大连理工大学

DALIAN UNIVERSITY OF TECHNOLOGY

Course Description

Computer Science and Technology

School of Computer Science and Technology

Name: Wu Doudou

Table of Contents

1. Mathematics

1.1. Calculus

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Fundamentals of Engineering Mathematics Analysis 1	5	6.85	2020-2021 SEMESTER 1
Fundamentals of Engineering Mathematics Analysis 2	6	8.22	2019-2020 SEMESTER 1
Integrable transformation and field theory B	2	2.74	2018-2019 SEMESTER 1
Total	**13**	**17.81**	

Brief description of the courses
Fundamentals of Engineering Mathematics Analysis 1: This compulsory course for science and engineering students establishes a critical mathematical foundation for advanced studies and professional applications. It focuses on one-variable calculus and first-order differential equations, emphasizing analytical techniques for problem-solving. Students develop logical reasoning through limit proofs and differential modeling, applicable to algorithmic analysis in informatics. The course enhances abstract thinking and precision in handling continuous and discrete transitions, preparing students for computational challenges in courses like Data Structures and fostering skills for innovative technical research.
Fundamentals of Engineering Mathematics Analysis 2: This essential course for science and engineering students builds on prior knowledge, providing a robust mathematical base for future coursework. It covers high-order differential equations, multi-variable calculus, and infinite series, equipping students with tools to analyze complex systems. The study of series convergence and multivariable optimization strengthens logical deduction and recursive thinking, aligning with discrete algorithm design. It fosters precision and problem-solving skills, preparing students for informatics applications like signal processing and laying a foundation for interdisciplinary innovation.
Integrable transformation and field theory B: This course is the basic course of Mathematical skills for bachelor of Science and engineering. It is helpful to understand many consequent courses. Students will understand the basic concepts and the fundamental properties of integrable transformations and vector analysis. Using integrable transformation to solve linear differential equations appearing in natural and human activities is taught. This course contains the knowledge of how to describe fields by grad div and rot operators.

1.2. Discrete Mathematics

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Mathematics Model B	1.5	2.055	2017-2018 SEMESTER 3
Optimization Method B	1.5	2.055	2018-2019 SEMESTER 2
Calculation Method B	1.5	2.055	2018-2019 SEMESTER 2
Total	**4.5**	**6.165**	

Brief description of the courses

Mathematics Model B:
This course introduces mathematical modeling with a focus on discrete structures and their applications, laying a foundation for problem-solving in science and engineering. It covers set theory, relations, and basic propositional logic to model discrete systems, alongside combinatorics for counting and optimization scenarios. Students learn to construct graph-based models, such as network flows, enhancing their understanding of graph theory. The course strengthens abstract thinking and logical reasoning, preparing students for subsequent courses like Data Structures. Practical exercises improve precision and analytical skills, fostering a scientific mindset for innovative research.
Optimization Method B:
This course explores optimization techniques, emphasizing discrete methods crucial for computer science and engineering. It introduces graph theory through shortest path and minimum spanning tree algorithms, alongside combinatorial optimization using permutations and combinations. Students study logical inference to formulate constraints and modular arithmetic for discrete optimization problems. The curriculum enhances abstract reasoning and symbolic calculus, building a mathematical foundation for courses like Artificial Intelligence and Database Principles. Through practical applications, it develops students' ability to analyze and solve complex problems, supporting future innovative work in informatics.
Calculation Method B:
This course focuses on computational methods with an emphasis on discrete mathematical foundations for engineering applications. It covers recursive algorithms and complexity analysis, rooted in discrete structures like sequences and trees, alongside probability concepts for statistical computation. Students explore predicate logic and inference rules to design efficient algorithms, reinforcing logical reasoning skills. Key topics include numerical techniques for discrete systems, enhancing precision and standardization in problem-solving. The course prepares students for advanced topics in Operating Systems and Compiling Principles, fostering innovative thinking and a solid theoretical base.

