



教师网上录入课堂信息 Teachers enter class information online

课程编号	Course number	30231133	课程名:	Course Name:	数据与算法 (英) Data & Algorithms
总学时:	Total Credit Hours:	104	总学分:	Total Credits:	3
<p>数据是客观世界的抽象描述，是信息和知识的载体；算法是处理数据的系统，帮助我们获取数据中的信息和知识；本课程介绍数据的表示、存储、访问方式，以及针对不同数据类型的各种算法的实现、评价和设计策略。课程内容包括非数值数据类型（表、树、图），数值数据类型（整数、浮点数），非数值算法（查找、排序、搜索），数值算法（插值、拟合），算法的分析方法（时间、空间复杂度）以及基本的算法设计策略（分治、动态规划）等。数据与算法之间的相互作用是课程的核心思想和主要线索。课程旨在帮助同学们提升用现代计算方法解决现实世界实际问题的能力，为后续的课程以及未来的研究、工作奠定基础。本课程为电子系核心课程，学生将掌握数据结构、算法设计与分析的核心概念，同时为未来科研阅读打下坚实的英文基础。推荐希望了解AI相关技术的同学选课。授课教师为电子系助理教授。电子系“因材施教-AI+系统”2022级班主任老师，专业方向为机器学习。2023年SRT特等奖指导教师、2024挑战杯特等奖指导教师。</p> <p>Data is an abstract description of the objective world and a carrier of information and knowledge. Algorithms are systems that process data and help us access the information and knowledge in data; This course introduces how data is represented, stored, and accessed, as well as the implementation, evaluation, and design strategies of various algorithms for different data types. The course content mainly includes non-numerical data types (tables, trees, graphs), numerical data types (integers, floating-point numbers), non-numerical algorithms (search, sorting, search), numerical algorithms (interpolation, fitting), algorithm analysis methods (temporal and spatial complexity), and basic algorithm design strategies (divide and conquer, dynamic programming). The interaction between data and algorithms is the core idea and main thread of the course. The course is designed to help students improve their ability to solve real-world problems with modern computing methods, and lay the foundation for subsequent courses and future research and work. This course is a core course of the Department of Electronics, and students will master the core concepts of data structure, algorithm design and analysis, and lay a solid foundation in English for future scientific research. It is recommended for students who want to learn about AI-related technologies to choose courses. The instructor is an assistant professor in the Department of Electronics. The 2022 class teacher of the Department of Electronics "Teaching Students in Accordance with Aptitude-AI+ System", majoring in machine learning. 2023 SRT Special Award Instructor and 2024 Challenge Cup Special Award Instructor.</p> <p>Data is an abstract description of the objective world and the carrier of information and knowledge; algorithms are systems that process data, helping us to extract information and knowledge from it. This course introduces the representation, storage, and access methods of data, as well as the implementation, evaluation, and design strategies of various algorithms for different data types. The course content mainly includes non-numeric data types (tables, trees, graphs), numeric data types (integers, floating-point numbers), non-numeric algorithms (searching, sorting, searching), numeric algorithms (interpolation, fitting), methods of algorithm analysis (time, space complexity), and basic algorithm design strategies (divide and conquer, dynamic programming), etc. The interaction between data and algorithms is the core idea and main thread of the course. The course aims to help students enhance their ability to solve real-world practical problems with modern computational methods, laying the foundation for subsequent courses and future research and work. This course is a core course of the electronic series, where students will master the core concepts of data structures, algorithm design, and analysis, while also laying a solid foundation in English for future scientific research reading. It is recommended for students who wish to understand AI-related technologies.