目录

0007370 集合与图论

课程编码：0007370

课程名称：集合与图论

英文名称：Set Theory and Graph Theory

课程类型：学科基础必修课

学分： 2.5 **总学时：** 45

面向对象：计算机科学与技术（实验班）、计算机科学与技术专业、物联网工程专业本科生

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：同磊

课程简介：

《集合与图论》是离散数学的重要组成部分，广泛应用于计算机科学各个领域。本课程要求学生在掌握基本概念和理论的基础上，逐步培养并掌握计算学科的基本思维方法和研究方法，提高学生分析和解决问题的能力，使学生具备良好的科学素养和工程意识，能够运用基础知识和专业知识研究分析并最终解决复杂的工程问题。本课程的主要内容包括：集合的基本概念、集合的运算、容斥原理、鸽舍原理；二元关系、五大基本关系、等价关系、偏序关系、关系的运算、函数；图的基本概念、图的表示，赋权图的最短路径、有向树、无向树、欧拉图、哈密顿图、二部图、平面图。

推荐教材或主要参考书：

[1] 邓米克，邵学才，《离散数学》，清华大学出版社，2014

[2] 邵学才，邓米克等，《离散数学(第 2 版)》，电子工业出版社，2009

[3] 邵学才，叶秀明等，《离散数学(第 4 版)》，机械工业出版社，2011

[4] [美］Richard Johnsonbaugh 石纯一等译，《离散数学(第 7 版)》，人民邮电出版社，2009

[5] [美] Kenneth H. Rosen 著，徐六通等译，《离散数学及其应用(第 7 版)》，机械工业出版社，2015

[6] 左孝凌等，离散数学，上海科学技术文献出版社，2001

[7] 屈婉玲、耿素云、张立昂，《离散数学（第 2 版）》，清华大学出版社，2008

[8] 王元元，离散数学，机械工业出版社，2010

[9] Bemard Kolman, Robert C．Busby，Sharon Ross．Discrete Mathematical Structures，高等教育出版社，2001

0007370 Set Theory and Graph Theory

Course Number: 0007370

Course Title: Set Theory and Graph Theory

Course Type: Compulsory

Credit: 2.5 **Total Credit Hours:** 45

Students: Undergraduate students majoring in Computer Science, and Internet of Things Engineering

Prerequisites: Advanced mathematics、Linear algebra

Evaluation Method: Course participation + written exams

Writer: Lei Tong

Course Description:

Set Theory and Graph Theory is an important part of discrete mathematics and has been widely used in various fields of computer science. This course requires students to gradually develop and master the basic thinking methods and research methods of computer science; improve students' ability to analyze and solve problems, and enable students to have good scientific literacy and engineering awareness and be able to apply fundamentals and expertise to study, analyze and ultimately solve complex engineering problems. The main contents of this course include: basic concepts of sets, operations of sets, inclusion-exclusion principle, pigeon house principle; binary relations, five basic relations, equivalence relations, partial order relations, relational operations, functions; basic concepts of graphs, graph representation, shortest path of weighted graph, directed tree, undirected tree, Euler graph, Hamilton graph, bipartite graph, and planar graph.

Recommended Textbooks/References:

1. Deng Mike, Shao Xuecai. Discrete mathematics. Beijing: Tsinghua University Press, 2014
2. Shao Xuecai, Ye Xiuming et al. Discrete Mathematics (Fourth Edition). Beijing: Mechanical Industry Press, 2011
3. Shao Xuecai et al. Discrete Mathematics (Second Edition). Beijing: Publishing House of electronics industry, 2009
4. Richard Johnsonbaugh et al. Discrete Mathematics (Seventh Edition). The People's Posts and Telecommunications Press, 2009
5. Kenneth H. Rosen et al. Discrete Mathematics and Its Applications (Seventh Edition), Mechanical Industry Press, 2015
6. Zuo Xiaoling et al. Discrete Mathematics. Shanghai Scientific and Technological Literature Press, 2001
7. Qu Wanling, Geng Suyun, Zhang Li'ang, Discrete Mathematics(Second Edition), Tsinghua University Press, 2008
8. Wang Yuanyuan, Discrete Mathematics, Mechanical Industry Press, 2010
9. Bemard Kolman, Robert C．Busby，Sharon Ross．Discrete Mathematical Structures，Higher Education Press, 2001

0005686 数字逻辑Ⅰ

课程编码：0005686

课程名称：数字逻辑 I

英文名称：Digital Logic Ⅰ

课程类型：学科基础必修课

学分： 3.0 **总学时：** 48

面向对象：计算机类专业本科生

先修课程：模拟电子技术

考核形式： 平时成绩+考试

撰写人：王秀娟

课程简介：（250-300 字）

数字逻辑是计算机基础理论的一个重要组成部分,它为计算机组成原理等后续课程提供必要的逻辑基础。本课程的目标是要求学生掌握数字逻辑的基本概念和方法；掌握电路的抽象、分析、设计能力；掌握应用开发工具进行相应的仿真及应用的能力。课程的主要内容包括：必要的数制和码制知识，逻辑代数的基本定律、规则、常用公式、卡诺图，硬件描述语言的语法规则、三种基本建模方法，组合电路的分析与HDL设计，组合电路中的竞争与险象，触发器的工作原理、逻辑特性和硬件描述语言模型，典型时序电路的分析与HDL设计，基于状态机和HDL的一般同步时序电路的设计。

教学内容重点是逻辑代数的理论、知识，组合电路的分析与设计方法，同步时序电路的分析与设计方法，基于硬件描述语言的Verilog建模方法。教学内容难点是组合电路与时序电路的设计方法。

推荐教材或主要参考书：

[1] 王秀娟等. 数字逻辑基础与 Verilog 硬件描述语言（第 2 版）. 清华大学出版社，2020.6

[2] 彭建朝等. 数字电路的逻辑分析与设计. 北京工业大学出版社，2007.9

[3] M. Rafiquzzaman; Steven A. McNinch. Digital Logic: With an Introduction to Verilog and Fpga-Based Design. Wiley. 2019.9

0005686 Digital Logic Ⅰ

Course Number: 0005686

Course Title: Digital Logic Ⅰ

Course Type: Required course of subject basis

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

Students: Undergraduate students majoring in Computer class

Prerequisites: Analog circuit technology

Evaluation Method: Course participation + written exams

Writer: Wang Xiujuan

Course Description:

Digital Logic is one of the required courses of subject basis for undergraduate students Major in Computer class. The main target of this course is students mastering the basic concepts and methods of digital logic, mastering the abstraction, analysis, and design abilities of circuits and developing ability to apply development tools for corresponding simulations and applications. The teaching contents are mainly covered by the following aspects: numerical system and code system; the basic laws, basic rules and formulae commonly used of logic algebraic; Karnaugh map; grammatical rules of HDL; three basic modeling methods; the analysis of the combinational logic circuit and the HDL design; the hazard phenomenon in combination logic circuit; the operation principle of flip-flop; the logical performance and HDL model; the analysis of typical sequential circuits and HDL design; the design of general synchronous sequential logic circuits based on the state machine and HDL.

The teaching contents are mainly covered by the following aspects: Theory and knowledge of logic algebra, analysis and design method of combinational circuit, analysis and design method of synchronous sequential circuit, Verilog modeling method based on hardware description language. The difficulties of teaching contents are described as followings: Design method of combinational circuit and sequential circuit.

Recommended Textbooks/References:

1. WANG Xiujuan, WEI Jianhua, JIA Xibin The basis of digital logic and Verilog hardware description language (The second edition). *Beijing: Tsinghua University Press*, 2020
2. PENG Jianchao. Logic analysis and design of digital circuits. *Beijing: Beijing University of Technology Press*, 2007
3. M. Rafiquzzaman;Steven A. McNinch. Digital Logic: With an Introduction to Verilog and Fpga-Based Design. *Wiley*. 2019.9

0010734 模拟电子技术

课程编码：0010734

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： 2.0 **总学时：** 32

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业、信息安全（实验班）专业、物联网工程专业本科生

先修课程：电路分析基础-1

考核形式： 平时成绩+闭卷考试

撰写人：李硕朋

课程简介：（250-300 字）

模拟电子技术是信息学部计算机学院为计算机科学与技术、信息安全、物联网工程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模拟电子技术的基本理论和分析方法，培养学生模拟电子技术设计的创新精神、思维能力、分析和解决实际问题能力。教学内容重点是模拟电子技术的基本理论和基本分析方法。教学内容的难点是模拟电子电路的分析、设计方法。

推荐教材或主要参考书：

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

0010734 Analog Electronic Technology

Course Number: 0010734

Course Title: Analog Electronic Technology

Course Type: Subject basic compulsory course

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

Students: Undergraduate students majoring in Computer Science and Technology (Experimental class), Computer Science and Technology, Information Security (Experimental class), and Internet of things Engineering

Prerequisites: Fundamentals of Circuit Analysis

Evaluation Method: Course participation + written exams

Writer: Shuopeng Li

Course Description:

Analog electronic technology is a basic compulsory course offered by the School of Computer Science, Department of Information Techonology, for undergraduate students majoring in computer science and technology, information security, and Internet of Things engineering. The mission of this course is to enable students to master the basic theories and analysis methods of analog electronic technology, and to cultivate students' innovative spirit, thinking ability, analysis and practical problem-solving abilities in analog electronic technology design. The teaching content focuses on the basic theory and basic analysis methods of analog electronic technology. The difficulty of the teaching content is the analysis and design methods of analog electronic circuits.

Recommended Textbooks/References:

1. Tong shibai, Hua chengying. Fundamentals of Analog Electronics (Fifth Edition.). Higher Education Press. 2015

0008186 数据结构与算法

课程编码：0008186

课程名称：数据结构与算法

英文名称：Data Structure and Algorithm

课程类型：学科基础必修课

学分： 3.5 **总学时：** 56

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业、信息安全（实验班）、物联网工程专业本科生

先修课程：高级语言程序设计、集合与图论

考核形式：平时成绩+笔试

撰写人：杜永萍

课程简介：

数据结构与算法分析是为计算机科学与技术、物联网工程、信息安全专业本科生开设的必修课程类型，对于学生的专业能力的培养具有重要作用。本课程是面对非数值性处理问题形成的一门学科，其主要目的是培养学生的计算思维、系统分析与设计、算法设计与分析、程序设计与实现专业基本能力。主要内容涉及基本数据结构、排序、索引、检索、高级数据结构等内容，从逻辑结构的角度系统介绍线性表、字符串、二叉树、树和图等各种基本数据结构；从算法的角度系统地介绍各类排序、检索和索引算法；从应用的角度介绍更复杂的数据结构与算法分析技术。通过本课程的学习，学生应该掌握数据结构与算法的基本概念、合理组织数据的基本方法、高效处理数据的基本算法、并具备面对实际问题选择恰当数据结构与相应算法的能力。

推荐教材或主要参考书：

[1] 张铭、王腾蛟、赵海燕，数据结构与算法，高等教育出版社，2011 年 1 月。

[2] 严蔚敏、吴为民，数据结构（C 语言版），人民邮电出版社，2017 年 8 月。

[3] 张乃孝、裘宗燕，数据结构—C++与面向对象的途径，高等教育出版社，2003 年 4 月。

[4] Clifford A S. 数据结构与算法（C++）2 版，电子工业出版社，2010 年 1 月。

[5] Michael Main, Data Structures & Other Object Using C++(3Rd Edition)，清华大学出版社，2007 年 1 月。

0008186 Data Structure and Algorithm

Course Number: 0008186

Course Title: Data Structure and Algorithm

Course Type: Required Courses

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

Students: Undergraduate students majoring in Computer Science and Technology, Internet of Things Engineering, Information Security.

Prerequisites: High-level Language Programming, Data Structures and Algorithms

Evaluation Method: Course participation+written exam

Writer: Yongping Du

Course Description:

The Data Structure and Algorithm is one of the required courses for undergraduate students Major in the College of Computer Sciences of Faculty of Information Technology. This course faces non-numerical processing problems. The main target of this course is to clarify cultivating students' basic abilities in computational thinking, system analyzing and design, algorithm design and analyzing, program design and realization. The main content involves basic data structure, sorting, indexing, retrieval, advanced data structure, etc. From the perspective of logical structure, it systematically introduces various basic data structures such as linear tables, strings, binary trees, trees and graphs; systematically from the perspective of algorithms introduce various sorting, retrieval and indexing algorithms; introduce more complex data structures and algorithm analysis techniques from the perspective of application. Through the study of this course, students should master the basic concepts of data structures and algorithms, the basic methods of rationally organizing data, the basic algorithms for efficiently processing data, and the ability to choose appropriate data structures and corresponding algorithms in the face of practical problems.

Recommended Textbooks/References:

1. Zhang Ming,Wang Tengjiao, Zhao Haiyan. Data Structure and Algorithm. Beijing. Higher Education Press. 2011.1.
2. Yan Weimin, Wu Weiming. Data Structure(C). Tsinghua University Press，2017.8.
3. Zhang Naixiao, Qiu Zongyan. Data Structure - C++ and Object-Oriented Approach. Beijing, Higher Education Press. 2003.4.
4. Clifford A S. Data Structure and Algorithm（C++）(2nd Edition). Beijing. Publishing House of Electronics Industry. 2010.1.
5. Michael Main, Data Structures & Other Object Using C++(3rd Edition). Beijing, Tsinghua University Press. 2007.1.

0008191 代数与逻辑

课程编码：0008191

课程名称：代数与逻辑

英文名称：Algebraic Structure and Symbolic Logic

课程类型：学科基础必修课

学分：2.0　**总学时：**36

面向对象：计算机科学与技术（实验班）、计算机科学与技术专业、物联网工程专业本科生

先修课程：高等数学（工），线性代数（工），集合与图论

考核形式：　平时成绩+考试

撰写人：全笑梅、张婷

课程简介：

代数和逻辑被广泛应用在计算机各个领域，它们有助于优化程序的性能和兼容性，实现模块化、高效化编程。本课程要求学生在掌握基本概念和理论的基础上，逐步培养并掌握计算学科的基本思维方法和研究方法，提高学生的抽象思维和逻辑推理能力，使学生具备良好的科学素养和工程意识，能够运用基础知识和专业知识研究分析并最终解决复杂的工程问题。本课程的主要内容包括：命题逻辑和谓词逻辑的基本概念、逻辑等价式和逻辑蕴涵式、推理理论；代数系统的基本概念以及特殊的代数系统：群、环、域、格等，主要方法有：真值表法、逻辑推演法，包括直接法、间接法、抽象和演绎分析法、符号法、同构类比法等。

推荐教材或主要参考书：

[1] 邓米克，全笑梅，刘兆英等. 《离散数学教程（第 3 版）》电子工业出版社，2020.12

[2] 邓米克，邵学才. 《离散数学》. 清华大学出版社，2014.8

[3] 邵学才，叶秀明等.《离散数学(第 4 版)》.机械工业出版社，2011

[4] [美］Richard Johnsonbaugh，张文博等译，《离散数学(第 8 版)》，电子工业出版社，2020.4

[5] [美] Kenneth H. Rosen 著，徐六通等译，《离散数学及其应用(第 8 版)》，机械工业出版社，2020.1

[6] 屈婉玲、刘田、耿素云、张立昂，《离散数学（第 4 版）》，清华大学出版社，2022.9

0008191 Algebraic Structure and Symbolic Logic

Course Number: 0008191

Course Title: Algebraic Structure and Symbolic Logic

Course Type: Compulsory

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

Students: Undergraduate students majoring in Computer Science and Technology and Internet of Things Engineering

Prerequisites: Advanced Mathematics, Linear Algebra, Set Theory and Graph Theory

Evaluation Method: Course assignments and participation + written exams

Writer: Xiaomei Quan、Ting Zhang

Course Description:

Algebraic Structure and Symbolic Logic is used extensively in many fields of computer science. They help to optimize the performance and compatibility of programs to achieve modularization efficiently. The students are expected to understand the basic concepts, theories, methods, etc., based on which they can gradually get the computing mindset. This course intends to develop the students' ability to think in an abstract and logical way for complex engineering problem solutions. The basic topics include: Proposition and Predicate Logic, Logical Equivalence and Implication, Rules of Inference; Algebraic Structure, typical algebraic structures: Group, Ring, Field, Lattice, etc. The typical problem-solving methods included in the course are truth tables, rules for inference (direct/indirect methods), induction and deduction, symbolic method, isomorphic mapping, etc.

Recommended Textbooks/References:

1. Mike Deng, Xiaomei Quan, Zhaoying liu, etc. Discrete Mathematics (3rd edition), *PHEI*,2020.12
2. Mike Deng, Xuecai Shao, Discrete Mathematics, *Tsinghua University Press*, 2014.12
3. Xuecai Shao, Xiuming Ye, Discrete Mathematics (4th edition), *Machine Press*, 2011
4. Richard Johnsonbaugh, Discrete Mathematics (8nd edition), *PHEI*, 2020. 4
5. Kenneth H. Rosen, Discrete Mathematics and Its Applications (8th edition), *Machine Press*, 2020. 1
6. Wanling Qu, Tian Liu, Suyun Geng, Liang Zhang, Discrete Mathematics (4th edition), *Tsinghua University Press*, 2022. 9

0007739 计算机组成原理

课程编码：0007739

课程名称：计算机组成原理

英文名称：Principles of Computer Organization

课程类型：学科基础必修课

学分： 3.0 **总学时：** 48

面向对象：计算机类专业本科生

先修课程：数字逻辑

考核形式：平时成绩+考试

撰写人：朱文军

课程简介：（250-300 字）

计算机组成原理是信息学部为计算机科学与技术专业、信息安全专业、物联网工程专业本科生开设的一门学科基础必修课。本课程的任务是使学生深入理解计算机各功能部件的组成及实现原理，建立计算机整机概念，通过实例学习计算机系统的设计及其相关的技术，并掌握指令系统的功能、格式、寻址方式等基本概念。教学内容重点：计算机系统的硬软组成、计算机内部数据信息表示、数值运算方法、运算器原理、控制器原理及工作过程、存储器工作原理、存储器字位扩展、输入输入系统功能及常见控制方式。教学内容的难点：运算器原理、控制器原理及工作过程，存储器工作原理、存储器字位扩展。

推荐教材或主要参考书：

[1] 易小琳，朱文军，鲁鹏程，方娟，毛国君，计算机组成原理与汇编语言，清华大学出版社，2009 年 3 月

[2] [美] 戴维·A. 帕特森（David A. Patterson），约翰·L. 亨尼斯(John L. Hennessy)，计算机组成与设计：硬件、软件接口（英文版-原书第 4 版），机械工业出版社，2012 年 1 月

0007739 Principles of Computer Organization

Course Number: 0007739

Course Title: Principles of Computer Organization

Course Type: Compulsory course

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

Students: Undergraduate students majoring in Computer Science and Technology, Information Security, Internet of things Engineering

Prerequisites: Digital logic

Evaluation Method: Course participation + written exams

Writer: Zhu Wenjun

Course Description:

Principles of computer organization is one of the compulsory courses for undergraduate students Major in computer science and technology, information security and internet of things engineering. The main target of this course is to make students understand each functional unit, the composition and implementation principle of computer. This course is focus on making students grasp the design method of the computer system and its related technology, and master the function, format and addressing mode of the instruction system. The teaching contents are mainly covered by the following aspects: the hardware and software components of the computer system, the representation of the internal data information of the computer, the numerical operation method, the principle of the arithmetic unit, the principle and working process of the controller, the working principle of the memory, the expansion of the memory capacity, the functions of the input and output system and common control methods. The difficulties of teaching contents are described as followings: the principle of the arithmetic unit, the principle and working process of the controller, the working principle of the memory, the expansion of the memory capacity.

Recommended Textbooks/References:

1. Yi xiaolin, Zhu wenjun, Lu pengcheng, Fang juan, Mao guojun, Principles of Computer Organization and Assembly Language, *Tsinghua University Press*, 03-2009.
2. David.A.Patterson, John.L.Hennessy, Computer Organization and Design: The Hardware/Software Interface (Fourth Edition), *China Machine Press*, 01-2012.