1.3. Linear Algebra

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Linear Algebra and Analytic Geometry	3.5	4.795	2017-2018 SEMESTER 1
Total	**3.5**	**4.795**	

Brief description of the courses

Linear Algebra and Analytic Geometry:
This course is a compulsory course for science and engineering students. It mainly includes the definition and basic operation of the matrix and vector, special matrix, block matrix, elementary transformation of a matrix, elementary matrix; the definition, property and calculation of a matrix; the definition and property of an invertible matrix, the condition of a matrix being invertible, the method for finding the inverse of a matrix, the method for solving matrix equations; the linear representation of vectors, the linear dependence of vectors, rank, the basis of vectors; the definition and property of the rank of a matrix, the method for finding the rank of a matrix, judging the linear dependence of vectors, the numerical method for finding the basis of vectors; the existence of the solution of a linear system, the property and structure of the solutions of a linear system, the numerical method for solving linear system; the basis and dimension of a vector space, the coordinate of a vector; the inner product of two vectors, Schmidt orthonormalization, orthogonal matrix; the definition and properties of the eigenvalue and the corresponding eigenvector of a matrix, the

numerical method for solving eigen information, the definition and properties of similarity matrix, the condition of diagonalization by a similarity transformation, the diagonalization of a symmetric matrix by a similarity transformation; the definition and the matrix form of a quadratic form, contragredient transformation, transforming a quadratic form to its standard form by orthogonal transformation and the method of completing the square, the positive definite quadratic form, the positive definite matrix; the basic introduction of the linear space and linear transformation; the dot product, vector product and mixed product of two vectors, the line and plane equation, the angle of intersection, distance and relative position of a straight line and a plane, sphere, cylinder, surface ofrevolution, quadratic surface, numerical experiments.

1.4. Probability Theory

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Probability and Statistics A	3	4.11	2020-2021 SEMESTER 1
Total	**3**	**4.11**	

Brief description of the courses

Probability and Statistics A:
In this compulsory course, the students will study the following: Event and its calculus; Classical Probability; Conditional probability; Independent and Bernoulli test; One dimensional random variables and their distribution functions; One dimensional discrete random variables; One dimensional continuous random variables; Distributions of the functions of random variables; Two dimensional discrete random variables; Two dimensional continuous random variables; Distributions of the functions of two dimensional random variables; Expectations of random variables; Variances of random variables; Covariance; Correlation coefficient; Law of large number; Central Limit Theorems; Statistical Population sample; The three distributions; Sample's distributions of normal population; Confidence interval; Hypothesis Testing; Point estimation, unbiasness, effectiveness, consistency of estimator.

1.5. Complex Function

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Complex Function	2	2.74	2017-2018 SEMESTER 3
Total	**2**	**2.74**	

Brief description of the courses

Complex Function:
Complex Functions is a public basic course for science and engineering students. The contents of this course are complex numbers, complex functions, analytic functions, complex integration, series representations for analytic functions, residue theory etc. It will help students to solve the mathematical problems in other courses.

2. Foundation Academic Activities

2.1. Physics

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
College Physics A1	3.5	4.795	2018-2019 SEMESTER 1
College Physics A2	3	4.11	2018-2019 SEMESTER 1
College Physics Experiment 1	1	1.37	2018-2019 SEMESTER 1
College Physics Experiment 2	1	1.37	2018-2019 SEMESTER 1
Total	**8.5**	**11.645**	

Brief description of the courses
College Physics A1: This foundational course for science and engineering students introduces classical mechanics principles. It covers kinematics, dynamics, work, energy, and momentum, using mathematical models to solve physical problems. Students develop analytical skills through vector analysis and differential equations, applicable to computational simulations in informatics. The course fosters logical reasoning and precision, preparing students for technical interdisciplinary studies. **College Physics A2:** This course advances physics knowledge for science and engineering students, focusing on electromagnetism and thermodynamics. It explores electric fields, magnetic forces, circuits, and heat transfer, emphasizing problem-solving with mathematical tools. Students enhance analytical abilities for informatics applications like signal processing and hardware design, building a strong foundation in logical deduction and scientific inquiry. **College Physics Experiment 1:** This practical course introduces science and engineering students to experimental physics techniques. It focuses on mechanics and thermodynamics, where students measure motion, forces, and heat transfer using lab equipment. Through hands-on experiments, students enhance data analysis and error evaluation skills, building a foundation for scientific inquiry and precision relevant to informatics applications like sensor technology. **College Physics Experiment 2:** This lab course advances experimental skills for science and engineering students, focusing on electromagnetism and optics. Students conduct experiments with circuits, magnetic fields, and light properties, mastering measurement and data interpretation. It strengthens logical deduction and technical proficiency, equipping students for informatics-related tasks such as signal processing and hardware design in computational systems.

