课程计划/课程描述

Curriculum /Course Description

计算机科学与技术

Computer Science and Technology

沈阳航空航天大学

Shenyang Aerospace University

2022

Foreword

Mission

The mission of the Computer Science and Technology Program is to cultivate senior engineering and technical personnel who possesses comprehensive professional abilities after mastering the skills and techniques in hardware, software and application aspects of modern computer areas. The program focuses on the training of the practical and engineering ability for students. Students will be well prepared to go in for the careers concerning academic research, education, enterprise and management immediately upon graduation in such areas as the scientific computing, computer teaching, computer engineering, hardware design and development of software and system integration.

Programs Educational Objectives

1. To have a certain natural science and humanistic science basic theory knowledge, the good humanistic quality.
2. Prepare students to have the capabilities of preliminary scientific research, technology development and organizational management, utilize complementary non-technical skills such as communication skills, teamwork, leadership, ethical and societal responsibility considerations.
3. Provide students with applied engineering experiences through hands-on laboratory courses, internships, and cooperative education experience.
4. To systematically understand and achieve the basic theory and application knowledge in Computer Science and technology.
5. To master the skills and techniques in hardware, software and application with practical experience.
6. To gain perfect programming and application development ability.
7. To find a good career or job in IT field.

Computer Science and Technology

1st Semester First Year

Code	Course Name	Hours	Credits
L17001	Comprehensive Chinese I	96	6
L17006	Chinese Culture and History	32	2
L17007	Fundamental Law	32	2
L14013	Advanced Mathematics I	80	5
L01076	C Programming Language*	80	5
		320	20

2nd Semester First Year

Code	Course Name	Hours	Credits
L17002	Comprehensive Chinese II	96	6
L14014	Advanced Mathematics II	80	5
L14004	College Physics	64	4
L01039	Discrete Mathematics*	56	3.5
L01002	C Programming Language Project	2W	2
L14051	Lab in Physics	24	1.5
		320	22

1st Semester Second Year

Code	Course Name	Hours	Credits
L17003	Comprehensive Chinese III	64	4
L14010	Probability and Statistics	48	3
L14053	Linear Algebra	40	2.5
L01054	Algorithm and Data Structure*	80	5
L02131B	Introduction to Circuit Analysis	56	3.5
L02023	Electronic Process Practice	2W	2
L01088	Data Structure Project	2W	2
			22

2nd Semester Second Year

Code	Course Name	Hours	Credits
L17004	Comprehensive Chinese IV	64	4
L02120B	Analog electronic circuits	56	3.5
L02102	Digital Circuits*	56	3.5
L01096	Object Oriented Programming and Java*	64	4
L02112	Digital Circuits Project	2W	2
			17

1st Semester Third Year

Code	Course Name	Hours	Credits

L17009	Technical Chinese	48	3
L01037	Computer Organization*	72	4.5
L01008	Operating System*	64	4
L01002	Java Programming Language Project	2W	2
L01038	Computer Organization Project	2W	2
			15.5

2nd Semester Third Year

Code	Course Name	Hours	Credits
	Computer Chinese	32	2
L01077	Computer Networks*	64	4
L01033	Computer Graphics	40	2.5
L01147A	Micro-controller’s Principle and Applications A*	64	4
L01048	Principles of Database System*	64	4
L01043	Software Engineering*	48	3
L01057	Microcomputer System Project	2W	2
		312	21.5

1st Semester Final Year

Code	Course Name	Hours	Credits
L01042	Aircraft Maintenance and Quality	32	2
	Aircraft Assembly	32	2
	Aircraft Design	32	2
L01044	Aircraft CAD/CAM	4W	4
		208	10

2nd Semester Final Year

Code	Course Name	Hours	Credits
L01045	Internship Practice	3W	3
L01006	Graduation Project & Thesis	16W	16
			19
		Total	147

Medium of Education: English

Comprehensive Chinese Ⅰ/Ⅱ/Ⅲ/Ⅳ/Ⅴ/Chinese for Science and Technology

This course is aimed at developing students' skills in listening, speaking, reading, and writing. It also focuses on improving basic communication competence in Chinese language.

Introduction to China

This course introduces students to the characteristics of China's social development, Chinese history, and culture, Chinese traditional thinking inheritance and innovation of Chinese life changes, China's contribution to human civilization, and various manifestations of China's modernization. It also introduces the students to China's ideology of past, present, and future.

Introduction to Chinese Law

This course introduces students to Chinese legal tradition and law, such as constitutionalism and rule of law, administrative law, civil law, marriage law, succession law, criminal law, and the procedural law. The course also focuses on fundamental and practical aspects of the Chinese law to familiarize international students about legal issues in China.

Advanced Mathematics Ⅰ/Ⅱ

This course is designed to introduce the student to the main ideas of calculus. It is divided into two semesters.

C Programming Language

C Programming Language is a professional basic and pilot course of Computer Science & Technology.