0007359 操作系统原理

课程编码：0007359

课程名称：操作系统原理

英文名称：Principle of Operating System

课程类型：学科基础必修课

学分：3.0　　**学时：**48

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

先修课程：计算机组成原理、数据结构与算法

考核形式：笔试

撰写人：王丹

课程简介：

本课程是计算机科学与技术专业重要的专业课程。课程目的是使学生全面了解和掌握操作系统的基本概念、基本原理、基本方法、主要功能及资源分配策略，培养学生系统软件的分析和设计能力。具体知识包括操作系统相关概念、发展历史、双重模式、系统调用、进程、进程状态、进程控制块、IPC、线程、进程调度、调度算法、临界资源和临界区、同步硬件解决方案、信号量、经典 IPC 问题、进程通信、管程、死锁、重定位、连续内存分配、分页存储管理、分段存储管理、虚拟存储器、请求分页存储管理、页面分配和置换、请求分段存储管理、文件和文件系统、逻辑结构、访问控制方法、目录结构、目录实现、外存分配、I/O 系统结构和 I/O 设备类型、I/O 控制方式、缓冲、设备独立性、SPOOLing、设备驱动、磁盘结构和调度。

推荐教材或主要参考书：

[1] 西尔伯查茨(Abraham Silberschatz)，高尔文(Peter Bear Galvin)，加根(Greg Gagne).郑扣根译.操作系统概念：Java 实现（第 7 版）（翻译版）.高等教育出版社.2010

[2] Tanenbaum.A.S 著，陈向群，马洪兵译.现代操作系统 (原书第 3 版).机械工业出版社.2009

[3] 费翔林，骆斌，孙钟秀.操作系统教程（第 4 版）.高等教育出版社.2008

[4] William Stallings 著，陈向群，陈渝译.操作系统:精髓与设计原理(原书第 6 版).机械工业出版社.2010

0007359 Principle of Operating System

Course Number: 0007359

Course Title: Principle of Operating System

Course Type: Professional required course

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

Students: Undergraduate Students Major in Computer Science and Technology

Prerequisites: Principle of Computer Organization, Assembly Language, Data Structure and Algorithm

Evaluation Method: Written Exam

Writer： Wang Dan

Course Description:

This course is an important course for computer science and technology, information security and relative specialties. The aim of this course is to make students understand the basic theory, concepts and various management techniques of operating system, and cultivate their ability to analyze and design the system software. Detail knowledge include: operating system concept, history, dual model, system call, process, the states of process, process control block, IPC, thread, process scheduling, scheduling algorithm, critical resource and critical section, hardware solution to synchronization, semaphore, classical IPC problems, process communication, monitor, deadlock, relocation, contiguous memory allocation, paging memory management, segmentation memory management, virtual memory, demand paging, page allocation and replacement, demand segmentation, file and file system, logical structure, access control method, directory structure, directory implementation, storage allocation, I/O structure, I/O device, I/O control method, buffer, device independence, SPOOLing, device driver, disk structure and scheduling.

Recommended Textbooks/References:

1. Abraham Silberschatz, Peter Bear Galvin, Greg Gagn. Operating System Concept: Java Implementation. Higher Education Press. 2010
2. Tanenbaum.A.S. Modern Operating System.(3rd Edition). Mechanical Industry Publishing House. 2009
3. Fei Xianglin, Luo Bin, Sun Zhongxiu. Operating System Tutorials (4th Edition). Higher Education Press. 2008
4. William Stallings. Operating Systems Essentials and Design Theory (6th Edition). Mechanical Industry Publishing. 2010

0000345 数据库原理

课程编码：0000345

课程名称：数据库原理

英文名称：Database Systems Principles

课程类型：学科基础必修课

学分：3.0　　**学时：**48

面向对象：计算机科学与技术（实验班）、计算机科学与技术专业、物联网工程专业本科生

先修课程：集合与图论，代数与逻辑，数据结构与算法

考核形式：笔试

撰写人：杜金莲

课程简介：（200-300 字）

数据库原理课程的理论教学部分涉及到问题的抽象与归纳、逻辑思维、问题求解的方法与思路，其中的逻辑思维以及解决方案的多样性均有利于学生计算思维的训练。本课程通过概念模型建模、数据模型的建模、关系代数、范式理论等内容的教学，培养学生正确的思维方法，同时为软件技术开发打下坚实的理论基础，以利于将来在计算机领域中学习新的理论知识、从事科学研究工作。此外，数据库原理课程中数据库应用部分涉及软件开发能力的培养。数据库技术是大型软件开发的核心技术，也是目前许多新兴的数据库技术，如：大数据处理、流数据处理、分布式数据处理技术的基础。本课程通过关系型数据库的 SQL 语言、事务处理等内容的教学，培养学生的工程应用能力。对于计算机专业大类的本科生来说，本课程是理论与实践相结合紧密的、十分重要学科基础课程。

推荐教材或主要参考书：（含主编，教材名，出版社，出版日期）

[1] Jeffrey D. Ullman，Jennifer Widom.数据库系统基础教程（原书第 3 版）岳丽华 金培权 万寿红等译.北京：机械工业出版社.2009 年 8 月。

[2] 邝劲筠，杜金莲.数据库原理实践（SQL Server 2012）.北京：清华大学出版社.2015 年 7 月。

[3] Abraham Silberschatz ,Henry F.Korth ,S.Sudarshan. 数据库系统概念（原书第 5 版）杨冬青 、马秀莉、唐世渭等译.北京：机械工业出版社.2009 年 1 月。

[4] 李建中，王珊. 数据库系统原理（第 2 版）.北京： 电子工业出版社. 2007 年 5 月。

[5] 王珊，陈红著.数据库系统原理教程.北京：清华大学出版社.1998 年 7 月。

0000345 Database Systems Principles

Course Number: 0000345

Course Title: Database Systems Principles

Course Type: Professional required course

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

Students: Undergraduate students major in Computer

Prerequisites: Discrete Mathematics Data Structure& Algorithm Analysis

Evaluation Method: Written Exam

Writer： Du Jinlian

Course Description:

Database systems principle uses the methods of abstract, induction, logic thinking and problem solving. The diversity of problem solving makes for students' computational thinking training as well as the logic. The course helps students develop efficient competence in solving problems and software development by exercise conceptual modeling, data modeling, relation algebra, normal form, etc. It also helps students lay a solid theoretical basis to facilitate future learning new theory in the field of computer knowledge and engage in scientific research work.

Database technology is the core of large-scale software development technology. It contributes to the basis of many emerging technology, such as big data processing, streaming data processing, distributed data processing, etc. The course helps students develop the ability of engineering practice by learning SQL language, transaction processing. It is a combination of theory and practice and very important as a discipline basic course for computer science undergraduate students.

Recommended Textbooks/References:

1. Jeffrey D. Ullman，Jennifer Widom.A First Course in DatabaseSystem (3rd Edition) Yue LiHua, Jin Peiquan, Wan Shouhong Translated Beijing.：China Machine Press. 2009.
2. KuangJinyun, Du Jinlian. Database Principles Practice（SQL Server 2012）.Beijing：Tsinghua University Press. 2015.
3. Abraham Silberschatz, Henry F.Korth, S.Sudarshan. Database Systems Conception(5th Edition). Yang Dongqing, Maxiuli, Ttangshiwei Translated. Beijing: China Machine Press.2009.
4. Li Jianzhong，Wang Shan. Database Systems Principles(2nd Edition). Beijing： Electronic Industry Press. 2007.
5. Wang Shan, Chen Hong. Database Systems Principles Course. Beijing：Tsinghua University Press. 1998.

0005684 计算机网络

课程编码：0005684

课程名称：计算机网络

英文名称：Computer Networks

课程类型：学科基础必修课

学分： 2.5 **总学时：** 40

面向对象：计算机科学与技术、物联网工程专业本科生

先修课程：高级语言程序设计、数字逻辑 I

考核形式： 平时成绩+考试

撰写人：竹翠

课程简介：（250-300 字）

计算机网络是信息学部计算机学院为计算机科学与技术、物联网工程专业本科生开设的学科基础必修课程类型。计算机网络已经无处不在，互联网技术正成为世界经济发展的重要引擎，互联网也日益成为一个复杂的巨型系统，需要更多的网络技术人才。本课程的任务是使计算机类专业的本科学生掌握计算机网络的基本理论、基本原理和基本技术，了解网络新技术和新发展，使学生对分层模型系统加深整体认识，提升解决计算机网络问题和实际运用的能力。教学内容重点：网络体系结构与标准、分层模型中各层次的服务、功能、协议及工作原理和技术、主要网络设备的工作原理。教学内容难点：网络体系结构、路由算法、TCP/IP 协议、域名系统等。

推荐教材或主要参考书：

[1] ANDREW S.TANENBAUM 等著，潘爱民译，教材名称，计算机网络（第六版），清华大学出版社，2022 年 6 月

[2] 谢希仁著，计算机网络（第八版），电子工业出版社，2021 年 6 月

0005684 Computer Networks

Course Number: 0005684

Course Title: Computer Networks

Course Type: Professional required course

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

Students: Undergraduate students majoring in computer science and Internet of Things engineering

Prerequisites: Advanced Programming Language, Digital Logic

Evaluation Method: Course participation + written exams

Writer： Zhu Cui

Course Description:

Computer Networks is one of the professional required courses for undergraduate students Major in computer science and Internet of Things Engineering. Internet technology is becoming an important engine of world economic development, and the Internet has increasingly become a complex giant system, requiring more network technology talents. The task of this course is to enable undergraduate students of related majors to master the basic theory, principles and technologies of computer networks, understand new technologies and developments of networks. This course also aims to enable students to deepen their overall understanding of hierarchical systems, and improve their ability to solve computer network problems and apply them in practice. The teaching content of this course focuses on network architecture and standards, services and protocols of the hierarchical model, and how a typical network device works. The course difficulties include network architecture, routing algorithms, TCP/IP protocol, etc.

Recommended Textbooks/References:

1. Andrew S.Tanenbaum, Computer Networks (6th Edition), Tsinghua University Press, 6-2022

2. Xie Xi-ren, Computer Networks (8th Edition), Publishing House of Electronics Industry, 6-2021

0004859 计算机系统结构Ⅱ

课课程编码：0004859

课程名称：计算机系统结构Ⅱ

英文名称：Computer Architecture Ⅱ

课程性质：学科基础必修课

学分： 2 **总学时：** 32

面向对象：计算机科学与技术专业，物联网工程专业类本科生

先修课程：数字逻辑Ⅰ、计算机组成原理

考核形式： 平时成绩+考试

撰写人：高明霞

课程简介：（250-300 字）

计算机系统结构Ⅱ是信息学部为计算机科学与技术以及物联网工程专业本科生开设的学科基础必修课程。本课程的任务是通过学习这门课程，学生能掌握系统设计的核心理念和量化思考方式，可以针对计算机系统的瓶颈，运用计算机系统论、设计方法学分析、解决相关问题，从而具备了构建计算机系统复杂工程的能力。教学内容重点：计算机系统结构基本概念，指令系统及 RISC 技术，存储系统概念及 Cache 技术，流水线技术及各种相关，并行系统以及多级网络。教学内容的难点：由知识层面蕴含的技术以及思想培养学生从高层建筑的观点，应用算法、硬件、软件去综合考察、分析及设计计算机系统结构的能力，以及从性能价格比的观点去分析、评估一个计算机应用系统的能力。

推荐教材或主要参考书：

[1] 方娟. 《计算机系统结构（第 2 版）》. 北京：清华大学出版社，2021 年

[2] [美] 约翰·L. 亨尼斯(John L. Hennessy), 戴维·A. 帕特森（David A. Patterson）.《 计算机体系结构：量化研究方法（英文版·原书第 6 版）》. 机械工业出版社，2019 年

0004859 Computer Architecture Ⅱ

Course Number: 0004859

Course Title: Computer Architecture Ⅱ

Course Type: Professional required course

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

Students: Undergraduate students majoring in Computer Science and Technology and Internet of Things Engineering

Prerequisites: Digit Logic, Principles of Computer Organization

Evaluation Method: Course participation + written exams

Writer：Mingxia Gao

Course Description:

Computer Architecture Ⅱ is one of the Professional required course for undergraduate students Major in Computer Science and Technology and Internet of Things Engineering. The main target of this course is to enable students to master the basic concepts, basic theories, related technologies and latest trends of computer system structure, and understand how to achieve the best and most reasonable distribution of software and hardware functions, so as to master the structure, composition and realization of computer system as a whole. This course is focus on cache and pipeline technology. The teaching contents are mainly covered by the following aspects: basic concepts of computer system architecture, instruction system and RISC technology, storage system concept and cache technology, pipeline technology and various related technologies, parallel systems, and multi-level interconnection networks. The difficulties of teaching contents are described as followings: cultivate students' ability to comprehensively examine, analyze, and design computer system structures from the perspective of high-rise buildings, using algorithms, hardware, and software, as well as analyze and evaluate a computer application system from the perspective of cost-effectiveness, based on the technology and ideas contained in knowledge.

Recommended Textbooks/References:

1. Fangjuan. 《Computer System Architecture (2nd Edition)》. *Beijing: Tsinghua University Press*, 2021
2. John L John L. Hennessy, David A Patterson, David A Computer Architecture: Quantitative Research Methods (English Version Original Book 6th Edition) *Machinery Industry Press*, 2019

0003483 人工智能导论 I

课程编码：0003483

课程名称：人工智能导论 I

英文名称：Introduction to Artificial Intelligence

课程类型：学科基础必修课

学分：2.5 **总学时：**40

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

先修课程：集合与图论，代数与逻辑，数据结构与算法，高级语言程序设计

考核形式：平时成绩+考试

撰写人：冀俊忠

课程简介：（250-300 字）

人工智能是实现智能化社会的核心驱动力，智能时代的每一个科技进步和发展都离不开人工智能的相关原理和技术。本课程的目标是让学生了解人工智能的发展历史、基本概念和学科范畴，掌握人工智能的基本理论、原理和方法，培养学生进行智能系统算法设计及问题求解的能力并体验人工智能带来的乐趣。课程的主要内容包括知识表达和推理两方面，以搜索为技术主线贯穿整个课程内容。其中，知识表达方法包括产生式系统、语义网络、一阶谓词逻辑等。问题求解方法包括状态空间法、问题规约法、一般的图搜索方法、与或图搜索方法、博弈、基于归结原理的逻辑推理、计算智能和群体智能等算法。

推荐教材或主要参考书：

[1] 马少平、朱小燕，人工智能，清华大学出版社， 2004 年 8 月

[2] 陆汝钤，人工智能(上、下)，科学出版社， 2002 年 2 月

[3] Nilsson N J，Artificial Intelligence：A New Synthesis. Elsevier Publishers. 1998 年 4 月

[4] S. Russell，P. Norvig. Artificial Intelligence：A Modern Approach（Third Edition）. Pearson Education Inc. 2013 年 10 月

[5] 朱福喜，人工智能（第 3 版），清华大学出版社， 2020 年 7 月

0003483 Introduction to Artificial Intelligence

Course Number: 0003483

Course Title: Introduction to Artificial Intelligence

Course Type: Basic compulsory course

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

Students: Undergraduate students majoring in Computer Science and Technology

Prerequisites: Collection and graph theory, algebra and logic, data structures, advanced language program design

Evaluation Method: Course participation + written exams

Writer: Ji Junzhong

Course Description:

Artificial intelligence is the core driving force to achieve an intelligent society, and every scientific and technological progress and development in the intelligent era cannot be separated from the relevant principles and technologies of artificial intelligence. The goal of this course is to let students understand the development history, basic concepts and subject categories of artificial intelligence, master the basic theories, principles and methods of artificial intelligence, cultivate students' ability to design intelligent system algorithms and solve problems, and experience the fun brought by artificial intelligence. The main content of the course includes knowledge expression and reasoning, and the main line of search technology runs through the whole course content. Among them, knowledge representation methods include production system, semantic network, first-order predicate logic and so on. The problem solving methods include state space method, problem specification method, general graph search method, and or-graph search method, game, logical reasoning based on resolution principle, computational intelligence and swarm intelligence algorithms.

Recommended Textbooks/References:

1 Ma Shaopin, Zhu Xiaoyan. Artificial Intelligence. Tsinghua University Press. 08-2004.

2 Lu Ruqian. Artificial Intelligence. Science Press. 02-2002

3 Nilsson N J，Artificial Intelligence：A New Synthesis. Elsevier Publishers. 04-1998.

4 S. Russell，P. Norvig. Artificial Intelligence：A Modern Approach（Third Edition）. Pearson Education Inc. 10-2013.

5 Zhu Fuxi. Artificial Intelligence（Third Edition）. Tsinghua University Press. 07-2020

0005688 编译原理Ⅰ

课程编码：0005688

课程名称：编译原理Ⅰ

英文名称：Principles of Compiling

学分：3.5　　**总学时：**56

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

先修课程：高级语言程序设计、数据结构与算法分析

考核形式：笔试

撰写人：蒋宗礼

课程简介：

“编写编译器的原理和技术具有十分普遍的意义，以至于在每个计算机科学家的研究生涯中，有关原理和技术都会反复用到”。课程除要求学生掌握相关基本概念、理论外，还含有基本问题求解的典型思路和方法，继程序设计、数据结构与算法等课程后，再从系统级加深对程序和算法的再认识，提升计算机问题求解的水平，增强系统能力，体验实现自动计算的乐趣。知识包括语言的文法描述、词法分析、语法分析、语义分析、中间代码生成等，方法主要有：自顶向下、自底向上、逐步求精、递归求解，目标驱动，问题分析、问题的抽象与形式化描述，算法设计与实现，系统观、模块化等方法。

推荐教材或主要参考书：

[1] 蒋宗礼，姜守旭.编译原理.北京：高等教育出版社.2010

[2] Alfred Aho, Ravi Sethi, Jeffrey D. Ullman. Compilers: Principles, Techniques, and Tools.北京：人民邮电出版社.2002.

[3] 蒋宗礼，姜守旭.形式语言与自动机理论(第 2 版).北京：清华大学出版社.2013

0005688 Principles of Compiling

Course Number: 0005688

Course Title: Principles of Compiling

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

Students： Undergraduate students major in Computer Science and Technology

Prerequisites: High Level Language Programming; Data Structures and Algorithms Analysis

Evaluation Method: Written Exam

Writer： Jiang Zongli

Course Description:

The Principles of Compiling is one of the subject foundation requisite courses for undergraduate students major in Computer Science. High level language and grammar, lexical analysis, syntax analysis, attribute grammar and syntax-directed translation, intermediate code generating, symbol table management and Storage management are introduced in this course. The students are expected to understand the basic concepts, theories, methods, and techniques of compiler construction. The basic topics include: the structure of compiler, context-free grammar, the functions of scanner, description of token, the use of deterministic finite automata, top-down analysis, grammar reconstruction, LL(1), grammar, LL(1) analysis, recursively top-down analysis, bottom-up analysis, operator precedence grammar and operator precedence analysis, LR analysis, syntax-directed translation, attribute and its calculation, syntax-directed translation schemes, intermediate code, the translation of description sentence, the translation of assignment sentence, the translation of control sentence,. By the way, symbol table management and Storage management and optimization are briefly introduced. The typical problem solving methods included in the course are top-down, bottom-up, stepwise refinement, recursive, goal-driven, problem analysis, abstraction and formal description, system view, and modularization.

Recommended Textbooks/References:

1.JIANG Zongli, JIANG Shouxu. Compiler Principles and Techniques, *Higher Education Press*, 2010

2.Alfred Aho, Ravi Sethi, Jeffrey D. Ullman. Compilers: Principles, Techniques, and Tools. *Renmin Postal Press,* 2002

3.JIANG Zongli, JIANG Shouxu. Formal Languages and Automata Theory (3rd Edition). *Tsinghua University Press*, 2013

0004868 软件工程引论

课程编码：0004868

课程名称：软件工程引论

英文名称：Introduction to Software Engineering

课程性质：学科基础必修课

学分： 2.5 **总学时：** 40

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

先修课程：高级语言程序设计，数据结构与算法，数据库原理

考核形式： 平时成绩+考试

撰写人：付利华

课程简介：（250-300 字）

软件工程引论是信息学部为计算机科学与技术专业本科生开设的学科基础必修课程。本课程的任务是研究如何应用计算机科学、数学及管理等学科的理论来开发软件，它借鉴传统工程的原则、方法，以提高软件质量，降低软件开发成本为目的。课程主要讲授软件生存周期模型、需求分析、概要设计、详细设计、编码、软件质量与质量保证、项目计划与管理等。通过本课程的学习，可使学生了解软件工程发展的概况，掌握作为软件工程师必需了解的知识，包括软件工程学科的概念、技术与方法，以及如何运用软件工程的技术和方法。课程的学习使学生具备一定的实际软件系统设计、开发的能力，为从事软件工程实践和更深入地研究软件工程理论打下良好的基础。

推荐教材或主要参考书：

[1] Ian Sommervill. 彭鑫译. 软件工程. 北京：机械工业出版社，2018 年 2 月

[2] 郑人杰、马素霞、殷人昆编著. 软件工程概论. 北京：机械工业出版社，2020 年 1 月

[3] Stephen R.Schach. 邓迎春等译. 软件工程-面向对象和传统的方法. 北京：机械工业出版社，2012 年 1 月

0004868 Introduction to Software Engineering

Course Number: 0004868

Course Title: Introduction to Software Engineering

Course Type: Subject basic compulsory course

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

Students: Undergraduate students majoring in Computer science and technology

Prerequisites: High Language Programming, Data Structures and Algorithms, Database Systems Technology

Evaluation Method: Course participation + written exams

Writer：Fu Lihua

Course Description:

Introduction to Software engineering is one of the compulsory courses for undergraduates majoring in computer science and technology. Software engineering involves the theories, methods and tools of professional software development. Students should understand the basic concepts, theories, methods and techniques of software development. The basic topics include: the concepts of software lifecycle and software development model, software requirement analysis, system design, function design, coding and selection of programming language, software testing, software reuse, software maintenance, software project plan, software engineering management, software quality management, and software engineering environment, etc.