2.2. Biology

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
General Biology	2	2.74	2018-2019 SEMESTER 1
General Biology Experiment	0.5	0.685	2018-2019 SEMESTER 1
Total	**2.5**	**3.425**	

Brief description of the courses

General Biology:
This introductory course for science and engineering students explores fundamental biological principles. It covers cell structure, genetics, evolution, and basic biochemistry, using analytical models to understand life processes. Students develop scientific reasoning and data interpretation skills, applicable to bioinformatics and computational biology in informatics. The course lays a foundation for interdisciplinary technical studies.
General Biology Experiment:
This practical course complements General Biology, offering hands-on experience for science and engineering students. It includes experiments on cell observation, microscopy, and basic genetic analysis, emphasizing measurement and data recording. Students enhance analytical and problem-solving skills, relevant to informatics applications like biological data processing, fostering precision and experimental proficiency.

2.3. Circuit Theory and Electronics

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Circuit Theory A1	4	5.48	2017-2018 SEMESTER 2
Circuit Experiment A	1	1.37	2017-2018 SEMESTER 2
Analog Electronic Circuit	3.5	4.795	2018-2019 SEMESTER 1
Experiment of Analog Electronic Circuit	0.5	0.685	2018-2019 SEMESTER 1
Analog Circuit Course Design	1	1.37	2018-2019 SEMESTER 2
Total	**10**	**13.7**	

Brief description of the courses

Circuit Theory A1:
The content of this course includes basic circuit elements, basis circuit theories and basic circuit analysis methods to direct circuits, alternative circuits and dynamic circuits, which are essential and common basis for all electricity related majors. In details, the contents includes: (1) the voltage and current relation of basic circuit elements,Kirchhoff's law and Ohm's Law; (2) equivalent transformation; (3) loop current analysis, node voltage analysis; (4) circuit theorems; (5) phase analysis for common steady-state circuits; (6) phase analysis to specific circuits such as resonance circuit, magnetically coupled circuits, three-phase circuits and nonsinusoidal periodic circuits; (7) time-domain analysis to first-order circuits and second-order circuits; (8) two-port network analysis. By studying this course, the students will master the fundamental knowledge about electric circuit theory and the basic techniques for circuit analysis, and develop elementary experimentation skills, moreover, develop the strict scientific attitude and practical ability. Also this course will lay a theoretical foundation for the follow-up specialty courses.
Circuit Experiment A:
Course content includes the external characteristic of different power supplies and their equivalent transformation, DC linear network, series resonant, first order circuit response, RC phase-shifting network design, etc. Design, installation, calibration and applications of analog multimeter are also included in this course. Students need to do prep before class.In the laboratory, teachers explain the usage of related instruments and operational considerations. Students need to finish the experiments and write reports independently. This course is independent of theoretical teaching and the full score is 100. The final score will be given comprehensively on the basis of preview, process, discussion and analysis of experiment results, final report, etc.

Analog Electronic Circuit:
This course is required by students majoring in electronics to have a foundation of electronic technique. It aims to provide students with the basic theories, basic knowledge, and basic skills about semiconductor devices and analog electronic circuits, and to provide students with methods for analyzing and solving the problems in analog electronic circuits. The main contents include diode and basic diode circuits, bipolar junction transistor (BJT)and BJT amplifiers, field effect transistor (FET)and FET amplifiers,power amplifier (PA), differential amplifier and analog IC, feedback amplifiers, computation and processing of analog signals, transform and processing of waveforms, and DC power supply.
Experiment of Analog Electronic Circuit:
The Experiment is based on the theory course "Analog Electronic Circuit" and it is one of the major courses for all the students in Faculty of Electronic Information and Electrical Engineering. Through the exercises in experiment, students can consolidate and get further understanding of their theoretical knowledge. All tutorials are designed based on diodes, transistors, field effect transistors etc. semiconductor devices and analog electronic circuits. The main experiment contents include diode and basic diode circuits, bipolar junction transistor(BJT)and BJT amplifiers, field effect transistor(FET)and FET amplifiers, differential amplifiers, analog integrated circuit (IC) operational amplifiers, feedback amplifiers, analog signalgenerating and computing circuit, transform and processing of waveform circuit, voltage regulator, convertor, etc.
Analog Circuit Course Design:
Analog Circuit Course Design is one of the major courses.Through the exercises in analysis and design of analog electronic circuit, students can consolidate and get further understanding of their theoretical knowledge in Analog Electronic Circuit and apply the knowledge into practical applications. Students are required to finish their design projects independently. Based on the understanding of analog electronic circuit theory,and students are required to make their own design plan, design functional modules and cell circuit, draw circuit schematics, built their circuit and do testing. After finishing the whole project, students should be familiar with electronic system design methods and be able to complete simple design work independently. Based on the demand in the industry, this course focuses on training the ability of students to find problems, analyze problems, and solve the problems, on training students with scientific rigorous research attitude, and innovation, which lay a solid foundation for their further learning and work after graduation.

