course Type: Independent course

Credit: 1.0 **Total Credit Hours:** 16

Students: Undergraduate students majoring in Automation

Prerequisites:

Evaluation Method: Course participation + written exams

Writer： Qiao Junfei

Course Description:

Freshman Seminar is an independent course offered by the College of artificial intelligence and automation for undergraduates majoring in automation. Freshman Seminar adopts the small class teaching mode. The teaching methods include classroom centralized teaching, special discussion, engineering practice lecture, automation technology research, etc. Generally, the well-known professor of the specialty shall undertake the teaching task. There is no fixed textbook for the course.The content covers the brief history of the development of automation technology , the role and influence of automation technology, the professional knowledge system of automation, cutting-edge automation technology and development trends, etc. Through the study of this course, students can understand the overview of automation specialty and the development trend of automation technology, so as to lay a foundation for subsequent professional learning.

Recommended Textbooks/References:

1.Dai Xianzhong, Zhao Guangzhou, Introduction to automation (Second Edition). *Higher education press*, June 2016

2.Wan Baiwu, Introduction to automation (Major). *Wuhan University of Technology Press*, August 2010

3.China Association for science and technology, Road map of automation discipline. *China Science and Technology Press*, October 2020

0008336 人工智能导论

课程编码：0008336

课程名称：人工智能导论

英文名称：Introduction to Artificial Intelligence Technology

课程类型：自主课程

学分：2.0　　**总学时：**32

面向对象：自动化专业本科生

先修课程：高等数学（工）、概率论与数理统计（工）、离散数学、高级语言程序设计

考核形式：平时成绩+考试

撰写人：王立春

课程简介：（250-300 字）

人工智能导论是信息学部为自动化专业本科生开设的自主课程。本课程的任务是使学生初步掌握人工智能的一般性原理和主要技术，为进一步设计和实现智能控制系统提供必要的知识基础。教学内容重点包括：人工智能的定义与主要技术流派；图灵测试；状态空间表示；问题归约表示；谓词逻辑表示；A*算法；AO*算法；α-β剪枝搜索算法；局部优先搜索算法；归结原理的基本概念和方法；一阶谓词逻辑公式化成子句集；置换与合一；归结原理；Agent 要素和特性；Agent 结构；多 Agent 系统。教学内容难点有：图灵测试；谓词逻辑表示；A*算法；α-β剪枝搜索算法；局部优先搜索算法；置换概念和合一算法；Agent 结构。

推荐教材或主要参考书：

[1] 蔡自兴，刘丽钰，蔡京峰，陈白帆著，《人工智能及其应用》（第 5 版），清华大学出版社，2016.7.

[2] 马少平、朱小燕著，《人工智能》， 清华大学出版社，2004.8.

[3] Stephen Lucci，Danny Kopec 著,《人工智能》(第 2 版)， 林赐译，中国工信出版集团，人民邮电出版社，2018.10.

[4] David L.Poole, Alan K.Mackworth 著，《人工智能：计算 Agent 基础》，董红斌，董兴业，童向荣译，机械工业出版社，2015.1.

0008336 Introduction to Artificial Intelligence

Course Number: 0008336

Course Title: Introduction to Artificial Intelligence Technology

Course Type: Independent course

Credit: 2.0 **Total Credit Hours:** 32

Students: Undergraduate students majoring in automation

Prerequisites: Advanced Mathematics, Probability Theory and Mathematical Statistics, Discrete Mathematics, Programming with Advanced Language

Evaluation Method: Course participation + written exams

Writer： Wang Lichun

Course Description:

Introduction to Artificial Intelligence Technology is an independent course for the undergraduate students majored in automation, which is offered by the faculty of information technology. The main target of this course is to clarify general principles and important techniques of artificial intelligence, provide basis for designing and implementing intelligent control system. This course focuses on knowledge representation, searching, inference and automatic planning. The teaching contents are mainly covered by the following aspects: definition and major technical schools of artificial intelligence, Turing test, state space representation, problem reduction representation, predicate logical representation, A* algorithm, AO* algorithm, α-β pruning searching, local first search algorithm, concept and method of resolution principle, translating first order predicate logical formulas into a set of clauses, substitution and union, elements and characteristics of Agent, structure of Agent, Multiple Agent System. The difficulties of teaching contents are described as followings: Turing test, predicate logical representation, A* algorithm, α-β pruning searching, local first search algorithm, substitution and union, structure of Agent.

Recommended Textbooks/References:

1.Cai Zixing, Liu Liyu, Cai jingfeng, Chen Baifan, Artificial Intelligence: Principles & Applications (Fifth Edition), *Tsinghua University Press*, 2016.7.

2.Na Shaoping, Zhu Xiaoyan, Artificial Intelligence: Principles & Applications (Fifth Edition), *Tsinghua University Press*, 2004.8.