Recommended Textbooks/References:

1. Ian Sommerville. Software Engineering (ninth Edition). *China Machine Press*. 2-2018
2. Zheng Renjie, Ma Suxia, Yin Renkun. An Introduction to Software Engineering. *China Machine Press*. 01-2020
3. Stephen R.Schach. Object-Oriented and Classical Software Engineering (eighth Edition). *China Machine Press*. 01-2012

0008185 数字逻辑实验

课程编码：0008185

课程名称：数字逻辑实验

英文名称：Digital Logic Experiment

课程性质：实践环节必修课

学分： 1.0 **总学时：** 32

面向对象：计算机科学与技术（实验班）、计算机科学与技术专业本科生

先修课程：高级语言程序设计

考核形式：实验验收和实验报告

撰写人：鲁鹏程

课程简介：

数字逻辑实验是信息学部为计算机科学与技术专业本科生开设的一门实践环节必修课，课程中涉及的理论知识能够为后续的计算机组成原理、计算机系统结构等课程提供理论基础，实践中掌握的技能也可为后续硬件类实践课程提供必要的技术储备。本课程的目标是培养学生深入理解现代数字逻辑电路的分析和设计方法，能够利用先进 EDA 工具和硬件描述语言设计数字逻辑电路，从而巩固和加深数字逻辑课程中学到的理论知识，并具备调试电路、排除故障及解决实际问题的能力。课程的主要内容包括：利用 EDA 软件与硬件描述语言完成组合逻辑、存储器、计数器、状态机、简单和复杂接口等基本电路的设计与实现，并基于自顶向下的系统设计方法实现一个相对复杂的实用电路。

推荐教材或主要参考书：

[1] 数字逻辑实验课程组，《数字逻辑实验指导书》，自编，2020 年 10 月

[2] 王秀娟等，数字逻辑基础与 Verilog 硬件描述语言（第 2 版），清华大学出版社，2020 年 6 月

0008185 Digital Logic Experiment

Course Number: 0008185

Course Title: Digital Logic Experiment

Course Type: Compulsory Course in Practice

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

Students: Undergraduate students majoring in Computer Science and Technology

Prerequisites: Advanced Language Programming of Computer

Evaluation Method: Experimental acceptance check and Experimental report

Writer： Lu Pengcheng

Course Description:

Digital Logic Experiment is one of the compulsory courses for undergraduate students Major in Computer Science and Technology. The theoretical knowledge of the course can provide theoretical basis for subsequent courses such as Principles of Computer Organization and Computer Architecture, and the skills mastered in practice can also provide necessary technical reserves for subsequent hardware practical courses. The main target of this course is to clarify the analysis and design methods of modern digital logic circuits, cultivate students to use advanced EDA tools and hardware description languages to design digital logic circuits, thereby consolidating and deepening the theoretical knowledge learned in Digital Logic courses, and have the ability to debug circuits, troubleshoot, and solve practical problems. This course is focus on students' engineering practice abilities. The teaching contents are mainly covered by the following aspects: using EDA software and hardware description language to design and implement basic circuits such as combinational logic, memory, counters, state machines, simple and complex interfaces. In addition, it is also required to implement a relatively complex practical circuit design through a top-down system design method.

Recommended Textbooks/References:

1. Digital Logic Experiment Course Group, Digital Logic Experiment Instruction, self-edited, October 2020
2. Wang Xiujuan, Wei Jianhua, Jia Xibin, The basis of digital logic and Verilog hardware description language (The second edition), Tsinghua University Press, October 2020

0007375 计算机组成原理课设

课程编码：0007375

课程名称：计算机组成原理课设

英文名称：Principles of Computer Organization Project

课程类型：实践环节必修课

学分： 1.5 **总学时：** 45

面向对象：计算机类专业本科生

先修课程：计算机组成原理

考核形式：平时成绩+课设任务正确性检查成绩+课程设计报告

撰写人：朱文军

课程简介：（250-300 字）

计算机组成原理课设是信息学部为计算机科学与技术专业、信息安全专业、物联网工程专业本科生开设的一门实践环节必修课。本课程的任务是引导学生在系统级上认识计算机整机体系，理解并掌握计算机各核心组成部件的工作原理，加深对计算机“时空”概念的理解，使学生将理论课上学到的计算机组成的知识融会贯通，同时学习设计、实现及调试计算机整机系统的基本步骤和方法，提高分析问题和解决问题的能力，为提高学生的计算机硬件动手实践能力打下坚实的基础。教学内容重点：在 EDA 平台以及硬件实验箱上进行一台简单 MIPS 体系架构模型机的设计、封装和调试。教学内容的难点：模型机的设计和调试。

推荐教材或主要参考书：

1. [美] 戴维·A. 帕特森（David A. Patterson），约翰·L. 亨尼斯(John L. Hennessy)，计算机组成与设计：硬件、软件接口（英文版-原书第 4 版），机械工业出版社，2012 年 1 月

0007375 Principles of Computer Organization Project

Course Number: 0007375

Course Title: Principles of Computer Organization Project

Course Type: Practical compulsory course

Credit: 1.5 **Total Credit Hours:** 45

Students: Undergraduate students majoring in Computer Science and Technology, Information Security, Internet of things Engineering

Prerequisites: Principles of Computer Organization

Evaluation Method: Course participation + Task correctness check grade + Course design report

Writer：Zhu Wenjun

Course Description:

Principles of computer organization project is one of the practical compulsory courses for undergraduate students Major in computer science and technology, information security and internet of things engineering. The main target of this course is to guide students to know the whole computer system at the system level, understand and master the working principle of each component of the computer. This course is focus on deepening students' understanding of the concept of computer "space and time", enabling them to integrate the knowledge of computer composition learned in theoretical courses, and learn the basic steps and methods of designing, implementing, and debugging computer systems, improve the ability to analyze and solve problems, and lay a solid foundation for improving the students' hands-on computer hardware practical skills. The teaching contents are mainly covered by the following aspects: design, package and debug a simple MIPS architecture model machine on EDA platform and hardware experiment platform. The difficulties of teaching contents are described as followings: design and debugging of a model machine.

Recommended Textbooks/References:

1. David.A.Patterson, John.L.Hennessy, Computer Organization and Design: The Hardware/Software Interface (Fourth Edition), *China Machine Press*, 01-2012.

0002761 数据结构课设Ⅰ

课程编码：0002761

课程名称：数据结构课设Ⅰ

英文名称：Curriculum Design for Data Structure

课程类型：实践环节必修课

学分： 2.0 **总学时：** 60

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业、信息安全（实验班）专业、物联网工程专业本科生

先修课程：高级语言程序设计，数据结构与算法

考核形式：实验验收+课程设计报告

撰写人：杜永萍

课程简介：

数据结构课设是为计算机科学与技术、物联网工程、信息安全专业本科生开设的实践课程类型。本课程是一个综合性的实践教学环节，其目标是让学生运用所学数据结构知识上机解决与实际应用结合紧密的、规模较大的问题。通过分析、设计、编码、调试等各个环节的训练，使学生深刻理解、牢固掌握、综合应用数据结构和算法设计技术，增强分析、解决实际问题的能力，培养项目管理能力和团队合作精神等软件工作者的综合素质。课程设计所设计的题目，在难度和深度方面都大于课内的上机训练，要求最终提交一个具有一定实用价值、界面友好、功能完整、基本可靠的应用程序，从而体现数据结构与算法设计的重要作用。

推荐教材或主要参考书：

[1] 张铭、王腾蛟、赵海燕，数据结构与算法，高等教育出版社，2011 年 1 月。

[2] 严蔚敏、吴为民，数据结构（C 语言版），人民邮电出版社，2017 年 8 月。

[3] 张乃孝、裘宗燕，数据结构—C++与面向对象的途径，高等教育出版社，2003 年 4 月。

[4] Clifford A S. 数据结构与算法（C++）2 版，电子工业出版社，2010 年 1 月。

[5] Michael Main, Data Structures & Other Object Using C++(3Rd Edition)，清华大学出版社，2007 年 1 月。

0002761 Curriculum Design for Data Structure

Course Number: 0002761

Course Title: Curriculum Design for Data Structure

Course Type: Required Courses

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

Students: Undergraduate students majoring in Computer Science and Technology, Internet of Things Engineering, Information Security.

Prerequisites: High-level Language Programming, Data Structures and Algorithms

Evaluation Method: Project realization+Experimental Report

Writer: Yongping Du

Course Description:

The Curriculum Design for Data Structure is one of the practice courses for undergraduate students Major in the College of Computer Sciences of Faculty of Information Technology. The design practice for the data structure course is a comprehensive teaching practice process. The main target of this course is to clarify applying students' knowledge within the practical application of the close and the larger problem on the computer. During the training process of analysis, design, coding and debugging, the students can get a deep understanding of the algorithm and they can firmly grasp the comprehensive application of data structure and algorithm design techniques. It can enhance the ability of solve practical problems, and also develop project management capabilities and teamwork spirit.

Arrangements of the subject in curriculum design, it is greater than curricular-on training in terms of difficulty and depth. It is claimed to eventually submit a certain practical, user-friendly, full-featured and basic reliable application. It reflects the important role of the design on the data structures and algorithms.

Recommended Textbooks/References:

1. Zhang Ming,Wang Tengjiao, Zhao Haiyan. Data Structure and Algorithm. Beijing. Higher Education Press. 2011.1.
2. Yan Weimin, Wu Weiming. Data Structure(C). Tsinghua University Press，2017.8.
3. Zhang Naixiao, Qiu Zongyan. Data Structure - C++ and Object-Oriented Approach. Beijing, Higher Education Press. 2003.4.
4. Clifford A S. Data Structure and Algorithm（C++）(2nd Edition). Beijing. Publishing House of Electronics Industry. 2010.1.
5. Michael Main, Data Structures & Other Object Using C++(3rd Edition). Beijing, Tsinghua University Press. 2007.1.

0008190 计算机硬件类综合性课程设计

课程编码：0008190

课程名称：计算机硬件类综合性课程设计

英文名称：Comprehensive Projects of Computer Hardware

课程类型：实践环节必修课

学分：2.0　　**总学时：**60

面向对象：计算机科学与技术类本科生

先修课程：高级语言程序设计、数字逻辑、计算机组成原理、数据结构与算法

考核形式：设计和文档

撰写人：王宗侠

课程简介：

计算机硬件类综合性课程设计是信息学部计算机科学与技术系为计算机科学与技术专业本科生开设的实践环节必修课。它在前修的高级语言程序设计、数字逻辑、计算机组成原理、数据结构与算法等课程和实验的基础上，将计算机硬件相关理论与实践有机串联起来，使学生形成一个系统的概念，在一个具体工程实际项目的实现过程中培养学生的系统思维能力和工程实践能力。本课程培养的是“工程应用开发型”人才，要求学生基于提供的硬件核心开发板和多种功能模块，自行搭建一个处理器系统，在此基础上设计并实现一个具体的应用，以此强化学生的系统分析、设计和集成能力，培养良好的科研素质。

推荐教材或主要参考书：

[1] Louise Helen Crockett, Ross Elliot, Martin Enderwitz,等. The Zynq book : embedded processing with the ARM Cortex-A9 on the Xilinx Zynq-7000 all programmable SoC[M]. Strathclyde Academic Media, 2014 年 7 月

[2] 陆佳华, 潘祖龙, 彭竞宇. 嵌入式系统软硬件协同设计实战指南:基于 Xilinx Zynq (第 2 版)[M]. 北京: 机械工业出版社, 2014 年 7 月

[3] 何宾. Xilinx Zynq-7000 嵌入式系统设计与实现：基于 ARM Cortex-A9 双核处理器和 Vivado 的设计方法(第 2 版) [M]. 北京: 电子工业出版社, 2019 年 11 月

0008190 Comprehensive Projects of Computer Hardware

Course Number: 0008190

Course Title: Comprehensive Projects of Computer Hardware

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

Students: Undergraduate students majoring in Computer Science and Technology

Prerequisites: Advanced Language Programming, Digital Logic, Principles of Computer Composition, Data Structures and Algorithms

Evaluation Method: Design and Documents

Writer： Wang Zongxia

Course Description:

Comprehensive Projects of Computer Hardware is one of the compulsory practice courses for the undergraduates majoring in computer science and technology. Based on the courses and experiments of Advanced Language Programming, Digital Logic, Principles of Computer Composition, Data Structure and Algorithms, it connects theories related computer hardware with practice organically, so that students can form a systematic concept. Cultivate students' systematic thinking ability and engineering practice ability during the realization of a specific project. This course is to cultivate "engineering application development" talent. Students are required to build a processor system by oneself based on provided hardware core development board and various functional modules, and then design and implement a specific application on this basis to strengthen students' system analysis, design and integration abilities, and cultivate good scientific research qualities.

Recommended Textbooks/References:

[1] Louise Helen Crockett, Ross Elliot, Martin Enderwitz, etc. The Zynq book : embedded processing with the ARM Cortex-A9 on the Xilinx Zynq-7000 all programmable SoC[M]. Strathclyde Academic Media, July-2014

[2] Lu Jiahua, Pan Zulong, Peng Jingyu. Practical Guide for Embedded System Software and Hardware Co-design: Based on Xilinx Zynq (2nd Edition) [M]. Beijing: China Machinery Industry Press, July-2014

[3] He Bin. Xilinx Zynq-7000 Embedded System Design and Implementation: Design Method Based on ARM Cortex-A9 Dual-Core Processor and Vivado (2nd Edition) [M]. Beijing: Publishing House of Electronics Industry, November-2019

0008189 计算机软件类综合性课程设计

课程编码：0008189

课程名称：计算机软件类综合性课程设计

英文名称：Computer software comprehensive curriculum design

课程类型：实践环节必修课程

学分： 2.0 **总学时：** 60

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

先修课程：高级语言程序设计，数据结构与算法，数据库原理

考核形式：报告

撰写人：付利华

课程简介：（250-300 字）

计算机软件类综合性课程设计是信息学部为计算机科学与技术专业本科生开设的实践环节必修课程。软件综合课程设计目的是使学生进一步加深对软件工程中讲授的软件系统分析、设计、实现和测试的理解，增强学生系统软件分析、设计能力和实践能力。在课程设计过程中，学生不仅获得需求建模能力、程序设计与实现能力、项目管理能力以及团队协作能力等，而且学习各种开发技术包括结构化和面向对象的技术。学生将掌握如何利用工具进行大型软件系统的分析、设计、实现、测试和项目管理。该课程给学生提供了参与大规模系统设计与实现的机会。

推荐教材或主要参考书：

[1] Ian Sommervill. 彭鑫译. 软件工程. 北京：机械工业出版社，2018 年 2 月

[2] 郑人杰、马素霞、殷人昆编著. 软件工程概论. 北京：机械工业出版社，2020 年 1 月

[3] Stephen R.Schach. 邓迎春等译. 软件工程-面向对象和传统的方法. 北京：机械工业出版社，2012 年 1 月

0008189 Computer software comprehensive curriculum design

Course Number: 0008189

Course Title: Computer software comprehensive curriculum design

Course Type: Compulsory course in practice

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

Students: Undergraduate students major in computer science and technology and internet of things engineering

Prerequisites: High Language Programming, Data Structures and Algorithms, Database Systems Technology

Evaluation Method: project development report and presentation

Writer： Fu Lihua

Course Description:

Computer software comprehensive curriculum design is one of the required practical courses for undergraduates majoring in computer science and technology. Computer software comprehensive curriculum design aims at solving software development problems by using engineering methods and techniques. In the design process, students can not only acquire requirements modeling, program design and implementation, project management, teamwork and other abilities, but also learn a variety of development techniques based on structure and object orientation. In addition, students will master how to use tools for development, testing, and project management. This course also provides students with the opportunity to participate in the design and implementation of large complex systems.

Recommended Textbooks/References:

1. Ian Sommerville. Software Engineering (ninth Edition). *China Machine Press*. 2-2018
2. Zheng Renjie, Ma Suxia, Yin Renkun. An Introduction to Software Engineering. *China Machine Press*. 01-2020
3. Stephen R.Schach. Object-Oriented and Classical Software Engineering (eighth Edition). *China Machine Press*. 01-2012

0010117 计算机网络综合课设

课程编码：0010117

课程名称：计算机网络综合课设

英文名称：Comprehensive Course Design of Computer Network

课程类型：实践环节必修课

学分：1.5　　**总学时：**45

面向对象：计算机类专业本科生

先修课程：计算机网络

考核形式：设计方案+方案实施+实验报告

撰写人：任兴田，竹翠，包振山，王勇，陈锬

课程简介：

计算机网络综合课设是信息学部为计算机类专业本科生开设的一门实践环节必修课。本课程主要内容是建立网络环境，分析网络协议，以及设计与实现一个网络程序。

教学内容重点：常用网络设备的工作原理，静态路由配置，动态路由配置，网络协议分析，网络编程的基本方法和基本流程，网络协议的实现机制。

教学内容难点：路由器的模式，静态路由配置，IEEE 802.3 帧抓取，套接口编程。

推荐教材或主要参考书：（含主编，教材名，出版社，出版日期）

[1]任兴田，王勇，杨建红，计算机网络课程设计，清华大学出版社．2016

0010117 Comprehensive Course Design of Computer Network

Course Number: 0010117

Course Title: Comprehensive Course Design of Computer Network

Course Type: Practical Requirements

Credit: 1.5 **Total Credit Hours:** 45

Students: Undergraduate students major in Computer

Prerequisites: Computer Network

Evaluation Method: Design scheme + scheme implementation + experimental report

Writer： Xingtian Ren, Cui Zhu, Zhenshan Bao, Yong Wang, Tan Chen

Course Description:

Comprehensive Course Design of Computer Network is one of the practical requirement courses for undergraduate students Major in computer. The main target of this course is to set up a network environment, analyze network protocols, and design and implement a network program.

The teaching contents are mainly covered by the following aspects: the principles of common network devices, static routing configuration, dynamic routing configuration, network protocol analysis, basic methods and processes of network programming, and implementation mechanisms of network protocols.

The difficulties of teaching contents are described as followings: router modes, static routing configuration, IEEE 802.3 frame capture, and socket programming.

Recommended Textbooks/References:

1.Xingtian Ren, Yong Wang, Jianhong Yang, Course Design of Computer Network, Tsinghua University Press, 2016

0007366 工作实习

课程编码：0007366

课程名称：工作实习

英文名称：Work Practice

课程类型：实践环节必修课

学分： 4.0 **总学时：** 120

面向对象：计算机科学与技术（实验班）、计算机科学与技术专业本科生

考核形式： 考查

撰写人：杜金莲，王丹

课程简介：（250-300 字）

工作实习是信息学部计算机学院为计算机科学与技术专业本科生开设的实践环节必修课。工作实习是在第七学期，去学校指定企业进行一段时间的工作，参与企业实际项目的设计与开发、测试等工作。学生运用已经掌握的基础知识和专业知识，了解、研究、分析实际工程系统的设计、开发的实际复杂问题，并通过文献查阅、小组讨论、信息综合以获得有效结论，增强独立解决实际工程问题的能力以及团队协作能力和自学能力。通过实习帮助学生认识到自身的不足和知识短板，及时弥补，为毕业后真正走上工作岗位，积累经验，打好基础。教学内容重点：按任务书完成工作任务、完成总结报告撰写并通过答辩。教学内容的难点：较好地完成实习工作任务。

0007366 Work Practice

Course Number:0007366

Course Title: Work Practice

Course Type: Practical Requirements

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

Students: Undergraduate students majoring in computer science and technology

Evaluation Method: Examine

Writer： Du Jinlian Wang dan

Course Description:

Work Practice is one of the Compulsory course in practice courses for undergraduate students Major in computer science and technology. Work Practice is in the seventh semester, to the school designated enterprises for a period of time to work, to participate in the enterprise actual project design and development, testing and other work. Students use the basic knowledge and professional knowledge they have mastered to understand, study and analyze the actual complex problems in the design and development of practical engineering systems, and to obtain effective conclusions through literature review, group discussion and information synthesis, so as to enhance the ability to solve practical engineering problems independently, as well as the ability of teamwork and self-study.Through internship to help students realize their own shortcomings and knowledge deficiencies, make up in time, in order to really go to work after graduation, accumulate experience and lay a good foundation. Key points of the teaching content: complete the task according to the task book, write the summary report and pass the reply. The difficulty of the teaching content: to complete the internship task well.