2.4. Engineering Training B

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Engineering Training B	2	2.74	2018-2019 SEMESTER 1
Total	**2**	**2.74**	

Brief description of the courses

Engineering Training B:
This practical course for science and engineering students provides hands-on training in foundational engineering skills. It covers mechanical assembly, circuit construction, and basic machining, integrating tools like CAD software and hardware prototyping. Students design and test small-scale systems, applying problem-solving and technical analysis to real-world challenges. The course emphasizes teamwork, precision, and systematic documentation, enhancing engineering proficiency. Through projects, students bridge theoretical knowledge with practical implementation, gaining skills in system integration and troubleshooting. This experience strengthens computational

thinking and hardware familiarity, preparing students for informatics applications such as embedded systems design and interdisciplinary innovation in computer science.

3. Practical Computer Science

3.1. Programming

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
University Computer	2	2.74	2017-2018 SEMESTER 1
Object-oriented Programming	2.5	3.425	2019-2020 SEMESTER 1
Programming Basis A	4	5.48	2019-2020 SEMESTER 2
Software Integrated Training	2.5	3.425	2020-2021 SEMESTER 1
Production Practice	1	1.37	2019-2020 SEMESTER 1
Total	**12**	**16.44**	

Brief description of the courses

University Computer:
"Fundamentals of Computer" is one of the basic courses in general and the public through all the professional college students, as well as a required course in computer education. The course mainly introduces the field of computer related knowledge and application, the basic principle of computer and computer system work process, basic computer skills operation method. The main contents include the development of computer and application areas, the representation and storage of information, principles of computer composition, fundamentals of operating system, computer network technology and application, program design basis and algorithm, basis of database and information security, etc. In the process of course practice, we also guide students familiar with common office software operation method. By studying this course, students can master computer application and operation skill, preliminary methods and using a computer to obtain knowledge, awareness of problem analysis, problem solving, gradually improve the computational thinking ability and information literacy of college students, in order to meet and adapt to the information society on the basis of the quality of College students, to lay the foundation for a future the application of computers to solve professional problems.

Object-oriented Programming:
In this course, we mainly teach the object-oriented programming language, including the concepts and the procedures. Through the study of C++ language, the students could understand the features and concepts of object-oriented programming, and master the method and procedure of object-oriented programming. Totally understand the concepts and implementation procedures of class, object, encapsulation, inheritance and polymorphism, as wellas overloading. Master the application process of template and exception. Meanwhile, by studying the content of classes'design and using computer to design programs, the students could improve their capability in class-based programming and C++ programming. Meanwhile, they could apply VC++ platform to debug and complete C++programs, as well as to solve real-world problems.

Programming Basis A:
The aim of the course is to cultivate students'ability to understand the basic steps of computation, grasp the procedure of programming and solve the practical problems through procedural programming tools such as flow chart and functions.It also aims to improve the students'ability to design computer program with a systematic approach. The contents of the course include such topics as

the syntax/semantics of C programming language, the basic concepts of C programming,the general computational methods and the design of man-machine interface, the procedural design methods and key concepts such as pointers and arrays.

Software Integrated Training:

This course is an important practical courses for the students majoring in computer science and technology, it covers several aspects of knowledge and their comprehensive using, including software engineering, data structure and algorithm, database technology, computer network and computer programming languages. For the selected software project,requirements analysis, general design, detailed design, programing environment construction, software test and the document compilation are trained. So that students can understand the curriculum knowledge, and especially through comprehensive use of different courses, improve the ability of scientific research, software development, practical problem solving skills, organization and coordination ability and team spirit. Through various teaching approaches and methods (such as:enterprise expert lectures, the guidance of teachers with practical experience of enterprise, team development, group discussion, debate),the actual development process enables students to complete a software project, training students can make reasonable analysis and comprehensive design to a complex engineering problem. Finally,a complete software system can be achieved.