Here we'll learn about the basic steps of programming using a kind of high-level programming language tool, C. We'll learn relevant knowledge of grammar about C programming language, and based on which , learn how to analyze a specific question, how to design suitable data structure, how to design appropriate algorithm, how to edit, compile and debug a program , and at the end, to get the expected result with this high-level programming language. At the same time, We'll know the essential procedure to deal with a question with a programming language, and lay a sound foundation for later study.

College Physics Ⅰ

This course is the introduction to classical mechanics, electromagnetism and special relativity. In classical mechanics, it includes motion in one and two dimensions, Newton's laws of motion and their applications, work and energy, linear momentum and collisions, rotational

motion, and principles of conservation. In electromagnetism, it covers a study of electric charges, forces, and field, Coulomb's law, electric potential and electric potential energy, electric current, electric circuits, and an introduction to magnetism. In special relativity, it includes frame of reference, Galilean transformation, Michelson, Morley experiment, postulates of special theory of relativity, Lorentz transformation, length contraction, time dilation, relativity of simultaneity in addition to velocities, variation of mass with velocity, Mass energy equation.

Discrete Mathematics

Discrete mathematics is the part of mathematics devoted to the study of discrete objects. Discrete mathematics is the gateway to more advanced courses in all parts of mathematical sciences. It provides the mathematical foundations for many computer science courses including data structures, algorithms, database theory ,formal languages, computer security and so on . Here we will cover propositional logic, quantifier logic , basic structures ,and will focus on relations , algebraic structures , lattice and Boolean algebra .The course is to teach mathematical reasoning and problem solving ,rather than a discrete set of skills.

College Physics II

This course introduces students to the laws of thermodynamics, wave motion, optics, and quantum physics. The student will learn about heat behaviors critical to understanding of engines and furnaces, metallurgy, geothermal system, etc. A mathematical description of wave motion will be introduced. The student will also learn about that light can be viewed as either a particle or a wave. The three primary topics examined are interference, diffraction, and polarization. These phenomena can't be adequately explained with ray optics, but can be understood if light is viewed as a wave. For quantum physics, it introduces underlying ideas of quantum theory and the wave-particle nature of matter, and discusses applications of quantum theory including the photoelectric effect, the Compton Effect, and x-rays.

Linear Algebra

This course encompasses the study of linear equations, matrices, determinants, vectors in the plane and space, vector spaces, linear transformations, inner products, eigenvalues values and eigenvectors. Students will learn to recognize and express the mathematical ideas graphically, numerically, and symbolically.

Algorithm and Data Structure

This is an undergraduate level course on common data structure used in programming. This course introduces some classical algorithms based on these data structures, which are described in C Language. It includes the following contents: linear list, array, graph, finding list, some ranking algorithms, key path algorithms, shortest path algorithms, minimum cost spanning tree algorithms, etc. This course is mainly based on lecture, and accompanied by some supplementary computer experiments. Students can practice their abilities about using different kinds of data structures and coding abilities.

Fundamentals of Circuit Analysis

Fundamentals of circuit analysis is the first professional basic course for telecommunication engineering and computer science major undergraduate students. It covers fundamentals of knowledge necessary in this field, such as basic concepts and laws for circuits, mesh and nodal analysis, circuit theorems, first-order circuit analysis, AC steady-state circuit analysis, single-phase and three-phase circuits.

Analog Electronic Circuits

This course is a technical basic course of Higher School, it focuses on training students' ability to analyze and solve problems. Through the curriculum learning, let students learn to read classic electronic circuit principle diagram and understand the composition and working principle of each part. Also able to qualitative or quantitative analysis /estimates the each part of circuit performance. Students can be roughly selected design scheme of circuit, Selects the related components and learn to install debug the circuit. So this course to strengthen introduced the basic concepts and basic unit of the circuit is and set up the training link. Courses also strengthen the basic principle and basic analysis method, Subsequent through experiment or design courses to cultivate students’ practical ability.

Object Oriented Programming and Java

This course will give students the essentials of object-oriented programming in Java. Students will learn to formulate algorithms, to solve problems and to implement those solutions with a Java program that employs objects and classes. The student will be introduced to object-oriented design, applications, and class construction, methods and message passing, arrays, string-processing, file processing, and some event-handling and graphical user interface programming. This course is designed for students with some prior programming experience. Experiments provide the opportunity to explore these concepts including encapsulation, inheritance, polymorphism, graphical interface, multi-threading and network

communications.

Digital Circuit

Digital logic is a compulsory course, degree course, and exam course for the undergraduate of electronic specialties. Digital logic also is the first discipline basic course directly related to many industry control systems. Through studying this course the students should master the basic concept of digital logic circuit, basic principles, basic methods and basic circuits. The students should learn the basic design method of the digital system and related technology. The students should be able to finish preliminary analysis and design of simple digital systems. Here we will learn about the logic algebra fundamental. We will focus on the basic analysis and design method of combinational circuits, sequential circuits, and pulse circuits. Digital laboratories can provide the opportunity to connect several typical logic circuits.

Probability and Statistics

This course provides an elementary introduction to probability and statistics with applications.