0008184 毕业设计（论文）

课程编码：0008184

课程名称：毕业设计（论文）

英文名称：Graduation Project（Thesis）

课程类型：实践环节必修课

学分： 8.0 **总学时：** 480

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

考核形式： 导师评价+评阅人评价+答辩

撰写人：杜金莲 王丹

课程简介：（250-300 字）

毕业设计是重要的必修实践教学环节，在本专业的人才培养方案中，对保障学生达成毕业要求具有不可替代的作用。其基本目的在于通过课题选择与实施、撰写论文等实践活动，使学生进一步掌握本专业的基本知识、基本技术和基本方法，综合地、灵活地运用所学基础理论和专业技能解决计算机科学与技术学科和专业实际问题，并经历解决复杂工程问题的求解过程，从而得到全面训练。在此过程中重点培养学生针对实际的进行调查研究、查阅中外文献及相关资料，进行分析，并在此基础上能创新性的制定或设计计算问题的解决方案的能力，对方案进行实验和综合分析的能力以及总结提高的基本能力。

推荐教材或主要参考书：

[1] 指导教师安排

0008184 Graduation Project（Thesis）

Course Number: 0008184

Course Title: Graduation Project（Thesis）

Course Type: Compulsory Practice

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

Students: Undergraduate students majoring in Computer Science and Technology

Prerequisites:

Evaluation Method: Tutor evaluation+ thesis evaluation +defense

Writer： Du Jinlian Wang dan

Course Description:

Graduation project is an important part of compulsory practice teaching, which plays an irreplaceable role in guaranteeing students to achieve graduation requirements in the talent training program of this major. Its basic purpose is to enable students to further master the basic knowledge, basic technology and basic methods of this major, comprehensively and flexibly use the basic theory and professional skills learned to solve practical problems of computer science and technology, and go through the process of solving complex engineering problems, so as to obtain comprehensive training. In this process, we focus on cultivating students' ability to conduct investigation and research, consult Chinese and foreign literature and relevant materials, analyze them, and on this basis, develop or design innovative solutions to calculation problems, experiment and comprehensive analysis of solutions, and summarize and improve the basic ability.

Recommended Textbooks/References:

1.To be arranged by the instructor.

0002556 系统软件课设

课程编码：0002556

课程名称：系统软件课设

英文名称：System Software Design Project

课程类型：实践环节选修课

学分： 2.0 **总学时：** 60

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

先修课程：操作系统原理

考核形式：报告

撰写人：王丹

课程简介：（250-300 字）

本课程设计的目的是使学生进一步加深对操作系统的设计思想和实现机制的理解，增强学生系统软件分析、设计能力和实践能力，主要包括三个可选任务模块。第一个可选模块是分析 Linux 操作系统源代码，学生选择如下内容之一进行代码分析并完成分析报告： Linux 系统启动过程、Linux 的内存管理、Linux 进程控制、Linux 时钟中断与进程调度、Linux 进程间通信；第二个可选模块是操作系统相关原理的实现，要求学生完成进程调度、内存管理、磁盘调度等相关算法，并以图形化界面形式进行展示。第三个可选模块是基于 Pintos 实验平台的内核模块开发。因为 Pintos 是一个不完整的操作系统：一些主要的功能模块是空缺的，或者只有一个极简单的实现。要求学生在 Pintos 系统中设计、实现如下四个功能之一：基于优先级的进程调度、系统调用与用户程序运行、虚拟存储管理系统、文件系统。

推荐教材或主要参考书：

[1] 系统软件课程设计指导书.课程组自编.2012

[2] 毛德操，胡希明.Linux 内核源代码情景分析(上下册)，浙江大学出版.2006

[3] 费翔林，李敏，叶保留.Linux 操作系统实验教程.高等教育出版社.2009

[4] 庞丽萍，郑然.操作系统原理与 Linux 系统实验.机械工业出版社.2011

0002556 System Software Design Project

Course Number: 0002556

Course Title: System Software Design Project

Course Type: Compulsory course in practice

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

Students: Undergraduate students majoring in Computer Science and Technology

Prerequisites: Principle of Operating System

Evaluation Method: Demonstration, Presentation and Design Documents

Writer： Wang Dan

Course Description:

The aim of this project is to further deepen students‘ understanding about the design idea and implementation mechanism about OS, and to cultivate their ability to analyze, make design and program on the level of system software. Three optional modules are included in it. The first module requires students to analyze OS source code of Linux operating system and select one of the following tasks: Linux boot process, Linux memory management, Linux process control, Linux timer and process schedule, Linux process communication. The second optional module requires students to implement related OS algorithm including process schedule, memory management, disk schedule. The third module requires students to develop several kernel modules for Pintos system. Pintos is an incomplete operating system and some major modules are missing, or there is merely a simple implementation version. This module requires students to design and implement one of the following modules for Pintos including process schedule based on process priority, system call and user‘s program‘s execution, virtual memory system, File system.

Recommended Textbooks/References:

1.Guide of Design of System Software Project. Electronic Materials. 2012

2.Mao Decao, Hu Ximing. Analysis of Linux Kernel Source code. Hangzhou: Zhejiang University Press. 2006

3.Fei Xianglin, Li Min, Ye Baoliu. Reference Book of Theory of Formal Languages and Automata (second Edition). Tsinghua University Press. 2007

4.Pang Liping, Zheng Ran.Principle of Operating System and Linux Experiments. China Machine Press. 2011

0007380 嵌入式技术课设

课程编码：0007380

课程名称：嵌入式技术课设

英文名称：Projects of Embedded System Technology

课程类型：实践环节选修课

学分：2　　**总学时：** 60

面向对象：计算机科学与技术类本科生

先修课程：计算机组成原理，嵌入式系统设计技术

考核形式：项目设计

撰写人：韩德强

课程简介：

嵌入式技术课设是信息学部为计算机科学与技术类本科生开设的实践环节选修课，承担着培养学生软硬件系统能力和工程能力的任务。

嵌入式技术课设是对学生计算机软件、硬件课程学习的综合检验，配合理论课的教学，让学生亲自参加一个实际计算机应用系统的开发。

嵌入式技术课设是对学生综合能力考查的一门课程，它在专业基础课程、计算机组成原理、嵌入式系统设计技术等课程基础上由学生自主命题，由教师对题目的难易程度、工作量大小进行把关，充分发挥了学生的学习主动性、创新能力的培养以及团队合作精神，同时规范工程文档的建立。

推荐教材或主要参考书：

[1] 胡振波著. RISC-V 架构与嵌入式开发快速入门. 人民邮电出版社，2019 年 1 月

[2] 杨晋，曹盛宏编著，智能硬件项目教程——基于 ESP32，北京航空航天大学出版社，2020 年 6 月

[3] 李兰英，韩剑辉，周昕编著. 基于 Arduino 的嵌入式系统入门与实践. 人民邮电出版社，2020 年 9 月

[4] 陈吕洲编著. Arduino 程序设计基础（第 2 版）. 北京航空航天大学出版社，2015 年 2 月

[5] 《无线电》编辑部著. Arduino 智能硬件开发从入门到精通. 人民邮电出版社，2020 年 5 月

0007380 Projects of Embedded System Technology

Course Number: 0007380

Course Title: Projects of Embedded System Technology

Course Type: Elective courses in practice

Credit: 2 **Total Credit Hours:** 60

Students: Undergraduate students major in Computer Science and Technology

Prerequisites: Principles of Computer Organization, Embedded System Design technology

Evaluation Method: Project Design

Writer： Han Deqiang

Course Description:

Projects of Embedded System Technology is one elective course offered by the School of Computer for undergraduates majoring in computer science and technology. It is responsible for cultivating students' software and hardware system capabilities and engineering capabilities.

Projects of Embedded System Technology is a comprehensive test of students' computer software and hardware course learning. With the teaching of theoretical courses, students can participate in the development of a practical computer application system.

Projects of Embedded System Technology is a course to test students' comprehensive ability. It is based on professional basic courses, Principles of Computer Organization, Embedded System Design Technology and other courses by students to make their own questions, and teachers can determine the difficulty of the topic and work. The quantity is checked, giving full play to the students' learning initiative, the cultivation of innovation ability and the spirit of teamwork, while standardizing the establishment of engineering documents.

Recommended Textbooks/References:

1. Hu Zhenbo. RISC-V Architecture and Embedded Development Quick Start. Posts & Telecom Press, 01-2019.
2. Yang Jin, Cao Shenghong. Intelligent Hardware Project Tutorial - Based on ESP32. Beijing University of Aeronautics and Astronautics Press, 06-2020.
3. Li Lanying, Han Jianhui, Zhou Xin. Introduction and Practice of Embedded Systems Based on Arduino. Posts & Telecom Press, 09-2020.
4. Chen Lvzhou. Arduino programming foundation (2nd edition). Beihang University Press, 02-2015
5. "Radio" Editorial Department. Arduino smart hardware development from entry to proficiency. Posts & Telecom Press, 05-2020

0007347 3D 场景建模与远程交互课设

课程编码：0007347

课程名称：3D 场景建模与远程交互课设

英文名称：The Course Design in 3D Scene Modeling and Remote Interaction

课程类型：课程设计

学分：2.0　**总学时：** 60

面向对象：计算机科学与技术类本科生

先修课程：高级语言程序设计、计算机图形学

考核形式： 课程设计答辩

撰写人：杨新武

课程简介：

《3D 场景建模与远程交互课设》是计算机科学与技术专业本科生的专业选修实践课程。本课程的任务是介绍当前基于 Web 的三维虚拟现实技术，培养与提高学生的 WEB 级专业开发和三维场景建模的综合开发能力。本课程主要学习和应用虚拟现实建模语言、HTML 和 Java 语言，实现一个基于 Web 的、具有三维虚拟室内或室外场景、漫游地图显示以及远程交互功能的网页。本课程的主要教学内容分为三个模块：（1）三维场景建模：三维造型节点，几何变换节点，事件和路由，纹理映射等；（2）网页设计；（3）三维场景远程交互。

推荐教材或主要参考书：

[1] 李建，王芳，张天伍，杨爱云，李雨恒，虚拟现实技术基础与应用，机械工业出版社，2018 年

[2] 徐长青. 计算机图形学，机械工业出版社，2018 年

[3] 黄传禄 常建功 陈浩,零基础学 java（第 5 版），机械工业出版社，2020 年

0007347 The Course Design in 3D Scene Modeling and Remote Interaction

Course Number: 0007347

Course Title: The Course Design in 3D Scene Modeling and Remote Interaction

Course Type: Course Design

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

Students: Undergraduate students majoring in Computer Science and Technology

Prerequisites: High Level Language Programming; Computer Graphics

Evaluation Method: Course design defense

Writer： Xinwu Yang

Course Description:

The Course Design of 3D Scene Modeling and Remote Interaction is an elective practical course for undergraduate students majoring in Computer Science and Technology. The task of this course is to introduce the current web-based 3D virtual reality technology, cultivate and improve students' comprehensive development abilities in WEB level professional development and 3D scene modeling. This course mainly studies and applies virtual reality modeling languages, HTML, and Java languages to achieve a web-based web page with 3D virtual indoor or outdoor scenes, roaming map display and remote interaction functions. The main teaching content of this course is divided into three modules: (1) 3D scene modeling: 3D modeling nodes, geometric transformation nodes, events and routing, texture mapping, etc; (2) Web design; (3) Remote interaction of 3D scenes.

Recommended Textbooks/References:

1. Li Jian, Wang Fang, Zhang tianwu, Yang Aiyun, Li Yuheng, Fundamentals and Applications of Virtual Reality Technology, *China Machine Press*, 2018
2. Xu Changqing, Computer graphics, *China Machine Press*, 2018
3. Huang Chuanlu, Chang Jiangong, Chen Hao, Zero Basic Learning Java (5th Edition), *China Machine Press*, 2020

0008187 面向对象程序设计

课程编码：0008187

课程名称：面向对象程序设计

英文名称：Object Oriented Programming

课程类型：专业选修课

学分：2.5　**总学时：** 40

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业、信息安全（实验班）专业、物联网工程专业本科生

先修课程：高级语言程序设计

考核形式：平时成绩+考试

撰写人：杨惠荣

课程简介：（250-300 字）

面向对象程序设计（Object Oriented Programming，OOP）是一种被广泛应用的计算机编程架构，OOP 达到了软件工程的三个主要目标：重用性、灵活性和扩展性。课程通过分析 OOP 的基本思想及 Java 语言的实现机制，讨论 OOP 的方法，培养学生采用面向对象的方法分析和求解问题的能力。要求学生掌握面向对象的基本思想和有关的基本概念、基本方法，掌握基于 OOP 思想的 Java 语言实现机制，掌握 Java 语言的基本语法和 Java 集成开发环境下的编程技术，能够运用 OOP 方法分析和求解一般应用问题。并培养学生的面向对象系统分析、设计能力，提高解决复杂工程问题的能力。

推荐教材或主要参考书：

[1] 叶乃文，王丹，杨惠荣，面向对象程序设计(第 3 版)，清华大学出版社，2013 年 8 月

[2] 邢国波，杨朝晖，郭庆，徐遵义，Java 面向对象程序设计，清华大学出版社，2019 年 6 月

[3] 刘彦君，张仁伟，满志强，Java 面向对象思想与程序设计，人民邮电出版社，2018 年 11 月

0008187 Object Oriented Programming

Course Number: 0008187

Course Title: Object Oriented Programming

Course Type: Major Electives

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

Students: Undergraduate students majoring in Computer Science and Technology

Prerequisites: High-Level Language Programming

Evaluation Method: Course participation + experiment + written exams

Writer： Huirong Yang

Course Description:

Object oriented programming (OOP) is a widely used computer programming architecture. It achieves three main goals of software engineering: reusability, flexibility and expansibility. Our course analyzes the basic idea of OOP and the implementation mechanism of Java language, discusses the methods of OOP and cultivates students' ability to analyze and solve problems with object-oriented method. Students are required to master the basic idea of OO and related basic concepts and methods, to master the implementation mechanism of Java language based on OOP ideas, to master the basic syntax of Java language and the programming technology under the Java integrated development environment. The students should also able to analyze and solve general application problems with OO method. At the same time, students' ability of OOA(Object-Oriented system Analysis) and OOD(Object-Oriented Design) is trained, the ability of solving complex engineering problems is improved.

Recommended Textbooks/References:

1. Ye Naiwen, Wang Dan, Yang Huirong. Object oriented programming (3rd Edition). Tsinghua University Press. August 2013
2. Xing Guobo, Yang Chaohui, Guo Qing, Xu Zunyi. Java object-oriented programming. Tsinghua University Press. June 2019
3. Yanjun, Zhang Renwei, manzhiqiang. Java object-oriented idea and program design. People's Posts and Telecommunications Press. November 2018

0010053 C++语言程序设计

课程编码：0010053

课程名称：C++语言程序设计

英文名称：Programming in c++

学分：2.0　　**总学时：**32

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

先修课程：高级语言程序设计

考核形式：笔试或者实验+实验报告

撰写人：桂智明

课程简介：

该课程是针对计算机科学与技术实验班的专业选修课，针对计算机科学与技术专业的自主课程。通过对封装、继承、多态和模板类的讲述加强学生对面向对象编程方法的理解和掌握，培养学生对现实世界问题采用计算机语言描述时面向对象的抽象和设计能力，掌握面向对象的程序设计方法，学会利用C++语言编写面向对象的程序、利用调试工具调试程序，培养学生分析问题和解决问题的能力。要求学生掌握有关方面的基本概念、基本理论、基本方法和基本技术。具体知识包括：封装、继承、多态、运算符重载、模板类和基础模板类的使用、文件读写，异常处理和程序调试方法。通过该课程的学习，培养学生的运用C++的面向对象系统分析、设计能力和解决复杂工程问题的能力。

推荐教材或主要参考书：（含主编，教材名，出版社，出版日期）

[1] Harvery M.Deitel，C++大学基础教程（第五版），北京，电子工业出版社，2006

[2] 郑莉、李宁，C++教程，北京，人民邮电出版社，2010

[3] Bruce Eckel、Chuck Allison，C++编程思想，北京，机械工业出版社，2011

0010053 Programming in C++

Course Number: 0010053

Course Title: Programming in C++

Course Type: Major elective course, Self-Study

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

Students: Undergraduate students major in Computer Science

Prerequisites: High Level Programming Language Design Ⅲ

Evaluation Method: Written Exam or Experiment and Experimental report

Writer: Gui Zhiming

Course Description:

This course is a major elective course for undergraduates majoring in Computer Science and Technology (Experimental class students). This course is a self-study course for undergraduates majoring in Computer Science and Technology (Normal class students). Encapsulation, inheritance and polymorphism and their related concepts, method are introduced in this course. The students are expected to understand the basic concepts, theories, methods, and techniques of object oriented programming through studying these knowledge points. The basic topics include: the concepts of Encapsulation, inheritance and polymorphism; Using Operator overloading, template classes, stack, array list, file i/o, etc. Exception handling methods and debugging technique are also included in the course. Through the study of this course, students are trained to apply object-oriented system analysis and design skills in C++, as well as the ability to solve complex engineering problems.

Recommended Textbooks/References:

1. Harvery M.Deitel. C++ Basic Guide for University Student (5th Edition). Beijing: Electronic Industry Publishing House, 2006
2. Zhen Li, Li ning. C++ Language Programming Guide. Beijing: People's Posts and Telecommunications Press, 2010
3. Bruce Eckel, Chuck Allison. Programming Idea of C++. Beijing: Machinery Industry Press, 2011

0008163 汇编语言程序设计

课程编码：0008163

课程名称：汇编语言程序设计

英文名称：Assembly Language Programming

课程类型：专业选修课

学分： 2.0 **总学时：** 32

面向对象：计算机科学与技术（实验班）专业、物联网工程专业、计算机科学与技术专业本科生

先修课程：计算机组成原理

考核形式： 平时成绩+闭卷考试

撰写人：蔡旻

课程简介：（250-300 字）

汇编语言程序设计是信息学部为计算机科学与技术（实验班）专业、物联网工程专业以及计算机科学与技术专业本科生开设的专业选修课。本课程的任务是系统地培养学生对汇编语言程序设计的认知，使他们深入理解计算机系统理论，并进一步掌握高级程序设计语言在底层如何被转换和执行。教学内容重点：详细介绍汇编语言的格式、伪指令与宏指令的使用，探讨程序设计中的分支、循环及子程序的设计原理，阐述汇编程序的开发与调试过程，深入解读 CPU 的架构和工作原理，以及指令调度、高效存储器管理和基础输入输出处理技术。教学内容的难点：汇编语言中的变量组织方式、深入理解地址的访问机制、机器指令层面上的循环与分支处理逻辑，以及函数调用过程中参数的传递和管理方法。

推荐教材或主要参考书：

[1] 易小琳、朱文军、鲁鹏程、方娟、毛国君.计算机组成原理与汇编语言.北京：清华大学出版社，2009 年

[2] 沈美明、温冬婵. IBM-PC 汇编语言程序设计（第二版）. 北京：清华大学出版社，2001 年

[3] 卜艳萍、周伟.汇编语言程序设计教程（第二版）.北京：清华大学出版社，2007 年

[4] 李国安、李敏.汇编语言编程技术. 郑州：郑州大学出版社，2007 年

0008163 Assembly Language Programming

Course Number: 0008163

Course Title: Assembly Language Programming

Course Type: Major Electives

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

Students: Undergraduate students majoring in Computer Science and Technology, Internet of Things Engineering

Prerequisites: Principle of computer organization

Evaluation Method: Course participation + written exams

Writer： Cai Min

Course Description:

Assembly Language Programming is a major elective course offered by the Faculty of Information for undergraduate students majoring in Computer Science and Technology and Internet of Things Engineering. The objective of this course is to systematically cultivate students' understanding of assembly language programming, enabling them to delve deeply into the theory of computer systems and further grasp how high-level programming languages are converted and executed at the lower levels. Key teaching content includes: a detailed introduction to the format of assembly language, the use of pseudo-instructions and macro instructions, exploration of the principles of branching, looping, and subroutine design in program development, elaboration on the development and debugging process of assembly programs, in-depth interpretation of CPU architecture and its operational principles, as well as instruction scheduling, efficient memory management, and basic input/output processing techniques. The challenging aspects of the course content are: the organization of variables in assembly language, a deep understanding of addressing mechanisms, the logic of handling loops and branches at the machine instruction level, and the methods of parameter passing and management during function calls.