</p> <p>Lectures: 48 class hours, totally 15 lectures Hands-on Experiments (OJ) 10 times / Homework 5 times. They will be issued with the progress of the course. Exercise class will be arranged depends on the feedbacks of OJ and homework.</p> <p>Week Teaching Schedule Content</p> <p>1 Introduction Data, Model, and Algorithm</p> <p>2 Basic Data Structures: Linear Structure</p> <p>3 Binary Relations and Abstract Data Types, Linear List</p> <p>4 Basic Data Structures: Linear Structure</p> <p>5 Stack and Recursion, Queue</p> <p>6 Basic Data Structures: Linear Structure</p> <p>7 Queue, String, String Matching Algorithms</p> <p>8 Basic Data Structures: Tree</p> <p>9 Tree and Binary Tree</p> <p>10 Basic Data Structures: Tree</p> <p>11 Binary Search Tree, Priority Queue</p> <p>12 Basic Data Structures: Tree</p> <p>13 Graph and Classical Graph Algorithms</p> <p>14 Nonnumerical Algorithms</p> <p>15 Search and Sort</p> <p>16 Numerical Algorithms</p> <p>17 Concepts and Error</p> <p>18 Numerical Algorithms</p> <p>19 Linear Equations</p> <p>20 Numerical Algorithms</p> <p>21 Fitting and Interpolation</p> <p>22 Numerical Algorithms</p> <p>23 Non-linear Equations and Optimizations</p> <p>24 Algorithm Design</p> <p>25 Brute Force, Divide Conquer, Search Algorithm, and Greedy Algorithm</p> <p>26 Algorithm Design</p> <p>27 Dynamic Programming, and Randomize Algorithm</p> <p>28 Algorithm Optimization</p> <p>29 Computational Complexity Theory and Course Recap</p> <p>30 Final Exam</p>					
课程内容简介:	Course Description:				
进度安排:	Schedule:				
考核方式:	Assessment Method:	Assignment 10%: 5 times Programming 40%: 10 times Final Exam 50%	教材及参考书:	Textbooks and reference books:	Courseware-based Main reference textbooks: - Wu Ji, Chen Jiansheng, Bai Bo, Data and Algorithms, Tsinghua University Press Others: - Zhu Mingfang, Wu Ji, Data Structures and Algorithms, Tsinghua University Press - Zhang Wei et al., Introduction to Scientific Computing (2nd Edition), Tsinghua University Press - Xu Shiliang, Numerical Methods and Computer Implementation, Tsinghua University Press
主教材:	Main Textbook:				
参考书:	Reference book:				
合开教师:	Co-opening Teachers:				
		作业 10%: 5次 编程 40%: 10次 期末考试 50%	选课指导:	Course Selection Guidance:	1. 希望掌握数据结构和算法知识的二年级及以上学生 2. 有一定英语基础，愿意提升专业英语能力的学生 3. 想后续继续学习AI相关课程，参与AI方向项目的新生

		1.讲解详细：算法可视化设计，分步骤讲解 2.反馈式授课：关注反馈，开设单独习题课，提供习题、编程辅导 3.英文教学：英文PPT授课，英文讲解，提供术语中英对照 4.铺路AI：为将来AI学习做铺垫	
先修要求：	Prerequisites: 先修"C/C++编程、线性代数、微积分"课程 Prerequisites in "C/C++ Programming, Linear Algebra, Calculus".	教师教学特色：	Teachers' 1. Detailed explanation: algorithm visualization design, step-by-step Teaching explanation 2. Feedback teaching: pay attention to feedback, set up individual exercise courses, provide exercises and programming tutorials 3. English teaching: English PPT teaching, English explanation, provide Chinese and English terms 4. Pave the way AI: pave the way for future AI learning
Office Hour:	上课当天（周二）下午 2.00-3.00PM 2.00-3.00PM on the day of class (Tuesday).	成绩评定标准：	作业 10%：5次 编程（OJ） 40%：10次 期末考试 50%
教学日历：	Teaching Calendar: 查看教学日历 View the teaching calendar	Grading Criteria:	Assignment 10%: 5 times Programming (OJ) 40%: 10 times Final Exam 50%