3.Stephen Lucci，Danny Kopec, Artificial Intelligence (Second Edition), translated by Lin Ci, *China Industry and Information Publishing Group, People's Post and Telecommunications Press*, 2018.10.

4.David L.Poole, Alan K.Mackworth, Artificial Intelligence Foundations of Computational Agents, translated by Dong Hongbin, Dong Xingye, Tong Xiangrong, *Machinery Industry Press*, 2015.1.

0010056 LabVIEW 与 MATLAB 仿真

课程编码：0010056

课程名称：LabVIEW 与 MATLAB 仿真

英文名称：Simulation based on LabVIEW and MATLAB

课程类型：自主课程

学分： 2 **总学时：** 32

面向对象：自动化专业本科生

先修课程：智能检测与网联技术，线性代数，自动控制原理等

考核形式： 平时+实验+期末（大报告）

课程简介：（250-300 字）

本课程是信息学部为自动化专业本科生开设的自主课程。本课程的任务是使学生学习和掌握 LabVIEW 和 MATLAB 仿真的相关知识以及方法与技巧，从而具备一定的分析和解决自动化领域复杂工程问题能力。教学内容重点：两种软件的基本功能和仿真应用。对于 LabVIEW，首先学习虚拟仪器的基本概念（前面板和程序框图），以及创建和调试虚拟仪器的主要工具（操作选板）；然后学习虚拟仪器的创建和编辑技术，以及虚拟仪器的运行和调试技术。对于 MATLAB，首先学习其基础知识，包括：矩阵和数组运算、绘图、M 文件和编程；然后学习基于该软件的控制系统仿真技术。教学内容难点：LabVIEW 虚拟仪器调试和 MATLAB 控制系统仿真。

推荐教材或主要参考书：

教材：

[1] 聂春艳, 王桔, 张万里等编著. MATLAB 和 LabVIEW 仿真技术及应用实例(第 2 版). 清华大学出版社, 2018 年 1 月

参考书：

[1] 龙华伟, 顾永刚编著. LabVIEW 8.2.1 与 DAQ 数据采集. 清华大学出版社, 2008 年 8 月

[2] 张志涌等编著. 精通 MATLAB 6.5 版. 北京航空航天大学出版社, 2003 年 3 月

0010056+ Simulation based on LabVIEW and MATLAB

Course Number: 0010056

Course Title: Simulation based on LabVIEW and MATLAB

Course Type: independent curriculum

Credit: 2 **Total Credit Hours:** 32

Students: Undergraduate students majoring in automation

Prerequisites: Intelligent detection and networking technology, Linear algebra, Principle of automatic control, etc

Evaluation Method: Course participation + laboratory experiments +final reports

Course Description:

Simulation based on LabVIEW and MATLAB is one of the independent courses for undergraduate students majoring in automation. The main target of this course is that the students learn and master the simulation knowledge and skills based on LabVIEW and MATLAB, and hence they can analyze and solve the complex engineering problems in the field of automation. This course focuses on the basic functions of LabVIEW and MATLAB and their applications to simulation. For LabVIEW, first introduce the basic concepts of virtual instrument (front panel and block diagram), and the main tools for creating and debugging virtual instruments (palettes); then introduce the techniques for creating and editing virtual instruments, and the techniques for running and debugging virtual instruments. For MATLAB, first introduce the basic knowledge, including: matrix and array operations, drawing, M files and programming; and then introduce the control system simulation technology based on this software. The difficulties of teaching contents are the debugging virtual instruments written by LabVIEW and the simulation of control systems based on MATLAB.

Recommended Textbooks/References:

1. Nie Chunyan, Wang Ju, Zhang Wanli, et al, MATLAB and LabVIEW: simulation techniques and applications (2nd Edition), *Tsinghua University Press*, January-2018
2. Long Huawei, Gu Yonggang, LabVIEW 8.2.1 and DAQ (data acquisition), *Tsinghua Univer - sity Press*, August-2008
3. Zhang Zhiyong, Mastering MATLAB 6.5, *Beihang University Press*, March-2003

0010663 学术写作课程

课程编码：0010663

课程名称：学术写作课程

英文名称：Academic Writing Course

课程类型：自主课程

学分： 1.0 **总学时：** 16

面向对象：自动化专业本科生

先修课程：

考核形式：平时成绩+报告

撰写人：奥顿

课程简介：（250-300 字）

学术写作课程是人工智能与自动化学院为自动化专业本科生开设的自主课程。本课程的任务是通过学习学术写作，为学生最后撰写毕业论文和发表科技论文打下良好基础，并掌握撰写毕业论文方法、技巧和能力。论文是展现研究成果的一种重要方式，也是科研工作者与同行交流的一个重要途经，学术论文写作方法和规范是学生应该掌握的基本知识和基本技能，为将来从事科学研究打下基础。并且掌握口头、书面与同行和相关人员进行有效沟通和交流的能力。教学内容重点：期刊评价标准，论文管理工具的使用，如何写综述，撰写开题报告，毕业论文的写作。教学内容的难点：论文管理工具的使用，摘要的主要内容，如何提取关键词。