Recommended Textbooks/References:

1. Yi Xiaolin, Zhu Wenjun, Lu Pengcheng, Fang Juan, Mao Guojun. Principles of Computer Composition and Assembly Language. Beijing: Tsinghua University Press, 2009
2. Shen Meiming, Wen Dongchan. IBM-PC Assembly Language Programming (Second Edition). Beijing: Tsinghua University Press, 2001
3. Bu Yanping, Zhou Wei. Assembly language programming tutorial (second edition). Beijing: Tsinghua University Press, 2007
4. Li Guoan, Li Min. Assembly language programming technology. Zhengzhou: Zhengzhou University Press, 2007

0005683 模式识别

课程编码：0005683

课程名称：模式识别

英文名称：Pattern Recognition

课程类型：专业选修课

学分： 2.0 **总学时：** 32

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

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+考试

撰写人：杨翠翠

课程简介：（250-300 字）

模式识别是信息学部为计算机科学与技术专业本科生开设的专业选修课。该课程是人工智能的基础技术，其任务是让学生系统掌握模式识别的基本理论和方法，了解模式识别的发展趋势和应用领域，提高学生解决实际问题的能力，为后续模式识别和人工智能的深入学习和研究打下坚实的基础。本课程的教学重点是模式识别的基本理论和方法，包括：模式识别的基本概念；监督模式识别和非监督模式识别中常见的分类器设计与实现；特征选择和提取的方法；分类器的评价方法等。 本课程实践性强，授课时采用算法理论讲解和实验演示相结合的方式，其教学难点是阐明分类器设计中的数学理论，增强学生对不同分类器的认识和理解，进而提高学生实际应用的能力。

推荐教材或主要参考书：

[1]张学工, 模式识别(第三版), 北京: 清华大学出版社, 2010 年 8 月

[2]Sergios Theodoridis, Konstantinos Koutroumbas, 模式识别 (第四版), 李晶皎等译, 北京: 电子工业出版, 2016 年 10 月

[3]Richard O.Duda, Peter E.Hart, David G..Stork, 模式分类(原书第 2 版), 李宏东等译, 北京: 机械工业出版社, 2003 年 9 月

[4]周志华, 机器学习, 北京: 清华大学出版社, 2016 年 1 月

0005683 Pattern Recognition

Course Number: 0005683

Course Title: Pattern Recognition

Course Type: The elective course of the specialty

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

Students: Undergraduate students majoring in computer science and technology

Prerequisites: Advanced Mathematics, Linear Algebra, Probability and Mathematical Statistics

Evaluation Method: Course participation + written exams

Writer: Cuicui Yang

Course Description:

Pattern Recognition is one of the elective courses for undergraduate students Major in computer science and technology in Faculty of Information Technology. This course is the basic technology of artificial intelligence, and its main target is to enable students to systematically master the basic theories and methods of pattern recognition, understand the development trend and application field of pattern recognition, improve student's problem solving ability, and lay a solid foundation for further study and research of pattern recognition and artificial intelligence. This course is focus on the basic theories and methods of pattern recognition. The teaching contents are mainly covered by the following aspects: basic concepts of pattern recognition; design and implementation of classifier in supervised pattern recognition and unsupervised pattern recognition; feature selection and feature extraction; the evaluation method of classifier and so on. As a practical course, the teaching method of this course is the combination of algorithm theory explanation and experimental demonstration. The difficulties of teaching contents are to clarify the mathematical theories of classifiers, enhance the students' understanding on classifiers, and improve their practical ability.

Recommended Textbooks/References:

1. Zhang Xuegong, Pattern Recognition (Third Edition), *Beijing: Tsinghua University Press,* August 2010
2. Sergios Theodoridis, Konstantinos Koutroumbas, Pattern Recognition (Fourth Edition), Translated by Li Jingjiao et al., *Beijing : Publishing House of Electronics Industry*, October 2016
3. Richard O.Duda, Peter E.Hart, David G..Stork, Pattern Classification (Second Edition), Transalted by Li Hongdong et al., *Beijing: Machinery Industry Press,* September 2003
4. Zhou Zhihua, Machine Learning, *Beijing: Tsinghua University Press,* January 2016

0000631 数字系统设计（双语）

课程编码：0000631

课程名称：数字系统设计（双语）

英文名称：Digital System Design

课程类型：专业选修课

学分： 2.0 **总学时：** 32

面向对象：计算机科学与技术、物联网工程专业本科生

先修课程：数字逻辑，电路与电子技术

考核形式： 平时成绩+实验+考试

撰写人：张佳玥

课程简介：（250-300 字）

数字系统设计（双语）是信息学部为计算机科学与技术、物联网工程专业本科生开设的专业任选课。课程除要求学生掌握基于硬件描述语言的数字系统设计、仿真、综合等技术和方法外，还含有数字系统的工程设计实现过程，使学生适应基于大规模可编程集成电路的数字系统设计工作。同时作为双语课程，培养和提升学生应用英语获取和掌握前沿专业知识能力。设计方法包括：系统功能分析、分割、集成及描述，自顶向下的系统设计方法与应用，函数、任务的定义与调用，可复用参数化设计方法，测试平台计划制定、开发与应用，面向代码的可复用性、可综合性的设计方法等。实验环节：利用典型 EDA 开发仿真平台和实验台，设计实现小型数字系统设计与验证。

推荐教材或主要参考书：

[1] Michael，D.Ciletti 著，李广军，林水生，阎波 等译. Verilog HDL 高级数字设计（第二版）. 电子工业出版社，2019 年 1 月

[2] Zainalabedin Navabi. Digital System Test and Testable Design: Using Hdl Models and Architectures. Springer，2016 年 8 月

[3] 王秀琴，夏洪洋. Verilog HDL 数字系统设计入门与应用实例. 清华大学出版社，2019 年 3 月

[4] Kishore Mishra（基肖尔•米什拉）著，乔庐峰等译. Verilog 高级数字系统设计技术与实例分析. 电子工业出版社，2018 年 2 月

0000631 Digital System Design

Course Number: 0000631

Course Title: Digital System Design

Course Type: Major Elective Course

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

Students: Undergraduate students majoring in Computer Science and Technology, Engineering of Internet of Things(IoT)

Prerequisites: Digital Logic, Electronic Circuit and Electronic Technology

Evaluation Method: Course participation + Lab projects + Written exams

Writer：Jiayue Zhang

Course Description:

Digital System Design (Bilingual) is an elective course offered by Faculty of Information Technology for undergraduate students majoring in Computer Science and Technology and Internet of Things Engineering. The course aims to equip students with the knowledge and skills in digital system design, simulation, synthesis, and other related technologies and methods based on hardware description languages. It also includes the engineering design and implementation processes of digital systems, enabling students to the work of digital system design based on large-scale programmable integrated circuits. Furthermore, being a bilingual course, it aims to cultivate and enhance students' abilities to acquire and master cutting-edge professional knowledge through the application of English. The design methods covered in the course include system functional analysis, partitioning, integration, and description; top-down system design methods and applications; definition and invocation of functions and tasks; reusable parameterized design methods; development and application of test platform plans; code-oriented design methods for reusability and synthesis, and more. Laboratory projects include designing and implementing small-scale digital systems, as well as conducting verification experiments through typical Electronic Design Automation (EDA) development simulation platforms and experimental setups.

Recommended Textbooks/References:

1. Michael D. Ciletti, translated by Li Guangjun, Lin Shuisheng, Yan Bo, and others, Verilog HDL Advanced Digital Design, Electronics Industry Press, January 2019.
2. Zainalabedin Navabi， Digital System Test and Testable Design: Using Hdl Models and Architectures, Springer, August 2016.
3. Wang Xiuqin, Xia Hongyang, Introduction to Verilog HDL Digital System Design and Application Examples, Tsinghua University Press, March 2019.
4. Kishore Mishra, translated by Qiao Lufeng et al., Advanced Verilog Digital System Design Techniques and Example Analysis, Electronics Industry Press, February 2018.

0010654 数据通信原理（双语）

课程编码：0010654

课程名称：数据通信原理（双语）

英文名称：Principle of Data Communication

课程类型：专业选修课

学分： 2.0 **总学时：** 32

面向对象：计算机科学与技术专业、物联网工程专业本科生

先修课程：大学物理Ⅰ，数字逻辑Ⅰ，模拟电子技术

考核形式： 平时成绩+考试

撰写人：张文博

课程简介：（250-300 字）

《数据通信原理》是计算机学院为计算机科学与技术专业和物联网工程专业本科生开设的选修课。本课程的任务是：深入浅出地阐述数据通信的基本概念、基础知识、数据传输技术及其应用，展现近年来数据通信技术的最新发展，为后续课程打下基础。教学内容的重点：通信的基本模型，数据通信的基础知识，数据传输信道，信号编码技术、差错检测和纠正、复用技术、广域网技术等数据传输基本技术，以及蜂窝无线网络（含 5G 通信技术）、无线传输技术和无线网络技术（含无线宽带接入、WiMax 和蓝牙）。教学内容的难点：基带信号编码技术，循环冗余校验，非对称数字用户线路和 xDSL 的工作原理，码分复用（CDMA）技术，异步传递方式，4G 和 5G 广泛采用的 OFDM 和 MIMO 技术。

推荐教材或主要参考书：

1. William Stallings[著] ，王海，张娟，周慧，赵红宇[译]，数据与计算机通信（第十版），电子工业出版社，2015 年 9 月
2. 杨心强，陈国友 [著]，数据通信与计算机网络（第 5 版），电子工业出版社，2018 年 2 月
3. 中兴通讯学院，对话：通信原理，人民邮电出版社，2010 年 10 月

0010654 Principle of Data Communication（bilingual）

Course Number: 0002359

Course Title: Principle of Data Communication（bilingual）

Course Type: Optional Course

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

Students: Undergraduate students majoring in Computer Science and IOT Engineering

Prerequisites: Physics I, Digital Logic I, Analog circuit

Evaluation Method: Course participation + written exams

Writer： Zhangwenbo

Course Description:

"Principle of Data Communication" is one of the optional courses for undergraduate students Major in Computer science. The main target of this course is to clarify the basic concepts of data communication, basic knowledge, data transmission technology and some applications, to lay the foundation for the next courses. The teaching contents are mainly covered by the following aspects: the basic communications models, the basic knowledge of data communication, data transmission channel, signal coding technology, error detection and correction, multiplexing technology, wan technology and other basic data transmission technologies, as well as cellular wireless network (including 5G), wireless transmission technology and wireless network technology (including wireless broadband access, WiMax and Bluetooth). The difficulties of teaching contents are described as followings: coding technology for the baseband signal, cyclic redundancy check, asymmetric digital subscriber line and xDSL principle, code division multiplexing (CDMA) technology, asynchronous transmission mode, OFDM and MIMO technology widely used in 4G and 5G.

Recommended Textbooks/References:

1. William Stallings, Data and Computer Communications (10th Edition), Pearson *Press,* 09-2013.
2. Yang Xinqiang, Chen Guoyou. Data Communications and Networks (5th Edition), China machine *Press*, 02-2018.
3. College of ZTE communications，Dialogue：Communication Fundamentals，PTR *Press*，10-2010.

0008300 计算机图形学

课程编码：0008300

课程名称：计算机图形学

英文名称：Computer Graphics

课程类型：专业选修课

学分：2.0　**总学时：** 32

面向对象：计算机科学与技术专业本科生

先修课程：数据结构与算法、高级语言程序设计

考核形式：平时成绩+笔试

撰写人：杨新武

课程简介：

《计算机图形学》是计算机科学与技术专业本科生的专业选修课程，主要研究如何在计算机中表示图形以及如何利用计算机进行图形的计算、处理和显示。本课程除要求学生掌握计算机图形学的基本概念、原理、技术和算法外，还注重培养学生的专业思维方式，分析问题和解决问题的能力。本课程主要教学内容：图形学的概念、发展及当前研究热点、图形硬件、光栅图形生成算法、反走样、图形的二维和三维几何变换、二维观察、二维裁剪、投影变换、建模变换、三维观察等。

推荐教材或主要参考书：

[1] 徐长青，计算机图形学（第 3 版），机械工业出版社，2018 年

[2] 陆枫，何云峰，计算机图形学基础(第 3 版)，电子工业出版社，2018 年

[3] 陆玲，李丽华，宋文琳，桂颖，计算机图形学，机械工业出版社，2017 年

0008300 Computer Graphics

Course Number: 0008300

Course Title: Computer Graphics

Course Type: Professional Elective Course

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

Students: Undergraduate students majoring in Computer Science and Technology

Prerequisites: High Level Language Programming; Data Structures and Algorithms

Evaluation Method: Course Participation +Written Exam

Writer: Xinwu Yang

Course Description:

Computer Graphics is a professional elective course for undergraduate students majoring in Computer Science and Technology, Which mainly studies how to represent graphics in computers and how to use computers to calculate, process and display graphics. This course not only requires students to master the basic concepts, principles, techniques and algorithms of computer graphics, but also focuses on cultivating students' professional thinking mode and the ability to analyze and solve problems. The main teaching content of this course includes the concepts, development and current research hotspots of computer graphics, graphic hardware, raster graphic generation algorithms, anti-aliasing, two-dimensional and three-dimensional geometric transformations of graphics, 2D observation, 2D cropping, projection transformation, modeling transformation, 3D observation, etc.

Recommended Textbooks/References:

1. Xu Changqing, Computer Graphics(3rd Edition), *China Machine Press*, 2018

2. Lu Feng, Fundamentals of Computer Graphics (3rd Edition), *The Electronic Industry Press*, 2018

3. Lu Ling, Li Lihua, Song Wenlin, Gui Ying, Computer Graphics, *China Machine Press,* 2017

0006408 微型计算机接口技术Ⅲ

课程编号：0006408

课程名称：微型计算机接口技术III

英文名称：Microcomputer Interface Techniques

课程类型：专业选修课

学分：2.0　　**学时：**32

面向对象：计算机科学与技术专业、物联网工程专业本科生

先修课程：数字逻辑Ⅰ、计算机组成原理、汇编语言程序设计

考核形式：平时成绩+考试

撰写人：包振山

课程简介：

微型计算机接口技术课程是传统硬件基础课程，为其后的一系列硬件方向的专业课程肩负着“入门门槛”的重要作用。此课程以 16 位 CPU 8086/8088 为基本出发点，内容包括微处理器芯片的基本功能、微型计算机的外围芯片，以及构成微型计算机系统的接口芯片，微型计算机的结构特点以及实现微型计算机与外围连接的软、硬件基础知识和基本技能，各种典型环境下接口设计原则。该课程将使学生能够建立起微型计算机的整体观念，能够理解微机系统 I/O 接口电路，并具有设计、开发 I/O 接口电路的基本能力。此外，课程还对主流的 32 位微型计算机的基本工作原理作概要介绍。

推荐教材或主要参考书：（含主编，教材名，出版社，出版日期）

[1] 戴梅萼等编著.微型计算机技术及应用（第 4 版）.清华大学出版社，2008 年 2 月

[2] 包宋建.微机原理与接口技术.机械工业出版社，2020 年 03 月

[3] 顾晖.微机原理与接口技术—基于 8086 和 Proteus 仿真（第 3 版）.机械工业出版社，2019 年 09 月

0006408 Microcomputer Interface Techniques

Course Number: 0006408

Course Title: Microcomputer Interface Techniques

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

Students: Undergraduate students majoring in Computer Science and IOT Engineering

Prerequisites: Digital Logic, Principles of Computer Organization

Evaluation Method: Course participation +written exams

Writer： Baozhenshan

Course Description:

Microcomputer interface technology is a traditional hardware professional course, which is very important as it is the "entry" to the next series of hardware courses. Begin with 16 bit CPU 8086/8088, the course covers the basic function of the microprocessor chip, the periphery chips in the microcomputer chip, the interface chip in the microcomputer system; the structure character of the microcomputer system, the basic software and hardware knowledge and skills to connect the microcomputer with the other peripheral devices, and the interface design principles in kinds of typical environments. The students are expected to establish the concept of the microcomputer system, understand the I/O interface circuit, and develop the design and develop ability of I/O interface circuit. In addition, the course also overviews the basic running principle in the mainstream 32-bit microcomputer.

Recommended Textbooks/References:

1. Dai Meie. Micro computer technology and application (4th Edition). Tsinghua University Press, 2008.2
2. Bao Songjian. Microcomputer principle and interface technology. China Machine Press. 2020.03
3. Gu Hui. Microcomputer principle and interface technology - Based 8086 and Proteus Simulation (3th Edition). China Machine Press，2019.09

0007391 算法设计与分析

课程编码：0007391

课程名称：算法设计与分析

英文名称：The Design and Analysis of Algorithms

课程性质：专业选修课

学分： 2.0 **总学时：** 32.0

面向对象：计算机类本科生

先修课程：高级程序设计语言，集合与图论，代数与逻辑，数据结构与算法

考核形式： 平时成绩+考试

撰写人：张潇

课程简介：（250-300 字）

算法设计与分析是计算机科学的核心问题之一，也是计算机科学与技术专业本科的一门重要的专业（限选）课。计算思维由三部分构成，即逻辑思维、算法思维和系统思维，显然，“算法设计与分析”课程是算法思维最直接和最重要的知识载体。本课程的目标是引导学生学习研究计算机及其相关领域中的一些非数值计算的常用算法，培养其计算思维、程序设计与实现、算法设计与分析这 3 大专业基本能力，为学生解决计算机科学与工程应用领域中较为复杂的实际问题打下理论与实践基础。课程的主要内容包括：计算机问题求解的一般过程，主要包括分治法、贪心法、动态规划、回溯法和分枝限界等的算法设计思想及其应用。

推荐教材或主要参考书：

[1] 王晓东，《计算机算法设计与分析（第 5 版）》，电子工业出版社，2018 年 9 月

[2] Thomas H. Cormen 等著，殷建平等译，《算法导论（Introduction to Algorithms)（第 3 版）》[美].机械工业出版社，2012 年 12 月

[3] 屈婉玲，刘田，张立昂，王捍贫，《算法设计与分析（第 2 版）》，清华大学出版社，2016 年 2 月

0007391 The Design and Analysis of Algorithms

Course Number:0007391

Course Title: The Design and Analysis of Algorithms

Course Type: Specialized Direction Courses

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

Students: Undergraduate students majoring in Computer Science

Prerequisites: Advanced programming language, Discrete mathematics, Data Structures and Algorithm Analysis

Evaluation Method: Course participation + written exams

Writer： Zhang Xiao

Course Description:

The Design and Analysis of Algorithms is one of the specialized direction courses for undergraduate students major in Computer Science and Internet of things Engineering. The main target of this course is to clarify some common algorithms of non numerical calculation in field of computer. This course is focus on the general process of algorithms. The teaching contents are mainly covered by the following aspects: design ideas and applications of divide and conquer method, greedy method, dynamic programming, backtracking method and branch and bound algorithm. The difficulties of teaching contents are described as followings: how to use the above algorithm to solve practical problems.

Recommended Textbooks/References:

1. Wang Xiaodong, The Design and Analysis of Computer Algorithms (5th Edition), Electronic Industry Press, 2018.9
2. Written by Thomas H. Cormen, Translated by Yin Jianping, et al. , Introduction to Algorithms (3rd Edition), [USA]. China Machine Press, 2012.12
3. Qu Wanling, Liu Tian, Zhang Li Ang, Wang hanqian, The Design and Analysis of Algorithms (2nd Edition), Tsinghua University Press, 2016.2

0007383 人机交互引论

课程编码：0007383

课程名称：人机交互引论

英文名称：Introduction to Human-Computer Interaction

课程类型：专业选修课

学分： 2.0 **总学时：** 32

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

先修课程：高级程序语言设计、数据结构与算法

考核形式： 平时成绩+考试

撰写人：李童

课程简介：（250-300 字）

人机交互引论是信息学部计算机学院为计算机科学与技术专业本科生开设的专业限选课程。本课程的任务是培养学生抽象问题、分析问题、以及创造性利用已有知识和技术解决问题的能力，使学生具备调查、分析、选择恰当的人机交互技术加以应用的能力。

教学内容重点：使学生了解和初步掌握“问题抽象、需求分析、交互设计、交互测试”这一典型的工程问题的求解思路，以适应计算机科学技术与社会的快速发展。

教学内容的难点：将软件开发技术和方法与心理学和行为学等人文领域的知识相结合，使学生能够务实地以用户为中心设计和开发人机交互界面，最终提升软件系统的可用性。

推荐教材或主要参考书：

[1] 孟祥旭，李学庆，杨承磊，王璐.人机交互基础教程（第三版）.清华大学出版社，2016 年 3 月

[2] 骆斌.人机交互——软件工程视角.机械工业出版社，2012 年 12 月

[3] Jenifer Tidwell.界面设计模式影印版（第二版）.东南大学出版社，2011 年 5 月

0007383 Introduction to Human-Computer Interaction

Course Number: 0007383

Course Title: Introduction to Human-Computer Interaction

Course Type: Restricted electives

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

Students: Undergraduate students majoring in Computer Science and Technology

Prerequisites: Advanced Programming Language Design, Data Structure and Algorithm

Evaluation Method: Course participation + written exams

Writer： Li Tong

Course Description:

Introduction to Human-Computer Interaction is a restricted elective course for undergraduates majoring in Computer Science and Technology offered by the School of Computer Science, Faculty of Information. The task of this course is to train students to abstract problems, analyze problems, and creatively use existing knowledge and technology to solve problems, so that students have the ability to investigate, analyze, and select appropriate human-computer interaction techniques to apply.