Production Practice:

Two weeks of computer programming practice will be carried out in this course for the second year students in the major of computer science and technology. The teaching content consists of three parts. The first part is the overview of computer programming and IT development. In this part,the students can learn more about the state of the art and the future trends in computer programming,and the basic abilities of IT engineers. The second part is the intensive training of programming thinking and skill. In this part, the students will review the content of C language, Java language and data structure classes.After that, they will conduct more and more programming experiments. The third part is the training of advanced programming. In this part,the students will learn a little about object-oriented programming, mobile application development and human-computer interface development. The students will strengthen their abilities of self-directed learning about new programming languages. This course will be the basis of subsequent CS major courses. This course willalso lay the foundation for student employment.

3.2. Data Structures and Algorithms

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Data Structure (Bilingual)	2.5	3.425	2018-2019 SEMESTER 2
Total	**2.5**	**3.425**	

Brief description of the courses

Data Structure (Bilingual):

This course is one of the compulsory courses for non-computer professional engineering students majored in Automation, Electronic Information Engineering, Communication Engineering, etc. The course introduces basic data structures, such as linear lists, stacks, queues, arrays, trees and graphs. Through learning in this course, students should grasp the features of different data structures and can apply them skillfully. Common searching and sorting methods, algorithm design and analysis are also presented in this course. The aim of the course is to help students understand basic concepts of data structures and cultivate students ' ability in programming. Students can choose and design appropriate data structures to solve practical problems.

3.3. Software Engineering

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Software Engineering	2	2.74	2019-2020 SEMESTER 1
Software Engineering Curriculum Design	1	1.37	2019-2020 SEMESTER 3
Total	**3**	**4.11**	

Brief description of the courses
Software Engineering: Software engineering is a compulsory course for students majoring in computer science and technology, which is used for software development,maintenance and management. The framework of this course is based on the latest software engineering knowledge released by IEEE. This course focuses on the systematic understanding and practical application of the whole process of software development, taking the current popular unified development process,object-oriented technology and UMLlanguage as the core. After learning this course,students should master the basic concepts and basic principles of software engineering methods for developing software projects, and the process, standards, norms in the development process.Students also should be able to master the methods of developing high quality software, and how to effectively plan or manage software development activities.It can lay a solid theoreticalfoundation for students to participate in large software development projects.This course focuses on cultivating students'ability to apply theory to practice.The teacher teaches the principles and concepts of software engineering in the class, and after class teacher trains students'ability of software development by curriculum design. This course can help students understand the guiding role of software engineering in practice, and complete the software development documents according to the requirements. This course has important practical significance to improve students'ability of software development and project management. **Software Engineering Curriculum Design:** This course is a comprehensive experimental design course. After studying core curriculum "Software Engineering", it is a comprehensive implementation of the content. The objective is to further enhance the abilities of mastering the methods and techniques of software engineering, building up team work spirits, learning autonomously, designing creatively, and improve the abilities of synthesized analysis and solving problems. The contents include project preparing, project management, requirement analysis, software design, software implementation,software testing, and writing user manuals, and configuring managements.

4. Technical Computer Science (Computer Architecture)

4.1. Operating Systems and System Software

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Computer Composition Principle	3.5	4.795	2020-2021 SEMESTER 1
Experiment of Computer Composition Principle	1.5	2.055	2019-2020 SEMESTER 1
Operating System	3.5	4.795	2019-2020 SEMESTER 2
Operating System Experiment	1	1.37	2019-2020 SEMESTER 2
Computer System Structure	2.5	3.425	2019-2020 SEMESTER 2
Computer System Structure Experiment	1	1.37	2019-2020 SEMESTER 2

Principle of Database System	3	4.11	2019-2020 SEMESTER 2
Hardware Integrated Training	2.5	3.425	2019-2020 SEMESTER 3
Total	**23**	**31.51**	

Brief description of the courses

Principles of Compiler:

"Principle of Compiler"is one of the compulsory course of computer specialty, is a professional basic course. Compiler is a language translator, learning this course is helpful to the understanding of programming languages. The teaching goal of this course is to let the students master the basic concepts, the basic theory and basic method of the "Principle of Compiler", re-recognize programs and algorithms at the system level, improve the level of the problem solving of the computer, enhance system ability, experience the delight of automatic calculation. Through this course, students will be able to have more in-depth understanding of compiler basic concepts and theories, have the ability to apply them to solve some problems,and have the ability to design, implement, analyze and maintain a compiler. Course contents include the basic theories, methods and techniques required by the development of a compiler. Including lexical analysis, syntactic analysis, semantic analysis, intermediate code generation, code optimization and target code generation, as well as the symbol table, target code runtime storage organization, etc.