Fundamentals of Computer Organization and Architecture

In this course, we will learn the fundamentals of computer organization and architecture, from basic concepts, to the principles of improving and designing for, the performance of computer system. We will cover computer evolution and performance, computer system, central processing unit and its control, parallel processing basics, as well as some necessary groundwork knowledge such as number system. Along with classroom teaching, a few hands-on experiments will be carried out to reinforce the students' understanding.

Operating Systems

This course introduces the fundamental concepts of operating system design and implementation. The lectures present the central ideas and concepts and explain how they are manifested in real operating systems. The course divides into four major sections including process and thread management, memory management, I/O systems and storage management. Topics in the section of process and thread management include process concept, operations on process, process synchronization, inter process communication, CPU scheduling, deadlocks and threads. Topics in the section of memory management include contiguous memory allocation, segmentation, paging and virtual memory. Topics in the section of storage management include disk management and file systems. Topics in the section of I/O systems

include I/O hardware, application I/O interface, kernel I/O subsystem, transforming I/O requests to hardware operations. The class work also consists of a series of four programming lab experiments in order to improve students' understanding of the theoretical knowledge in lectures.

Computer Networks

This is a technical fundamental course for undergraduate students in the Computer Science and Technology program and is offered as an introduction to Computer Networks. We will discuss five layers of Computer networks which include physical layer, data link layer, network layer, transport layer and application layer.

Computer Graphics

Computer Graphics is a professional compulsory course for C.S. &T.. The course introduces many important data structures, fundamental algorithms and techniques for 2D and 3D computer graphics that are useful for presenting data visually on a computer. We will start by studying the basic process of drawing primitive objects on a display (lines, circles, polygons). And then look at the process of building two and three dimension mathematical models of more complex objects, manipulating and combining these models, and projecting the models onto a two dimensional image space. Along the way we'll also spend some time on windowing systems and on drawing more complex primitive objects such as curves and surfaces. The course covers the following topics: the basic concepts of computer graphics, development and application of computer graphics, the composition of the graphics system， basic graphics generation algorithm， graphics transformation, curves and surfaces, Open Gl Programming Fundamentals.

Micro-controller’s Principle and Application

This course introduces students to microprocessor and micro-controller technologies covering the theory of micro-controller architecture, instruction set, assembly language programming, analogy and digital peripherals, interrupts, parallel and serial interfacing. The 8-bit Intel 8051 micro-controller is selected for laboratory training sessions.

Principles of Database System

This course is a required course for computer majors. This course covers fundamentals of database architecture, database management systems, and database systems， principles and methodologies of database design, and techniques for database application development. It

will help students to develop an understanding of database models with the emphasis on relational database, the concept and mathematical foundations of relational database, the formalization of relations, the SQL database definition/manipulation language, transaction management, and entity relationship database design method.

Software Engineering

Building large software systems is hard, and the building large software systems that is actually work is even harder. As an important basic course of college computer specialty, it covers the techniques for dealing with the complexity of software systems development. It is dedicated to designing, implementing, and modifying software so that it is of high quality, affordable, standard and measurable. It is a systematic approach to every link of software development includes system architecture analysis, design, implementation, test, maintenance, and system architecture design and software project management. After the studying of this course, students can be qualified for the job of Large and medium-sized software project development or management independently.

Computer Chinese

This course is designed to introduce the Chinese expression of the computer concept and principle, such as the computer system composition, code mode, network communication, computer graphics, quantum computing, cloud computing and other modern computer concept and principle. In addition, the relations of computer to modern society are discussed also. Through studying above curricula content, the students are expected to acquire elementary ability of reading and comprehending computer specialty Chinese literature.

Introduction to Artificial Intelligence

This course introduces to students the basics of artificial intelligence, which includes problem solving, knowledge representation and reasoning, learning methods, and some application topics such as computer vision and natural language processing.

The objective of this class is to teach modern AI. Students learn about the basic techniques and tricks of the trade. After finishing the class students should understand the role of knowledge representation, problem solving, and learning in intelligent-system engineering, appreciate the role of problem solving, vision, and language in understanding human intelligence from a computational perspective, and be able to develop intelligent systems by assembling solutions to concrete computational problems.

Digital image processing

Digital image processing has relation with many research areas, from which the students can grasp the basic concepts, ideas, methods, and applications of digital image processing. The course can be divided into two phases. In the first phase, basic knowledge of digital image is introduced, and the usual techniques for image generation and spatial enhancement are discussed. In the second phase, techniques to improve the image quality are analyzed, and they are image transformation, frequency enhancement, color image, image recovery, and so on. The course can help the students improve their abilities to analyze and resolve problems, and prepare their future research & develop work related with digital image processing. Assessment of the course includes examination and homework.

Information Security

The aim of this course is to provide attendees with a thorough understanding of the issues associated with the protocol, principle and method of information systems. We will learn the different aspects of information security such as crypto, access control and protocols. Student will be able to speak about a multitude of security attacks and the defensive strategies used to combat them and evaluate security in information processing systems (operating systems and applications, networks, and so on).