The focus of the course content: enable students to understand and initially grasp the typical engineering problem solving ideas of "problem abstraction, demand analysis, interactive design, interactive testing", so as to adapt to the rapid development of computer science and technology and society.

Difficulties of the course content: Combining software development techniques and methods with knowledge from psychology and behavioral sciences enables students to design and develop human-computer interaction interfaces based on users in a pragmatic manner, and ultimately improve the usability of software systems.

Recommended Textbooks/References:

1. Xiangxu Meng, Xueqing Li, Chenglei Yang, Lu Wang. Basic Human-Computer Interaction Textbook (Third Edition). Tsinghua University Press, March 2016
2. Bin Luo. Human-Computer Interaction --- A Software Engineering Perspective. China Machine Press, December 2012
3. Jenifer Tidwell. Design Interface (Second Edition). Southeast University Press, May 2011

0005685 数字图像处理

课程编码：0005685

课程名称：数字图像处理

英文名称：Digital Image Processing

课程类型：专业限选课

学分：2　　**总学时：**32

面向对象：计算机科学与技术专业本科生、物联网专业本科生

先修课程：高等数学，线性代数，　C 语言

考核形式：平时成绩+作业+考试

撰写人：刘波

课程简介：

数字图像处理研究如何用计算机来实现改善图像质量、理解图像内容、压缩传输图像等处理。数字图像处理在消费电子、人机接口、机器人、工业生产、军事、遥感、医学等领域中有着重要应用。要求学生掌握数字图像处理的基本知识与基本方法，学会编程实现数字图像处理的基本算法。具体知识包括图像的数字化和表示，图像的直方图，图像处理系统的组成；连续和离散傅立叶变换，卷积，离散余弦变换；用直方图修改技术进行图像增强，图像平滑，图像锐化；图像分割；数学形态学图像处理；边缘检测，霍夫变换；图像的形状和纹理特征；图像编码；深度学习及其在图像识别中的应用。

推荐教材或主要参考书：（含主编，教材名，出版社，出版日期）

[1] R.C.Gonzalez 等著，阮秋琦等译.“数字图像处理”（第三版），电子工业出版社，2011

[2] 章毓晋，“图像处理和分析”，清华大学出版社，2005

0005685 Digital Image Processing

Course Number: 0005685

Course Title: Digital Image Processing

Course Type: Elective

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

Students: Undergraduate students majoring in Computer Science and Internet of Things

Prerequisites: Calculus, Linear algebra, C Programming Language

Evaluation Method: Course participation + assignments + written exams

Writer: Bo Liu

Course Description:

Digital image processing is focused on image quality improvement, image understanding and image compression. Digital image processing is applied in a variety of important domains, such as consumer electronics, human-computer interface, robotics, military and medicine. The students will be required to understand the basic knowledge and techniques of digital image processing, and learn to implement basic digital image processing algorithms. Topics covered include: image digitization, image representation, image histogram, components of image processing systems; continuous and discrete Fourier transformation, convolution, discrete consine transformation; histogram enhancement, image smoothing, image sharpening; image segmentation; mathematical morphology; edge detection, Hough transformation; shape and texture features; image coding; deep leaning and its applications to image recognition.

Recommended Textbooks/References:

1. R.C.Gonzalez et al. Digital Image Processing (third edition). China Electronic Industry Publishing House, 2011.
2. Zhang Yujing. Image Processing and Analysis (in Chinese). Tsinghua University Press, 2005.

0004858 计算机控制原理与技术Ⅱ

课程编码：0004858

课程名称：计算机控制原理与技术 II

英文名称：Principles and Technology of Computer Control

课程类型：专业选修课

学分： 2.0 **总学时：** 32

面向对象：计算机科学与技术专业、物联网工程专业本科生

先修课程：数字逻辑Ⅰ，计算机组成原理，微型计算机接口技术III

考核形式：平时成绩+实验+考试

撰写人：宋书瀛

课程简介：

计算机控制原理与技术是信息学部计算机学院为计算机科学与技术专业和物联网工程专业本科生开设的专业选修课程。本课程的任务是使学生掌握计算机控制系统的基本概念、基本理论、基本分析方法和主要控制技术，巩固所学的计算机专业知识，增强系统能力，将理论与技术应用到模拟系统的实践中去，培养学生综合应用计算机解决实际工程问题的能力。教学内容重点：计算机控制系统的概念及组成结构、连续控制系统的数学模型、典型闭环系统的稳定性及稳态误差分析、过程通道和数据采集系统、数字程序控制技术、数字 PID 控制算法。教学内容的难点：连续控制系统的数学模型、典型闭环系统的稳定性及稳态误差分析、步进电机控制系统原理及程序设计等。

推荐教材或主要参考书：

[1] 蒋心怡等, 计算机控制技术, 清华大学出版社，2007 年 1 月

[2] 陈祥光等, 自动控制原理及应用, 清华大学出版社，2018 年 1 月

[3] 蓝益鹏, 计算机控制技术, 清华大学出版社，2016 年 9 月

[4] 潘新民, 微型计算机控制技术(第 2 版), 电子工业出版社，2014 年 11 月

0004858 Principles and Technology of Computer Control

Course Number: 0004858

Course Title: Principles and Technology of Computer Control

Course Type: Major Electives

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

Students: Undergraduate students majoring in Computer Science and IOT Engineering

Prerequisites: Digital logic, computer composition principle, microcomputer interface technology

Evaluation Method: Course participation + Experiment +written exams

Writer： Songshuying

Course Description:

Principles and Technology of Computer Control is one of the Professional elective courses for undergraduate students Major in Computer Science and Technology. The main target of this course is to clarify and master the basic concepts, basic theories, basic analysis methods and main control technologies of computer control systems, consolidate the computer professional knowledge learned, and enhance the ability of the system. and the theory and technology are comprehensively applied to the practice of the simulation system. This course is focus on the concept and structure of computer control system, mathematical model of continuous control system, stability and steady-state error analysis of typical closed-loop system, process channel and data acquisition system, digital program control technology, digital PID control algorithm and so on. The teaching contents are mainly covered by the following aspects: the overview of computer control system, the basic theory of automatic control system, process channel and data acquisition system, digital program control technology, digital PID control algorithm. The difficulties of teaching contents are described as followings: the mathematical model of the continuous control system, the stability and steady-state error analysis of the typical closed-loop system, the principle and program design of the stepper motor control system, and so on.

Recommended Textbooks/References:

1. Jiang Xinyi et al., computer Control Technology, Tsinghua University Press, January 2007.
2. Chen Xiangguang et al., principle and Application of automatic Control, Tsinghua University Press, January 2018.
3. Lan Yipeng, computer Control Technology, Tsinghua University Press, September 2016.
4. Pan Xinmin, Microcomputer Control Technology (2nd Edition), Electronic Industry Press, November 2014

0005698 软件质量管理与测试

课程编码：0005698

课程名称：软件质量管理与测试

英文名称：Software Quality Management and Testing

课程类型：专业选修课

学分： 2.0 **总学时：** 32

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

先修课程：高级语言程序设计，数据结构与算法，数据库原理

考核形式：平时成绩+考试

撰写人：付利华

课程简介：（250-300 字）

软件质量管理与测试是信息学部为计算机科学与技术专业本科生开设的专业选修课程。本课程的主要任务是使学生掌握软件质量管理和测试中的基本概念、基本方法和测试技术，重点讲述白盒测试与黑盒测试的测试用例设计方法，单元测试、集成测试与系统测试的各个测试阶段，并使学生能够掌握在典型测试中运用软件测试技术设计测试用例的方法，学会软件测试工具的使用，以及软件测试过程的管理，在系统软件级上使学生系统科学地受到分析问题和解决问题的训练，从而具备初步的软件测试能力。通过对该课程的学习，学生可以学习软件测试的基本理论和基本原理、技术方法，掌握软件开发中的测试过程管理、测试用例设计试等解决实际问题的基本能力。

推荐教材或主要参考书：

[1] 朱少民. 软件测试. 北京：人民邮电出版社，2016 年 7 月

[2] 蔡建平. 软件测试实验指导教程. 北京：清华大学出版社，2009 年 1 月

[3] Ron Patton. 软件测试. 北京：机械工业出版社，2019 年 7 月

0005698 Software Quality Management and Testing

Course Number: 0005698

Course Title: Software Quality Management and Testing

Course Type: Major Elective Courses

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

Students: Undergraduate students major in computer science and technology

Prerequisites: High Language Programming, Data Structures and Algorithms, Database Systems Technology

Evaluation Method: Course participation + written exams

Writer： Fu Lihua

Course Description:

Software quality management and testing is one of the main elective courses for undergraduates majoring in computer science and technology. Software quality management and testing involves the theories, methods and tools of professional software testing. Students should understand the basic concepts, theories, methods and techniques of software testing. The basic content of this course includes: software quality management, unit testing, integration testing, system testing, white box testing, black box testing, performance testing, stress testing, automated testing, manual testing, logic coverage, statement coverage, decision coverage, condition coverage, etc.

Recommended Textbooks/References:

1. Zhu Shaomin. Software Testing. The People's Posts and Telecommunications Press. 2009

2. Cai Jianping. Experiment Guide of Software Testing. Tsinghua University Press. 2009

3. Ron Patton. Software Testing. China Machine Press. 2006

0004853 分布式系统导论（双语）

课程编码：0004853

课程名称：分布式系统导论（双语）

英文名称：Introduction to Distributed Systems

课程性质：专业选修课

学分： 2.0 **总学时：**32

面向对象：计算机类专业本科生

先修课程：操作系统原理，计算机网络

考核形式： 平时成绩+笔试

撰写人：金雪云

课程简介：（250-300 字）

分布式系统导论是信息学部为计算机科学与技术专业本科生开设的专业选修课程。本课程涉及了分布式系统的设计和实现，对操作系统和计算机网络知识的拓展、深化，满足学生这方面的兴趣爱好，从而发展学生的个性与特长。课程除了要求学生掌握相关基本概念、理论外，还包含解释分布式系统相关现象，面对分布资源的管理问题给出合适的解决方案，从而提升学生计算机问题求解水平，增强系统能力。知识点包括分布式系统的基础知识、进程间通信、命名服务、同步问题、分布式事务管理和复制与一致性问题；难点在于同步问题、分布式事务管理以及复制与一致性。

推荐教材或主要参考书：

[1] George Coulouris, Jean Dollimor，Distributed System Design and Concepts，机械工业出版社，2013

[2] Andrew S.Tanenbaum，Distributed System Principles and Paradigms，清华大学出版社，2008

0004853 Introduction to Distributed Systems (Bilingual Course)

Course Number: 0004853

Course Title: Introduction to Distributed Systems

Course Type: Major Optional Curriculum

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

Students: Undergraduate students majoring in Computer Science and Technology

Prerequisites: Operating System Theory, Computer Networks

Evaluation Method: Course participation + written exams

Writer: Jin Xueyun

Course Description:

Introduction to Distributed Systems is one of the Major Required Curriculum for undergraduate students Major in Computer Science and Technology. The main target of this course is to clarify the design and implementation of distributed system, expand and deepen the knowledge of operating system and computer network, meet students 'interests in this field, so as to develop students' personality and expertise. In addition to requiring students to master the relevant basic concepts and theories, the course also includes explaining the related phenomena of distributed system and providing appropriate solutions to the management problems of distributed resources, so as to improve students' solving level of computer problems and enhance the system ability. The teaching contents are mainly covered by the following aspects: fundamental knowledge, inter-process communication, name service, synchronization problem, distributed transaction management, replication and consistence. The difficulties of teaching contents are described as followings: synchronization problem, distributed transaction management, replication and consistence.

Recommended Textbooks/References:

1. George Coulouris, Jean Dollimor，Distributed System Design and Concepts，China Machine Press, 2013
2. Andrew S.Tanenbaum，Distributed System Principles and Paradigms，Tsinghua University Press, 2008

0004846 TCP/IP 协议分析及应用Ⅰ

课程编码：0004846

课程名称：TCP/IP 协议分析及应用Ⅰ

英文名称：TCP/IP Analysis and Application

课程类型：专业选修课

学分：2.0　　**总学时：**32

面向对象：计算机类专业本科生

先修课程：计算机网络

考核形式：平时成绩+考试

撰写人：任兴田

课程简介：

TCP/IP 协议分析及应用 I 是信息学部为计算机类专业本科生开设的一门专业选修课。本课程任务是使学生理解和掌握 TCP/IP 协议的研究方法、基本概念和基本原理，还能用协议分析软件和命令观察协议的运行，能实现简单的客户/服务器程序。

教学内容重点：TCP/IP 参考模型、环回接口处理 IP 包过程、子网划分、IP 路由技术、路由协议、ARP 请求/响应、对收到帧的过滤过程、C/S 程序的设计和实现、FTP 连接管理、DNS 解析过程、SMTP、POP3、HTTP、网络管理功能、SNMP 操作。

教学内容难点：协议分层、环回接口处理 IP 包过程、特殊 IP 地址、子网划分、RIP 对坏消息反映慢、发送/接收 ICMP 报文、多播程序中 socket 设置、UDP 伪首部、基本套接口编程、管理信息结构、管理信息库。

推荐教材或主要参考书：（含主编，教材名，出版社，出版日期）

[1] Kevin R. Fall, W. Richard Stevens 著, 吴英, 张玉, 许昱玮译. TCP/IP 详解: 卷 1. 协议(第 2 版). 机械工业出版社, 2016 年 6 月

[2] Douglas E. Comer 著，林瑶，张娟，王海译. 用 TCP/IP 进行网际互连.第一卷--原理、协议与结构(第五版). 电子工业出版社, 2007 年 2 月

0004846 TCP/IP Analysis and Application I

Course Number: 0004846

Course Title: TCP/IP Analysis and Application I

Course Type: Major Electives Course

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

Students: Undergraduate students major in Computer

Prerequisites: Computer Network

Evaluation Method: Course participation + written exams

Writer： Xingtian Ren

Course Description:

TCP/IP analysis and application is one of the major elective courses for undergraduate students Major in computer. The main target of this course is to enable students to understand and master the research methods, basic concepts and basic principles of the TCP/IP protocol. They can also observe the operation of the protocol using tools, and can implement simple C/S programs.

The teaching contents are mainly covered by the following aspects: TCP/IP reference model, processing of IP datagrams by loopback interface, subnetting, IP routing, routing protocol, ARP request and ARP replay, filtering process of received frames, design and implementation of C/S program, FTP connection management, DNS resolution process, SMTP, POP3, HTTP, functions of network management, SNMP operations.

The difficulties of teaching contents are described as followings: protocol layering, processing of IP datagrams by loopback interface, special IP addresses, subnetting, slow response to bad messages in RIP, sending and receiving ICMP messages, socket setting in multicast program, UDP pseudo headers, basic socket programming, structure of management information and management information base.

Recommended Textbooks/References:

1. Kevin R. Fall, W. Richard Stevens. TCP/IP Illustrated, Volume 1: The Protocols (2nd Edition). China Machine Press, 2016
2. Douglas E. Comer. Internetworking with TCP/IP Volume I: Principles, Protocols, and Architectures (5th Edition). Publishing House of Electronics Industry, 2009

0005693 多媒体技术

课程编码：0005693

课程名称：多媒体技术

英文名称：Multimedia Technology

课程类型：专业选修课

学分： 2 **总学时：** 32

面向对象：计算机科学与技术专业本科生

先修课程：高级语言程序设计，数据结构与算法，计算机组成原理，计算机体系结构

考核形式： 平时成绩+考试

撰写人：付鹏斌

课程简介：

多媒体技术是信息学部为计算机科学与技术专业本科生开设的专业选修课。任务是从数据压缩、体系结构等纵深理论入手，剖析和实践音视频、图像、动画的处理、识别技术及集成方法，感悟并体验绘画、色彩、版面的美学基础，理解算法、架构、编程整合成软硬件产品的方法，体会技术、艺术结合创造时尚品的技巧。从学科层面认识多媒体技术的整合能力，提升对计算机技术本身的理解和认知，体验多媒体应用设计的乐趣。通过对知识的掌握，艺术修养的提高，能力的培养，以提高学生的专业素养。

教学重点：1、数据压缩技术，2、美学基础，3、典型多媒体系统 CD-I 系统，4、多媒体集成技术。

教学难点：1、美学基础、2、多媒体交互技术，3、语音识别技术。

推荐教材或主要参考书：

[1] 鲁宏伟，甘早斌编著. 多媒体计算机技术(第 5 版) .电子工业出版社，2019.

[2]Ze-Nian Li，Mark S. Drew，Jiangchuan Liu.多媒体技术教程(原书第 2 版).机械工业出版社，2019.

[3] 赵子江.多媒体技术应用教程（第 7 版）.机械工业出版社，2018.

[4] 娄岩编.虚拟现实与增强现实应用基础.科学出版社，2018.

0005693 Multimedia Technology

Course Number: 0005693

Course Title: Multimedia Technology

Course Type: Professional Elective courses

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

Students: Undergraduate students majoring in Computer Science and Technology

Prerequisite courses**:** Advanced Language Programming, Data Structures and Algorithms, Principles of Computer Composition, Computer Architecture

Evaluation Method: Course participation + written exams

Writer: Pengbin Fu

Course Description:

Multimedia technology is a professional elective course for computer science and technology. The task is to start with theories such as data compression and architecture, Analyze and implement processing technologies and integration methods for audio, video, image, and animation,Exploring the aesthetic fundamentals of painting, color, and layout, Understand the methods of integrating algorithms, architecture, and programming into products, Experience the techniques of combining technology and art to create fashion products. Understanding the integration ability of multimedia technology from a disciplinary perspective, Enhance understanding of computer technology itself, Experience the fun of multimedia application design. By mastering knowledge, improving artistic cultivation, and cultivating abilities, we aim to enhance students' professional literacy.

Teaching focus: 1. Data compression technology, 2. Aesthetic foundation, 3. Typical multimedia system CD-I, 4. Multimedia integration technology.

Teaching difficulties: 1. Aesthetic foundation, 2. Multimedia interaction technology, 3. Speech recognition technology.

Recommended Textbooks/References:

1. Hongwei Lu , Zaobin Gan. Multimedia Computer Technology (5th Edition). Publishing House of Electronics Industry, 2019.
2. Zenian Li, Mark S. Drew, Jiangchuan Liu. Multimedia Technology Tutorial (Original Book 2nd Edition). China Machine Press, 2019.
3. Zijiang Zhao. Multimedia Technology Application Tutorial (7th Edition). China Machine Press, 2018.
4. Yan Lou. Fundamentals of Virtual Reality and Augmented Reality Applications. Science Press, 2018.