Compilation Principle Course Design:

Compilation Principle Course Design is one of the compulsory courses of computer faculty. The course design is the practice link of compiler principle. It requires that the students independently design and implement a small compiler-PL/0 (or other custom language) compiler at the understanding of the basic compiler theory and technology or in the form of collaboration team. The compiler achieves the basic function of the compiler such as lexicalanalysis, syntactic analysis, semantic analysis and code generation. The excellent students can further realize the interpreter of the generated code. Therefore, the students will have profound perceptual knowledge in all stages of compiling, and have a systematic and comprehensive understanding of the implementation of computer programming languages. The course teaching achieves the organic combination of theory courses and practice. Through the exploration and the experiment of the design and implementation ofa small compiler, the students'ability of engineering practice is cultivated. In the course design, the students understand the basic theories, methods and techniques needed in different development phases of a compiler, including lexical analysis, syntactic analysis, semantic analysis, intermediate code generation, code optimization and target code generation, and the symbol table, target runtime storage organization, etc.

Computer Composition Principle:

This is the core course linking the past and the future in computer science teaching system. As a compulsory professional foundation course, its purpose is to guide students to learn the basics of computer systems and theoretical knowledge, to master the representation and operation methods of all kinds of data information, to help students become familiar with each component in a computer system structure and their characteristics, to understand the working principle, structure and connection mode of the various components in the single processor computer system, to learn the concepts needed to set up complete computer systems, to understand the concept of hierarchical structure of computer systems, to master the instruction set architecture and implementation method. This course covers the hierarchical structure and performance indexes of computer system; data representation and operation; function, composition and basic operation principles of arithmetic unit; memory system; instruction system; central processor function and basic structure;the function, composition and working principle of the controller; the input/output system and bus.

Experiment of Computer Composition Principle:
This course is one of the specialized courses of computer science and technology. On the basis of learning and mastering the basic principle of computer composition,this practical course can deepen the students'understanding of theoretical knowledge and transform abstract knowledge into practical knowledge, which is beneficial to further study. This course focuses on the design and implementation of the calculator, the memory, the controller and the CPU in order to deepen the students'understanding of the basic theory of computer composition and focus on training design and basic design skills in cultivating practical ability. Through the experimental class exercise, so that students can master some of the commonly used chip and circuit basic design methods to improve the practical ability of students, analysis and problem solving ability.The main contents of the experiment are:the establishment of programmable experimental environment, calculator design experiments, memory design experiments,controller design experiments, non-water CPU system design.

Operating System:
The operating system is a compulsory course for undergraduates majoring in computer science and technology.The operating system is an important computer system software,which is used to manage the computer system software and hardware resources,control system workflow,and for users to use the computer to provide a convenient interface.Through the study of this course,students can master the basic concepts,principles,technical implements and system operation of the operating system.The course also trains students to use computer expertise to solve the complex engineering problems in the field of computer science and technology and to apply the basic principles of mathematics,natural science and engineering science for analysis of complex problems in computer engineering and related areas and will lay a solid foundation for the operating system software research and development in the future.

Operating System Experiment:
This course is one of the specialized experimental courses in computer science and technology, which is a professional practice for students to strengthen the understanding of computer operating. The experiments enable students to strengthen the understanding of the principles of the operating system and in-depth and intuitive understanding of various operating system algorithms and they train students to use the relevant engineering and professional knowledge of computer science and technology to solve complex engineering problems and help them to establish a complete operating system concept and achieve the ability to design the basic structure of the operating system.

Computer System Structure:
The course emphasizes the systematicnessand frontier in terms of teaching content, including how to make a reasonable layout in computer hardware and software of functional distribution from the holistic perspective;introducing the related concepts of computer system,the design principle and design idea from two aspects of hardware and software;training on how to quantitatively analysis the multi machine system,CPU,storage system,IO system and instruction systemin cultivating practical ability;paying attention to the latest development of contemporary computer system.Through this course,students can understand the concept structure of computer system,design principle,key technology and the field of advanced technology and development trends,including conceptual structure,instruction set computer system structure,pipelining, instruction level parallelism,memory hierarchy,I/O system,multi processing technology etc.And master the basic method for the quantitative analysis of the performance of computer systems,the necessary basic knowledge and practical ability to build understanding,study and research of the computer system,a solid foundation for further study in the field of computer research.