推荐教材或主要参考书：

[1] 张孙玮，吕伯昇，张 迅. 科技论文写作入门(第五版). 化学工业出版社，2017 年 2 月

[2] Barbara Gastel，Robert A. Day 著，任志刚译. 科技论文写作与发表教程(第八版). 电子工业出版社，2018 年 1 月

[3] 闫茂德，左磊，杨盼盼等. 科技论文写作. 机械工业出版社，2021 年 3 月

0010663 Academic Writing Course

Course Number: 0010663

Course Title: Academic Writing Course

Course Type: Independent course

Credit: 1.0 **Total Credit Hours:** 16

Students: Undergraduate students majoring in Automation

Prerequisites:

Evaluation Method: Course participation + Report paper

Writer： Ao Dun

Course Description:

Academic writing course is an independent course offered by the College of artificial intelligence and automation for undergraduate students majoring in automation. The task of this course is to lay a good foundation for students to write graduation thesis and publish scientific papers, and master the methods, skills and ability of writing graduation thesis. Thesis is an important way to show research results, and it is also an important way for scientific researchers to communicate with their peers. The writing methods and norms of academic papers are the basic knowledge and skills that students should master, so as to lay a foundation for future scientific research. And master oral, written and peer and related personnel for effective communication and exchange ability. Teaching contents: journal evaluation standards, the use of paper management tools, how to write a review, write the opening report, graduation thesis writing. The difficulties of teaching content: the use of paper management tools, the main content of the abstract, how to extract keywords.

Recommended Textbooks/References:

1.Zhang Sunwei, Lv Bosheng, Zhang Xun. Introduction to the writing of scientific and Technological Papers (Fifth Edition). Chemical Industry Press, February 2017

2.Barbara Gastel, Robert A. day, translated by Ren Zhigang. A course on writing and publishing scientific papers (Eighth Edition). Electronic Industry Press, January2018

3.Yan Maode, Zuo Lei, Yang Panpan, etc. Scientific and technological paper writing. Mechanical Industry Press, March 2021

0010059 自动化前沿技术讲座

课程编码：0010059

课程名称：自动化前沿技术讲座

英文名称：Lectures on Automation Frontier Technology

课程类型：自主课程

学分： 1.0 **总学时：** 16

面向对象：自动化专业本科生

先修课程：自动控制原理、现代控制理论、运动控制/过程控制系统 I、高级语言程序设计、智能检测与网联技术、微机原理与接口技术、计算机网络及应用、新生研讨课

考核形式：平时成绩+汇报

撰写人：张利国

课程简介：（250-300 字）

自动化前沿技术讲座是人工智能与自动化学院为自动化专业本科生开设的自主课程。本课程是为自动化专业大学四年级学生所开设的综合性专业提高课程。主要内容是介绍自动化领域科学研究和技术的最新发展与前沿知识，包括智能检测与网联技术研究情况、智能控制技术进展、医疗自动化进展、经济管理自动化进展、大型企业的综合自动化系统进展，及智能机器人、人工智能等其他相关领域的研究进展和技术进步等。通过本课程的学习，使学生能更多地了解自动化领域面临的挑战和所要解决的主要问题，掌握自动化前沿理论研究和技术发展的动态，以开阔学生视野，增强学生的创新意识，提高学生的交流能力和分析问题、解决问题的能力。

推荐教材或主要参考书：

自主查阅和论坛内容相关的学术文献。

0010059 Lectures on Automation Frontier Technology

Course Number: 0010059

Course Title: Lectures on Automation Frontier Technology

Course Type: Independent course

Credit: 1.0 **Total Credit Hours:** 16

Students: Undergraduate students majoring in Automation

Prerequisites: Automatic control principle, Modern control theory, Motion control / Process control system I, Advanced language programming, Intelligent detection and Networking technology, Microcomputer principle and interface technology, Computer network and application, Freshmen Seminar

Evaluation Method: Course participation + report

Writer： Zhang Liguo

Course Description:

This course is an independent course for Senior Automation students. The main content is to introduce the latest development and cutting-edge knowledge of scientific research and technology in the field of automation, including the research situation of intelligent detection and networking technology, the progress of intelligent control technology, the progress of medical automation, the progress of economic management automation, the progress of integrated automation system in large enterprises, and the progress of intelligent robot, intelligent control technology Artificial intelligence and other related fields. Through the study of this course, students can learn more about the challenges faced by the automation field and the main problems to be solved, master the dynamics of the frontier theoretical research and technological development of automation, so as to broaden their horizons, enhance their sense of innovation, and improve their communication ability and the ability to analyze and solve problems.

Recommended Textbooks/References:

Independent access to academic literature related to the content of the forum.