0001084 数字信号处理

课程编码：0001084

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： 2.0 **总学时：** 32

面向对象：计算机科学与技术专业类本科生

先修课程：高等数学，线性代数，概率论与数理统计，信号与系统

考核形式： 平时成绩+考试

撰写人：肖创柏

课程简介：（250-300 字）

数字信号处理是信息学部计算机学院为计算机科学与技术专业本科生开设的专业选修课程类型。本课程的目的是介绍信号数字处理的基本分析工具和技术，任务是学生通过学习该课程，了解离散时间信号、系统和现代信号处理的基本原理、算法与应用的基本理论、基本概念与基本方法，重点集中于离散时间信号与离散时间系统、z 变换及其在线性时不变系统分析中的应用、信号的频域分析、线性时不变系统的频域分析、离散傅立叶变换的特性及应用和快速傅立叶变换算法、离散时间系统的实现等。教学内容重点：一些基本的问题求解技术、方法和思想，数字化思维、计算思维和系统思维，特别是数字化处理带来的新问题及其处理方法，系统思维，为本领域的进一步学习和研究奠定基础。

推荐教材或主要参考书：

[1] [美] John G. Proakis，Dimitris G. Manolakis 著，方艳梅，刘永清等译. 数字信号处理（第四版），电子工业出版社, 2014 年 8 月

[2] 许可，万建伟，数字信号处理，清华大学出版社，2020 年 12 月

[3] [美] Alan V.Oppenheim，Ronaid W.Schafer 著，黄建国，刘树棠，张国梅译. 离散时间信号处理（第三版），电子工业出版社, 2015 年 1 月

[4] [美] Sanjit K. Mitra 著，余翔宇译, 数字信号处理—基于计算机的方法（第四版），电子工业出版社, 2018 年 6 月

[5] 程佩青，数字信号处理教程，清华大学出版社，2015 年 8 月

0001084 Digital Signal Processing

Course Number: 0001084

Course Title: Digital Signal Processing

Course Type: Professional elective course

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

Students: Undergraduate students majoring in Computer

Prerequisites: Signal and System, Linear Systems for Continuous-time Signals

Evaluation Method: Course participation + written exams

Writer: Chuangbai Xiao

Course Description:

The purpose of this course is to introduce the basic analytical tools and techniques of signal digital processing. Discrete-time signals, systems, and modern digital signal processing algorithms and applications are introduced in this course. The students are expected to understand the basic concepts, theories, methods, and techniques of discrete-time signals, systems, and modern digital signal processing algorithms and applications, through which their system and modeling abilities will be improved. The basic topics include: the concepts of signals, systems, and signal processing; classification of signals; the concept of frequency in continuous-time and discrete-time signals; analog-to-digital and digital-to-analog conversion; discrete-time signals and systems; analysis of discrete-time LTI systems; discrete-time systems described by difference equations; implementation of discrete-time systems; correlation of discrete-time signals; the z-transform and its application to the analysis of LTI systems; frequency-domain analysis of signals; frequency-domain analysis of LTI systems; the discrete Fourier transform: its properties and applications.

Recommended Textbooks/References:

1. J. G. Proakis, Dimitris G. Manolakis. Digital Signal Processing: Principles, Algorithm, and Applications (Fifth Edition). Publishing House of Electronics Industry. 2022
2. A. V. Oppenheim, R. W. Schafer. Discrete-Time Signal Processing (3rd Edition). Publishing House of Electronics Industry. January 2015
3. Sanjit K. Mitra. Digital Signal Processing: A Computer-Based Approach (Fourth Edition, English version). Publishing House of Electronics Industry. August 2019

0010055 IPv6 技术及应用

课程编码：0010055

课程名称：IPv6 技术及应用

英文名称：IPv6 Technology and Application

课程类型：专业选修课

学分：2.0　　**总学时：**32

面向对象：计算机类专业本科生

先修课程：计算机网络

考核形式：平时成绩+考试

撰写人：任兴田

课程简介：

IPv6 技术及应用是信息学部为计算机类专业本科生开设的一门专业选修课。本课程任务是使学生理解和掌握 IPv6 的研究方法、基本概念和基本原理，还能用协议分析软件和命令观察 IPv6 协议的运行，能设计 IPv6 实验床。

教学内容重点：Pv6 变化、IPv6 包头分析、IPv6 地址表示、IPv6 地址划分、单播地址、扩展头用法、扩展头分析、理解 IPv6 路由表、IPv6 路由过程、AH 和 ESP 分析、IPv6 对其他层协议的影响、邻居发现协议、移动 IPv6 工作原理、IPv6 过渡技术、IPv6 获得的支持、IPv6 网络配置、实验床方案设计和实现。

教学内容难点：IPv6 分段、IPv6 地址划分、任播、选路头、IPv6 路由过程、IPSec 实现的安全性服务、为使 DNS 适应 IPv6 所作的扩展、移动 IPv4 中三角路由、隧道工作原理、IPv6 获得的支持、IPv6 网络配置。

推荐教材或主要参考书：（含主编，教材名，出版社，出版日期）

[1] Silvia Hagen 著, 夏俊杰译. IPv6 精髓(第 2 版). 人民邮电出版社, 2013

[2] Michael Dooley, Timothy Rooney 著, 董守玲, 王昊翔, 胡金龙译. IPv6 部署和管理. 机械工业出版社, 2015

[3] Qing Li, Tatuya Jinmei, Keiichi Shima 著, 陈涓, 赵振平译. IPv6 详解第 1 卷: 核心协议实现. 人民邮电出版社, 2009

0010055 IPv6 Technology and Application

Course Number: 0010055

Course Title: IPv6 Technology and Application

Course Type: Major Elective Course

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

Students: Undergraduate Students Major in Computer

Prerequisites: Computer Network

Evaluation Method: Course participation + written exams

Writer： Xingtian Ren

Course Description:

IPv6 Technology and Application is one of the major elective courses for undergraduate students Major in computer. The main target of this course is to enable students to understand and master IPv6 research methods, basic concepts and basic principles. They can observe the operation of the IPv6 protocol using protocol analysis software and commands. They can also design IPv6 testbed.

The teaching contents are mainly covered by the following aspects: major changes in Pv6, IPv6 header analysis using Wireshark, IPv6 address notation, IPv6 subnetting, unicast address, extension header analysis using Wireshark, understanding IPv6 routing table, IPv6 routing process, AH and ESP analysis using Wireshark, impact of IPv6 on the protocols of other layers, neighbor discovery protocol, working principle of mobile IPv6, IPv6 transition, support for IPv6, IPv6 network configuration, design and implementation of IPv6 testbed.

The difficulties of teaching contents are described as followings: IPv6 segmentation, IPv6 subnetting, anycast, routing extension header, IPv6 routing process, security services implemented by IPsec, extensions to adapt DNS to IPv6, triangular routing in mobile IPv4, principles of tunnels, IPv6 support, IPv6 network configuration.

Recommended Textbooks/References:

1. Silvia Hagen. IPv6 Esentials. Post & Telecom Press, 2013
2. Michael Dooley, Timothy Rooney. IPv6 Deployment and Management. China Machine Press, 2015
3. Qing Li, Tatuya Jinmei, Keiichi Shima. IPv6 Core Protocols Implementation. Post & Telecom Press, 2009

0007350 Linux 操作系统

课程编码：0007350

课程名称：Linux 操作系统

英文名称：Principle of Linux Operating System

课程类型：专业选修课

学分：2.0　　**学时：**32

面向对象：计算机科学与技术（实验班）、计算机科学与技术专业、物联网工程专业本科生

先修课程：操作系统原理

考核形式：笔试

撰写人：王丹

课程简介：

通过对 Linux 操作系统的组织结构、设计思想和实现机制的学习，培养学生系统软件层面的分析问题和解决问题的能力。要求学生掌握有关 Linux 操作系统方面的基本概念、基本理论、基本方法和实现技术。主要内容包括：Linux 操作系统的特点、Linux 内核源代码组织与分析方法、Linux 系统引导过程；Linux 进程管理与进程调度；Linux 的中断与定时服务、Linux 系统调用、Linux 虚拟地址和物理地址；虚拟文件系统 VFS 及文件系统的注册、安装和卸载； EXT2 文件系统；Linux 设备分类与识别、设备驱动程序; 模块机制。

推荐教材或主要参考书：（含主编，教材名，出版社，出版日期）

[1]（美）Robert Love 著，陈莉君 康华译.Linux 内核设计与实现(原书第 3 版).机械工业出版社.2011

[2] 任哲等.微型计算机操作系统基础-基于 Linux/i386.清华大学出版社.2008

[3] 蒋静，徐志伟.操作系统原理• 技术与编程.机械工业出版社.2004

[4] 毛德操，胡希明.Linux 内核源代码情景分析(上下册).浙江大学出版.2006

[5] 河秦，王洪涛.Linux 2.6 内核标准教程.人民邮电出版社.2008

0007350 Priciple of Linux Operating System

Course Number: 0007350

Course Title: Priciple of Linux Operating System

Course Type: Major Electives

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

Students: Undergraduate students major in Computer Science and Technology

Prerequisites: Princinple of Operating System

Evaluation Method: Written Exam

Writer： Wang Dan

Course Description:

Organization, design idea and implementation mechanism of Linux operating system are introduced in this course. The students are expected to understand the basic concepts, theories, methods and techniques of Linux operating system, and to set up the related problem solving methods on the level of system software, through which their analysis, design and implementation abilities about the system software will be improved. The basic topics include: the feature of Linux, the source code organization structure of Linux, the boot process of Linux; the process management and process schedule; the interrupt and timer mechanism; system call; virtual memory and physics memory; virtual file system and file system‘s register, install and uninstall;Ext2 file system; device catalog and driver program; modules.

Recommended Textbooks/References:

1. Ren Zhe. Computer Operating System Basics Based on Linux/i386. Beijing: Tsinghua University Press.2008
2. Jiang Jing, Xu Zhiwei. Principle, Technology and Programming of Operating System. Beijing: China Machine Press. 2004
3. Mao Decao, Hu Ximing. Analysis of Linux Kernel Source code. Hangzhou: Zhejiang University Press. 2006
4. He Qin, Wang Hongtao. Linux 2.6 Kernel Standard Book. Beijing: Posts&Telecom Press. 2008
5. Robert Love. Linux Kernel Development (3th Edition). Beijing: China Machine Press.2011
6. Greg Kroah Hartman. Linux Kernel in a Nutshell. Nanjing: South Eastern University Press. 2007

0003484 数据挖掘

课程编码：0003484

课程名称：数据挖掘

英文名称：Introduction to Data Mining

课程类型：专业选修课

学分： 2.0 **总学时：32**

面向对象：计算机科学与技术专业及相关专业本科生，校选课本科生

先修课程：高级语言程序设计，数据结构与算法，概率论与数理统计，数据库原理

考核形式： 平时成绩+考试或者平时成绩

撰写人：赵文兵

课程简介：（250-300 字）

信息技术已进入了联机分析处理和数据挖掘的信息分析时代。数据挖掘是数据库研究、开发和应用最活跃的分支之一。本课程以关系数据为代表的结构化数据为代表，结合 Web 数据、文本数据等非结构数据，多角度全方位地介绍数据挖掘的基本概念、基本方法和基本技术，以及数据挖掘的最新进展。要求学生通过本课程的学习，认识数据挖掘在当今计算机应用中的作用，了解数据挖掘的整体结构，掌握数据预处理技术和数据挖掘技术，熟悉数据挖掘的基本原理和发展方向。通过课程作业和课程设计，要求学生能够将理论与实践相结合。

推荐教材或主要参考书：

[1] 陈封能. 数据挖掘导论（原书第 2 版）, 段磊等译，机械工业出版社， 2019 年 8 月

[2] Mohammed J. Zaki 等. 数据挖掘与分析:概念与算法，吴诚堃译，人民邮电出版社，2017 年 9 月

[3] Jure Leskovec 等. 大数据：互联网大规模数据挖掘与分布式处理，著，王斌译，人民邮电出版社，2015 年 7 月

[4] 韩家炜等. 数据挖掘：概念与技术（第三版），范明等译，机械工业出版社，2012 年 8 月

0003484 Introduction to Data Mining

Course Number: 0003484

Course Title: Introduction to Data Mining

Course Type: Major Optional Curriculum

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

Students: Undergraduate students majoring in Computer Science and Technology

Prerequisites: Program Design, Data Structure and Algorithm, Mathematical Statistics, Database Principles

Evaluation Method: Course participation + written exams or Course participation

Writer： Zhao Wenbing

Course Description:

Information technology has entered the era of online analytical processing and data mining. Data mining is one of the most active branches of database research, development and application. This course takes the structured data represented by relational data as the representative, and combines the unstructured data such as web data and text data to introduce the basic concepts, basic methods and basic technologies of data mining from multiple perspectives, as well as the latest development of data mining. Through the study of this course, students are required to understand the role of data mining in today's computer applications, understand the overall structure of data mining, master the data preprocessing technology and data mining technology, and be familiar with the basic principles and development direction of data mining. Through the course assignment and curriculum design, students are required to be able to combine theory with practice.

Recommended Textbooks/References:

1. Pang-Ning Tan etc. Introduction to Data Mining (2nd), China Machine Press, 2019
2. Mohammed J. Zaki etc. Data Mining and Analysis: Fundamental Concepts and Algorithms, Posts and Telecommunications Press, 2017
3. Jure Leskovec etc. Mining of Massive Datasets (2nd), Posts and Telecommunications Press, 2015
4. Jiawei Han etc. Data Mining: Concepts and Techniques (3rd), China Machine Press, 2012

0007354 SOPC 设计技术

课程编码：0007354

课程名称：SOPC 设计技术

英文名称：Design Technique Based On SOPC

课程类型：专业选修课

学分： 2.0 **总学时：** 32

面向对象：计算机科学与技术（实验班）、计算机科学与技术专业、物联网工程专业本科生

先修课程：计算机组成原理，数字系统设计（双语），微型计算机接口技术III

考核形式：试卷成绩+实验成绩

撰写人：郭黎敏

课程简介：（250-300 字）

“SOPC 设计技术”作为计算机科学与技术的一门重要课程，该课程具有先进性、系统性、综合性和使用性的特点。本课程以 IP 复用方法为基本思路，结合第三方 IP 核的应用以及自主 IP 核的开发，介绍片上可编程系统的设计、实现及应用测试。课程以典型 EDA 工具 Quartus Ⅱ为例证讲授，使同学较好的掌握片上可编程系统构造工具 SOPC Builder；设计以 Nios Ⅱ软核处理器为核心的嵌入式计算机系统；掌握高层次 IP 复用方法；学习自主 IP Core 设计技术和工程实现方法；通过 IDE、内嵌式逻辑分析仪和硬拷贝等工程过程，提高系统设计能力和基于 HAL 的应用编程能力。

推荐教材或主要参考书：

[1] 侯建军，郭勇. SOPC 技术基础教程（第 2 版）. 清华大学出版社，2018 年 2 月

[2] 李兰英. Nios Ⅱ嵌入式软核 SOPC 设计原理及应用. 北航出版社，2006 年 11 月

[3] Pong，P.Chu 著. 金明录，门宏志 译. 基于 Nios II 的嵌入式 SOPC 系统设计与 Verilog 开发实例. 电子工业出版社，2015 年 5 月

[4] 李翠锦，李成勇，代红英. 基于 SOPC 的 FPGA 设计实验指导. 成都西南交大出版社，2018 年 1 月

0007354 Design Technique Based On SOPC

Course Number: 0007354

Course Title: Design Technique Based On SOPC

Course Type: Professional Elective Courses

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

Students: Undergraduate students majoring in computer science and technology, Internet of things Engineering

Prerequisites: Computer composition principle, Digital system design, Microcomputer interface

Evaluation Method: Written exams + experiment exams

Writer： Limin Guo

Course Description:

"SOPC design technology" is an important course in computer science and technology. The course has the characteristics of advanced, systematic, comprehensive and usability. This course takes IP reuse as the basic idea, and introduces the design, implementation and application test of on-chip programmable system in combination with the application of third-party IP core and the development of independent IP core. The course takes Quartus II, a typical EDA tool, as an example to teach, so that students can better master SOPC builder, an on-chip programmable system construction tool, design an embedded computer system with Nios II soft core processor as the core, master the high-level IP reuse method, learn the independent IP core design technology and Engineering implementation method, and use IDE, embedded logic analyzer, hard copy and other engineering processes, Improve the ability of system design and application programming based on Hal.

Recommended Textbooks/References:

1．Jianjun Hou, Yong Guo. SOPC technology basic course (2nd Edition). Tsinghua University Press, February 2018.

2．Lanying Li. Design principle and application of Nios Ⅱ embedded soft core SOPC. Beihang press, November 2006.

3．Pong P.Chu. Embedded SoPC Design with Nios II Processor and Verilog Examples, Electronic Industry Press, May 2015.

4．Cuijin Li, Chengyong Li, Hongying Dai. FPGA design experiment guidance based on SOPC. Chengdu Southwest Jiaotong University Press, January 2018.

0010107 机器学习基础

课程编码：0010107

课程名称：机器学习基础

英文名称：Machine Learning Foundation

课程性质：专业选修课

学分： 2.0 **总学时：** 32

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

先修课程：高等数学，线性代数，概率论与数理统计，高级语言程序设计

考核形式： 平时成绩+大作业及汇报

撰写人：梁音

课程简介：（250-300 字）

机器学习基础是信息学部为计算机科学与技术专业本科生开设的专业选修课。本课程的目标是使学生了解机器学习的发展历史、基本概念和学科范畴，掌握机器学习的经典模型和算法，以及应用机器学习技术设计及求解应用问题的方法，为学生开展相关领域的科学研究和技术开发提供理论和技术基础。课程教学内容重点介绍机器学习的基本概念和研究问题，相关数学基础，以及重要的机器学习方法与模型；教学难点在于使学生掌握经典的机器学习方法，并将其应用于实际问题求解。课程将结合实例对机器学习中的基本理论及经典算法进行系统而深入的讲解，提升学生理论联系实际，以及应用机器学习方法解决问题的能力。

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] Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar 等著，张文生等译，机器学习基础，机械工业出版社，2019 年 4 月

0010107 Machine Learning Foundation

Course Number: 0010107

Course Title: Machine Learning Foundation

Course Type: Major Selective Course

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

Students: Undergraduate students majoring in Computer Science and Technology

Prerequisites: Advanced Mathematics, Linear Algebra, Probability Theory and Mathematical Statistics, High-level Language Programming

Evaluation Method: Course participation + Course design report and presentation

Writer: Yin Liang

Course Description:

Machine Learning Foundation is one of the major selective courses for undergraduate students Major in Computer Science and Technology. The main target of this course is to clarify basic concept and disciplinary category of machine learning, grasp the basic theory, classical models and algorithms, and be familiar with the methods for designing and solving application problems using machine learning technology, providing theoretical and technical foundations for students to carry out scientific research and project development. This course is focus on introducing the basic concepts and research problems of machine learning, relevant mathematical foundations, as well as important machine learning methods and models. The teaching difficulty lies in enabling students to master classic machine learning methods and apply them to practical problem solving. The course will combine examples to systematically explain the basic theories and classic algorithms in machine learning, enhancing students' ability to integrate theory with practice and apply machine learning methods to solve problems.

Recommended Textbooks/References:

1. Zhou Zhihua, Machine Learning, *Tsinghua University Press*, 01-2016
2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar et al., Machine Learning Foundation, *China Machine Press*, 04-2019

0010057 Python 与数据分析

课程编码：0010057

课程名称：Python 与数据分析

英文名称：Python for Data Analysis

课程类型：专业选修课

学分：2.0　　**总学时：**32

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

先修课程：高级语言程序设计

考核形式：平时成绩+考试

撰写者：米庆

课程简介：

Python 与数据分析是信息学部为计算机科学与技术专业本科生开设的专业选修课，以 Python 语言及其常用库为基础，帮助学生掌握清洗、统计、分析和展示数据的能力，重点培养学生灵活运用 Python 及第三方专业资源，进行科学计算、可视化绘图、数据处理、分析与建模的能力。所涵盖的教学内容包括：数据分析的概念、数据分析的流程、Python 语言基础、Python 数据分析常用库，如 NumPy、Matplotlib、pandas 和 scikit-learn 的运用等内容。其中教学内容的重点为：数据分析的流程，NumPy、Matplotlib、pandas 和 scikit-learn 的理解与运用；教学内容的难点为：scikit-learn 的理解与运用。

推荐教材或主要参考书：

[1] Wes Mckinney. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython. O'Reilly Media, October 2017

[2] 黄红梅, 张良均. Python 数据分析与应用. 人民邮电出版社, 2018 年 4 月

[3] 朱春旭. Python 数据分析与大数据处理. 北京大学出版社, 2019 年 10 月

0010057 Python for Data Analysis

Course Number: 0010057

Course Title: Python for Data Analysis

Course Type: Optional course

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

Students: Undergraduate students majoring in computer science and technology

Prerequisites: High-level Language Programming

Evaluation Method: Course participation + written exams

Writer: Qing Mi

Course Description:

Python for Data Analysis is one of the optional courses for undergraduate students majoring in computer science and technology. The main target of this course is to clarify the concept and process of data analysis, the parts of the Python language and libraries that can be used to solve data analysis problems. This course focuses on the nuts and bolts of manipulating, processing, cleaning, and crunching data in Python. It is also a practical, modern introduction to scientific computing in Python, tailored for data-intensive applications. The teaching contents are mainly covered by the following aspects: the process of data analysis, the application of NumPy, Matplotlib, pandas and scikit-learn. The difficulties of teaching contents are described as followings: the application of scikit-learn.