Computer System Structure Experiment:
Computer System Structure experiment is one of the computer science practice courses, which aims

to provide a strong foundation for students to understand modern computer system architecture. This course focuses on training the ability for students to analyze and research the computer architecture and system.The course mainly includes as follows: 1. Experimental software training; 2. MIPS instruction architecture experiment; 3. Pipeline experiment; 4. Instruction schedule experiment; 5. Cache experiment.

Principle of Database System:

This course is one of the major courses in computer science and technology, as wellas one of the compulsory courses in computer science and technology. Through the course of the study of theory and practice,so that students can grasp the basic concepts of database system and the basic theory; the definition and principle can be used to explain the relationship between the theory of database data model, data manipulation, data standardization and security concepts;and have the ability to achieve database management system software preliminary design with database management system using the existing basic design;database application system, combined with the actual project data model development capabilities.

Hardware Integrated Training:

This course is an important practical courses for the students majoring in computer science and technology, it covers severalaspects of knowledge and their comprehensive using,including circuit analysis and design, program design,principles of computer composition,computer architecture and computer network. For the selected project,requirements analysis,general design, detailed design, system development, system integration,system test and the document compilation are trained. So that students can understand the curriculum knowledge,and especially through comprehensive use of different courses,improve the ability of scientific research,system development, practical problem solving skill,organization and coordination ability and team spirit.

4.2. Computer Network and Security

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Computer Network A	3.5	4.795	2019-2020 SEMESTER 1
Computer Networks Experiment	2	2.74	2019-2020 SEMESTER 2
Total	**5.5**	**7.535**	

Brief description of the courses

Computer Network A:

1. Computer Network Overview

Introduce the development of the computer network, definition, classification and component, network topology and protocol, and then we can get a macroscopical knowledge of the network and communication;

2. Communication Networks Fundamentals

1) Through the ISO/OSI reference model, get the knowledge of network topology and the relation and function of the protocol in each layer; 2) The physical layer protocol and application examples, the principle of RS232 and control method; 3) Data link layer functions, grasp the frame method, flow control and error control method, HDLC; 4) Function of Network Layer, knowing well about the principle of datagram, virtual circuit, routing, and flow control; 5) Protocol of Network of the top, including transport layer, section layer, presentation layer and application layer. Knowing well about the principle and application of the process transmission control, data conversion, breakpoint resume, encryption and digital signature.

3. Communication Networks Fundamentals

1) Learning the cutting-edge and recent developments from references; 2) Getting the protocol, principle and latest achievement of wireless local network.

4. Internetworking and Interconnect Equipment

1) The techniques of network planning and system integration; 2) Knowing well about the network design way and procedure of campus network; 3) The application of various access techniques between campus network and Internet; 4) Premise Distribution System, the method of structured cabling in intelligent building and the application of related products.

Computer Networks Experiment:

In learning to master the basic computer network theory, through the experiment teaching, more can enhance the students to further understand knowledge and consolidation,this experiment course is one of the specialized experiment courses in computer science. Introduction from the basic computer network technology the front part,gradual introduction of the commonly used equipment of computer network experiment and networking, including hubs,switches and routers configuration methods,protocols use, etc. The configuration principle part mainly introduces the wireless network and IPv6 network protocol. This experiment is to design experiments as the main form,provide equipment and tools to what the students need,allow students to complete the program's content requirements, independent network scheme of its own,and debugged.In the experiment for students to strengthen learning network knowledge, theory, practical engineering technology training, improve the students'practical ability, to adapt to the rapid development of network technology needs.

5. Theoretical Computer Science

5.1. Automata Theory and Formal Languages

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Principles of Compiler	3.5	4.795	2019-2020 SEMESTER 1
Compilation Principle Course Design	1	1.37	2019-2020 SEMESTER 1
Total	**4.5**	**6.165**	

Brief description of the courses

Principles of Compiler:

"Principles of Compiler" is a compulsory course for computer science students, serving as a foundational professional course. It explores compilers as language translators, deepening students' understanding of programming languages through the lens of formal language theory. The course aims to equip students with mastery of basic concepts, theories, and methods, emphasizing automata theory and formal languages. Key topics include lexical analysis using finite automata and regular expressions, syntactic analysis with context-free grammars and pushdown automata, and semantic analysis for language processing. Students re-evaluate programs and algorithms at a systems level, enhancing problem-solving and system design skills. Additional content covers intermediate code generation, code optimization, target code generation, symbol tables, and runtime storage organization. By studying these, students gain the ability to design and analyze compilers, experience the automation of computation, and build a solid theoretical foundation in formal languages and automata, preparing them for advanced informatics challenges.