Recommended Textbooks/References:

1. Wes Mckinney. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython. O'Reilly Media, October 2017
2. Hongmei Huang, Liangjun Zhang. Python Data Analysis and Application. Posts and Telecom Press, April 2018
3. Chunxu Zhu. Python Data Analysis and Big Data Processing. Peking University Press, October 2019

0000334 并行计算

课程编码：0000334

课程名称：并行计算

英文名称：Parallel Computing

课程类型：专业选修课程

学分： 2 **总学时：** 32

面向对象：计算机科学与技术专业、物联网工程专业本科生

先修课程：计算机体系结构、操作系统原理、计算机网络

考核形式：平时作业+期末考试

撰写人： 梁毅

课程简介：（250-300 字）

并行计算是信息学部为计算机科学与技术、物联网工程专业本科生开设的专业选修课程。本课程的任务是帮助学生在具备计算机硬件及系统软件基础知识的前提下，掌握并行计算的基本理论、方法与技术。教学内容的重点是并行计算机体系结构、面向共享存储的并行编程模型、面向消息传递的并行编程模型以及并行处理技术。教学内容的难点是结合理论知识，理解和掌握 OpenMP、MPI 和 Map/Reduce 等并行程序的编写、调试与分析方法，并进行相关实验实践。

推荐教材或主要参考书：

[1] （德）贝蒂尔·施密特等著，张常有等译，并行程序设计，机械工业出版社，2020 年 6 月

[2] （美）帕切克著，邓倩妮译. 并行程序设计导论. 机械工业出版社，2012 年 11 月

0000334 Parallel Computing

Course Number: 0000334

Course Title: Parallel Computing

Course Type: Major Elective Course

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

Students: Undergraduate students majoring in Computer Science and Technology or Internet of Things Engineering

Prerequisites: Computer Architecture, Operating System, Computer Network

Evaluation Method: Homework assignments+written exam

Writer: Yi Liang

Course Description:

Parallel computing is one of the major elective courses for undergraduate students majoring in Computer Science and Technology or Internet of Things Engineering. The main target of this course is to help students develop a solid understanding of the fundamental theories, methods, and techniques of parallel computing, assuming a foundation in computer hardware and system software.This course focuses on key aspects such as parallel computer architectures, parallel computing models, shared-memory parallel programming models, message-passing parallel programming models, and parallel processing techniques. The difficulties of teaching contents are described as followings: the integration of theoretical knowledge with practical skills, particularly in developing, debugging, and analyzing parallel programs using tools like OpenMP, MPI, and Map/Reduce.

Recommended Textbooks/References:

1. Bertil.S, Jorge.G.D, Christian.H, Parallel Programming:Concept and Practice. Morgan Kaufmann Publishers, 11-2017
2. Peter.P , An Introduction to Parallel Programming, Morgan Kaufmann Publishers, 03-2011

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 Seminars

课程类型：自主课程

学分： 1.0 **总学时：**16

面向对象：计算机科学与技术（实验班）、计算机科学与技术专业、物联网工程专业本科生

先修课程：无

考核形式：考勤+学生做报告+班级研讨+学生研究型作业

撰写人：杜金莲 王丹

课程简介：（250-300 字）

新生研讨课（Freshman Seminars）是由各学科领域的教授面向一年级学生开设的小班研讨形式的课程。其教学模式无论在授课方法、教学媒介、考核手段等诸多方面皆与惯常教学有很大不同。课程由多个课堂组成，多以探索、讨论和研讨为导向、强调师生互动和学生自主学习，对同学们在掌握知识、开拓视野、合作精神、批判思考、交流表达、写作技能等诸多方面进行整体上的培养与训练。新生研讨课不仅让新生学习知识，更重要的是让新生体验认知过程，强调教师的引导与学生的充分参与和交流，启发学生的研究和探索兴趣，培养学生发现问题、提出问题、解决问题的意识和能力。

0009394 Freshman Seminars

Course Number: 00070074

Course Title: Freshman Seminars

Course Type: Independent course

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

Students: Undergraduate majoring in Computer Science and Technology and Internet of things Engineering

Prerequisites: No prerequisite

Evaluation Method: Course participation +reports+discussion+research assignments

Writer： Du Jinlian Wang dan

Course Description:

Freshman seminar is a small class seminar course offered by professors in various fields for freshmen. Its teaching mode is quite different from conventional teaching in teaching methods, teaching media and assessment means. The course is composed of several classes, which are mostly guided by exploration and discussion.It emphasizes the interaction between teachers and students and students' autonomous learning.Freshmen seminar not only enables freshmen to learn knowledge, but also enables them to experience the cognitive process. It emphasizes teachers' guidance and students' full participation and communication, inspires students' interest in research and exploration, and cultivates students' awareness and ability to discover, raise and solve problems.

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

课程类型：自主课程

学分： 1.0 **总学时：** 16

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

先修课程：无

考核形式： 平时成绩+考察

撰写人：涂山山

课程简介：（250-300 字）

学术写作是计算机学院（部）为信息计算机科学与技术专业本科生开设的自主课程类型。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] 李玉浩，Writing English Research Papers 英语学术写作概论，知识产权出版社，2013 年 8 月

[3] 罗伊娜·默里等，学术写作手册：一种新方法，上海教育出版社，2011 年 6 月

[4] 王雨磊，学术论文写作与发表指引， 中国人民大学出版社，2017 年 9 月

[5] 海伦· 索德，学术写作指南：100 位杰出学者的写作之道，人民教育出版社，2018 年 12 月

0010663 Academic writing

Course Number: 0010663

Course Title: Academic writing

Course Type: Independent course

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

Students: Undergraduate students majoring in computer science

Prerequisites:

Evaluation Method: Course participation + paper

Writer: Shanshan Tu

Course Description:

Academic writing is one of the subject elective courses for undergraduate students Major in Computer and Information Security. The main target of this course is to clarify how to write academic papers, to help students write thesis and scientific publications and gain the skills, abilities, and methods to write final thesis. This course is focus on paving a way for students to communicate with others and lay the foundation for conducting scientific research, as paper is an important way of revealing research results. The teaching contents are mainly covered by the following aspects: evaluation standard of journals, how to write a summary, how to write a thesis. The difficulties of teaching contents are described as followings: reference manage software, the main content of an abstract, how to extract key words.

Recommended Textbooks/References:

1. Sunwei Zhang，Bosheng Li，Xun Zhang，Introduction to scientific writing (5th Edition)，*Chemical Insustry Press*，February-2017
2. Yuhao Li，Writing English Research Papers，*Intellectual Property Publishing House*，August-2013
3. Rowena Murray et al.，The handbook of Academic writing: a fresh approach，*Shanghai educational publishing house*，June-2011
4. Yulei Wang，Guidelines for writing and publishing academic papers，*China Renmin University Press*，September-2017
5. Halen· Sword，Air & Light & Time & Space How Successful Academics Write，*People's education Press*，December-2018

0010719 学术前沿课程

课程编码：0010719

课程名称：学术前沿课程

英文名称：Academic Frontiers

课程类型：自主课程

学分：1.0　**总学时：**16

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

先修课程：

考核形式： 报告

撰写人：涂山山

课程简介：（250-300 字）

学术前沿是计算机学院（部）为计算机科学与技术专业本科生开设的自主课程。本课程的任务是主要介绍计算机领域的各个分支方向，深入介绍每个方向的前沿理论和前沿工作，重点涉及编程语言、网络安全、操作系统、软件工程、人工智能、计算机网络等方向的前沿。

推荐教材或主要参考书：

无

0010719 Academic Frontiers

Course Number: 0010719

Course Title: Academic Frontiers

Course Type: Independent course

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

Students: Undergraduate students majoring in computer science

Prerequisites:

Evaluation Method: Reports

Writer: Shanshan Tu

Course Description:

Academic Frontiers is one of the courses for undergraduate students major in computer science. This course mainly introduces the branches of computer science, and introduces the cutting-edge theories and researches in each direction, focusing on the frontiers of programming language, network security, operating system, software engineering, artificial intelligence, and computer networks.

Recommended Textbooks/References:

0010131 嵌入式系统设计技术

课程编码：0010131

课程名称：嵌入式系统设计技术

英文名称：Embedded System Design Technology

课程类型：自主课程 / 专业选修课

学分：2　　**总学时：** 32

面向对象：计算机科学与技术（实验班）专业本科生 / 计算机科学与技术专业本科生

先修课程：计算机组成原理，C/C++语言程序设计

考核形式：项目设计及文档

撰写人：韩德强，杨淇善

课程简介：

嵌入式系统设计技术是信息学部为计算机科学与技术专业本科生开设的自主课程 / 专业选修课，承担着培养学生软硬件系统能力和工程能力的任务。

嵌入式系统设计技术课程承担着学生软、硬件综合能力培养的任务。本课程属于工程性、技术性和实践性都特别强的一门课程。因此，在开展理论教学的同时，必须对实践教学环节给以足够的重视。通过本课程的学习，学生能够掌握嵌入式系统的基本概念、开发方法和流程。通过讲解嵌入式微处理器硬件结构，使学生熟悉嵌入式硬件实验平台及开发环境的使用方法，掌握基本的数字量和模拟量输入/输出接口，掌握 UART、SPI、I^2C、Wi-Fi 等通信接口技术，并能针对应用需求编写应用程序。

推荐教材或主要参考书：

[1] 胡振波著. RISC-V 架构与嵌入式开发快速入门. 人民邮电出版社，2019 年 1 月

[2] 杨晋，曹盛宏编著，智能硬件项目教程——基于 ESP32，北京航空航天大学出版社，2020 年 6 月

[3] 李兰英，韩剑辉，周昕编著. 基于 Arduino 的嵌入式系统入门与实践. 人民邮电出版社，2020 年 9 月

0010131 Embedded System Design Technology

Course Number: 0010131

Course Title: Embedded System Design Technology

Course Type: Independent course / Major elective course

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

Students: Undergraduate students major in Computer Science and Technology (Elite Class) / Computer Science and Technology

Prerequisites: Principles of Computer Organization, Programming in C/C++

Evaluation Method: Project Design and Documents

Writer： Han Deqiang, Yang Qishan

Course Description:

Embedded System Design Technology is one of the independent course / major elective course for undergraduate students major in Computer Science and Technology. It is responsible for cultivating students' software and hardware system designing and engineering capabilities.

Embedded System Design Technology undertakes the task of cultivating students' comprehensive ability in design and development of software and hardware systems. This course focuses on engineering, technology, and practical. Therefore, attaching great importance to the combination of theoretical teaching and practical teaching is necessary. Students are able to master basic concepts, development methods and processes of embedded systems after completing this course. Students possess the ability of completing application project with basic digital and analog input/output interfaces and communication interface technologies such as UART, SPI, IIC, Wi-Fi by an embedded hardware development platform and environment, which stems from the course's explanation of embedded microprocessor hardware architecture.

Recommended Textbooks/References:

1. Hu Zhenbo. RISC-V Architecture and Embedded Development Quick Start. Posts & Telecom Press, 01-2019.
2. Yang Jin, Cao Shenghong. Intelligent Hardware Project Tutorial - Based on ESP32. Beijing University of Aeronautics and Astronautics Press, 06-2020.
3. Li Lanying, Han Jianhui, Zhou Xin. Introduction and Practice of Embedded Systems Based on Arduino. Posts & Telecom Press, 09-2020.

0008193 大数据管理与分析

课程编码：0008193

课程名称：大数据管理与分析

英文名称：Big Data Management and Analytics

课程类型：自主课程、专业先修课

学分： 2.0 **总学时：**32

面向对象：计算机科学与技术（实验班）专业、计算机科学与技术专业本科生

先修课程：数据结构与算法，数据库原理

考核形式：平时成绩+考试 或者平时成绩

撰写人：赵文兵

课程简介：（250-300 字）

大数据的管理与分析作为数据科学（Data Science）的学科前沿，近年来无论在理论还是实践方面都是研究和应用工作的热点，并且获得了长足的发展。

本课程从介绍大数据的概念出发，立足于大数据的管理，面向大数据的分析技术，使学生明了大数据管理中富于挑战性的难点所在，掌握对大数据进行收集、转化和加载的管理技术，学习对大数据进行查询和分析的技术，发现其中隐藏的信息与模式的方法，理解大数据背景下的信息安全与隐私保护。通过课堂教学、实践教学、集中讨论等教学模式发现技术的可行性、有用性和有效性问题，帮助学生明确大数据的应用和研究方向。

推荐教材或主要参考书：

[1] Jeffrey Aven 著. Spark 数据分析：基于 Python 语言，王道远译，机械工业出版社，2019 年 4 月

[2] 朱锋等著. Spark SQL 内核剖析，电子工业出版社，2018 年 7 月

[3] Jure Leskovec 等. 大数据：互联网大规模数据挖掘与分布式处理，著，王斌译，人民邮电出版社，2015 年 7 月

[4] 董西成. Hadoop 技术内幕: 深入解析 MapReduce 架构设计与实现原理. 机械工业出版社，2013 年 5 月

0008193 Big Data Management and Analytics

Course Number: 0008193

Course Title: Big Data Management and Analytics

Course Type: Major Optional Curriculum

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

Students: Undergraduate students majoring in Computer Science and Technology

Prerequisites: Data Structure and Algorithm, Database Principles

Evaluation Method: Course participation + written exams or Course participation

Writer： Zhao Wenbing

Course Description:

As the frontier of data science, the management and analysis of big data has been a hot spot of research and application both in theory and practice in recent years, and has made great progress. This course starts from the introduction of the concept of big data, based on the management of big data and the analysis technology for big data, so that students can understand the challenging difficulties in big data management, master the management technology of collecting, transforming and loading big data, learn the technology of query and analysis of big data, find the hidden information and mode, and understand the big data Information security and privacy protection in the context of data. Through classroom teaching, practical teaching, centralized discussion and other teaching modes, we can find out the feasibility, usefulness and effectiveness of technology, and help students clarify the application and research direction of big data.

Recommended Textbooks/References:

1. Jeffrey Aven. Data Analytics with Spark Using Python, China Machine Press, 2019
2. Zhu Feng etc. Spark SQL Kernel Analysis, Posts and Telecommunications Press, 2018
3. Jure Leskovec etc. Mining of Massive Datasets (2nd), Posts and Telecommunications Press, 2015
4. Dong Xicheng. Hadoop Inside: MapReduce Architecture Designs and Implementation principles, China Machine Press, 2013

0007384 认识实习

课程编码：0007384

课程名称：认识实习

英文名称：Cognitive Practice

课程类型：自主课程

学分： 1.0 **总学时：** 30

面向对象：计算机科学与技术（实验班）专业、计算机科学与技**术**专业类本科生

先修课程：新生研讨课

考核形式：平时成绩+报告

撰写人： 杜金莲 王丹

课程简介：（250-300 字）

认识实习是计算机科学与技术专业本科生实践教学环节的生要组成部分。本课程的任务是旨在通过参观专业相关企业、开展校际交流、领域专家讲座、师生讨论等方式提高学生对专业的认知度，使学生对所学专业建立感性认识，初步了解与专业学习和实践相关的内容、专业相关领域的发展趋势和前沿，初步了解未来就业环境。本课程共分 4 个部分：企业和其它高校参观、专业介绍、师生讨论和领域专家论坛，其中教学内容重点是企业参观和专家论坛，通过这些环节可以了解并认识现有先进技术。

0007384 Cognitive Practice

Course Number: 0007384

Course Title: Cognitive Practice

Course Type: Independent course

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

Students: Undergraduate majoring in Computer Science and Technology

Prerequisites: Freshman Seminar

Evaluation Method: Course participation + written reports

Writer： Du Jinlian Wang dan

Course Description:

Cognition practice is an important part of practical teaching for undergraduates majoring in computer science and technology. The main target of this course is to improve students' awareness of the major by visiting related enterprises, carrying out inter school exchanges, lectures by experts in the field, professional introduction, and discussion between teachers and students, so as to enable students to establish a perceptual understanding of their major, to understand the contents related to professional learning and Practice, the development trend and frontier of relevant fields, and to understand the future employment environment. This course is focus on the visit of enterprises and other universities, professional introduction, teacher-student discussion and field expert forum. The teaching contents are mainly covered by the following aspects: the visit of enterprises and field expert forum.

0007947 高级语言程序设计

课程编码：0007947

课程名称：高级语言程序设计

英文名称：High Level Language Programming

课程类型：公共基础必修课程

学分： 3.5 **总学时：** 56

面向对象：计算机科学与技术（实验班）、物联网工程、信息安全、计算机大类

先修课程：无

考核形式： 平时成绩+阶段编程测验+期末考试

撰写人： 蔡越江

课程简介：

本课程依托 C 语言进行计算机科学的启蒙教育，初步培养学生的计算思维能力，训练程序设计的基本方法和技巧，使学生能够通过使用高级语言编写程序解决简单的实际问题，为解决复杂工程问题打下坚实基础。本课程在传授知识的同时，还要训练学生动手能力、培养分析问题和解决工程问题的能力，注重能力的培养、个性的发展。课程是后续理论和实践教学的基础和重要工具。课程主要内容包括 C 语言基础语法、三种基本的程序控制结构、数据的组织结构、函数、程序的组织结构、模块化的程序设计思想与方法、初识计算机算法以及程序的基本调试技巧等。

推荐教材或主要参考书：

[1] 廖湖声，叶乃文，周珺编著. C 语言程序设计案例教程(第 3 版). 人民邮电出版社, 2018 年 11 月

[2] 李文新等. 程序设计导引及在线实践(第 2 版). 清华大学出版社, 2017 年 1 月

[3] （美）Brian W.Kernighan,Dennis M.Ritchie 著. C 程序设计语言(英文版)(第 2 版). 机械工业出版社, 2006 年 8 月

[4] P.J.Deitel,H.M.Deitel 著. C 大学教程(第 5 版)(英文版). 电子工业出版社, 2010 年 5 月

0007947 High Level Language Programming

Course Number: 0007947

Course Title: High Level Language Programming

Course Type:

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

Students: Undergraduate students majoring in computer science

Prerequisites: no

Evaluation Method: Course participation + Stage programming test +written exams

Writer： Cai Yuejiang

Course Description:

High-level language programming is one of the public basic compulsory courses for undergraduate students Major in computer science. This course relies on the C language for computer science initiation education, initially cultivates students' computational thinking ability, trains the basic methods and skills of program design, enables students to write programs to solve simple practical problems, and lays a solid foundation for solving complex engineering problems. While imparting knowledge, this course also trains students' hands-on ability, develops the ability to analyze and solve engineering problems, and emphasizes the cultivation of abilities and the development of individuality. The course is the foundation and important tool for subsequent theoretical and practical teaching. The teaching contents are mainly covered by the following aspects: C language basic grammar, three basic program control structures, data organization structure, function, program organization structure, modular program design ideas and methods, first understanding of computer algorithms and basic debugging skills of programs

Recommended Textbooks/References:

1. Liao Husheng, Ye Naiwen, and Zhou Jun. C Language Programming Case Tutorial (3rd Edition). People's Posts and Telecommunications Publishing House, November 2018
2. Li Wenxin, etc. Program Design Guide and Online Practice (2nd Edition). Tsinghua University Press. January 2017
3. Brian W. Kernighan, Dennis M. Ritchie. C Programming Language (2nd Edition). Machinery Industry Press. August 2006
4. P.J.Deitel, H.M.Deitel. C University Course (5th Edition). Electronic Industry Press. May 2010

0007365 高级语言程序设计课设

课程编码：0007365

课程名称：高级语言程序设计课设

英文名称：Practice for High Language Programming

课程类型：学科基础必修课程

学分：1.5　　**总学时：**45

面向对象：计算机科学与技术（实验班）、物联网工程、信息安全、计算机大类，电子科学与技术、电子信息工程（实验班）、电子信息工程、通信工程、自动化、机器人工程、软件工程类本科生

先修课程：高级语言程序设计

考核形式：面试+实践报告

撰写人： 蔡越江

课程简介：

高级语言程序设计课设是信息学部为计算机大类等专业本科生开设的学科基础必修课程。本课程是高级语言程序设计课程的后续实践课程。课程通过一个趣味盎然的游戏程序的设计与实现使学生亲身经历一个对初学者而言较为复杂的程序的设计与开发过程。巩固和拓展高级语言程序设计课程的教学成果。培养学生综合运用高级语言程序设计课程所学知识，编写C语言程序解决实际问题的能力。

推荐教材或主要参考书：

无

0007365 Practice for High Language Programming

Course Number: 0007365

Course Title: Practice for High Language Programming

Course Type: basic compulsory course

Credit:1.5 **Total Credit Hours:**45

Students: Undergraduate students majoring in computer science

Prerequisites: High Level Language Programming

Evaluation Method: Interview + Practice report

Writer： Cai Yuejiang

Course Description:

Practice for High Language Programming is one of the public basic compulsory courses for undergraduate students Major in computer science. This course is a follow-up practical course of the advanced language programming course. Through the design and implementation of an interesting game program, the course enables students to experience the design and development process of a program that is more complicated for beginners. Consolidate and expand the teaching results of high-level language programming courses. Cultivate students' ability to comprehensively use the knowledge learned in high-level language programming courses to write C language programs to solve practical problems.

Recommended Textbooks/References:

no