Compilation Principle Course Design:

"Compilation Principle Course Design" is a compulsory practical course for computer science

students, complementing the theoretical study of compilers. It requires students to independently or collaboratively design and implement a small compiler, such as a PL/0 compiler, applying automata theory and formal language concepts. The compiler must perform lexical analysis using finite automata, syntactic analysis with context-free grammars, semantic analysis, and code generation. Exceptional students may extend functionality to include an interpreter for generated code. Through this hands-on exploration, students gain deep perceptual knowledge of compilation stages, mastering the role of regular expressions, pushdown automata, and language hierarchies. The course integrates theory and practice, covering techniques like intermediate code generation, optimization, target code generation, symbol tables, and runtime storage. It cultivates engineering practice skills, providing a systematic understanding of programming language implementation and reinforcing foundational knowledge in automata and formal languages.

5.2. Digital Logic

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Digital Circuits and Systems	3.5	4.795	2018-2019 SEMESTER 2
Digital Circuit and System Experiment	0.5	0.685	2018-2019 SEMESTER 2
Digital Circuit Course Design	1	1.37	2019-2020 SEMESTER 1
Total	**5**	**6.85**	

Brief description of the courses

Digital Circuits and Systems:
This foundational course for undergraduates explores digital systems through a mathematical logic lens. Students master propositional logic and Boolean algebra, applying them to analyze and design logic circuits using integrated devices. It covers symbolic representation, truth functions, and formal reasoning for MSI and LSI circuits, implemented via VHDL. The course equips students with skills to design digital systems, blending hardware and software, while grounding them in logical principles essential for computer science.

Digital Circuit and System Experiment:
This core course for electrical and electronic engineering students introduces digital electronics through hands-on experiments. Students design and debug combinational and sequential logic circuits, applying propositional logic and Boolean algebra to analyze gate circuits, flip-flops, and counters. Using oscilloscopes and multimeters, they test logic functions and signal parameters, enhancing formal reasoning skills. The course fosters data analysis and fault identification, grounding students in mathematical logic principles for digital system design.

Digital Circuit Course Design:
This core course for electrical and electronic engineering students focuses on digital system design using programmable logic devices. Students apply propositional logic and Boolean algebra to design combinational and sequential circuits with Verilog HDL on the Quartus II platform. Through independent projects, they debug multi-level systems, verify designs via simulation, and analyze results, enhancing formal reasoning skills and grounding them in mathematical logic for digital electronics.

5.3. Data Science and Digital Image Processing

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Digital Image Processing	2	2.74	2019-2020 SEMESTER 1

Computer Graphics	2	2.74	2019-2020 SEMESTER 2
Total	**4**	**5.48**	

Brief description of the courses
Digital Image Processing: This elective course introduces digital image processing techniques for science and engineering students. It covers image enhancement, filtering, and feature extraction, using mathematical tools like convolution and Fourier transforms. Students apply algorithms to analyze and manipulate images, enhancing computational skills. The course supports informatics applications in vision systems and data analysis, fostering problem-solving and technical innovation. **Computer Graphics:** Introduction to the evolution history of computer graphics,the relationship with other relevant disciplines,the main research areas and current research trends. Explaining computer graphics algorithms,programming methods and data structures. Explaining the basic graphic primitives generation algorithms, including line, circle and ellipse rasterization algorithms and their optimization algorithms, polygon fill algorithm,character processing,graphic primitive's attribute processing, as well as anti-aliasing technology. In the two-dimensional graphics, explaining two-dimensional geometric transformations and viewing transformations, line and polygon clipping algorithms. In the three-dimensional graphics, explaining three-dimensional graphics generation process, three-dimensional geometric transformations, three-dimensional projection transformation and clipping. In addition, explaining the basic usage and programming techniques about OpenGL.

6. Artificial Intelligence

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Artificial Intelligence	3	4.11	2019-2020 SEMESTER 1
Artificial Intelligence and Information Society	2	2.74	2020-2021 SEMESTER 1
Deep Learning Principle and Application	2	2.74	2020-2021 SEMESTER 1
Information Retrieval	2.5	3.425	2019-2020 SEMESTER 1
Total	**9.5**	**13.015**	

Brief description of the courses
Artificial Intelligence: This course introduces the basic principles of artificial intelligence, methods and techniques, problem solving methods. Various knowledge representation methods willbe introduced. Searching and reasoning techniques will be discussed, including blinding search,heuristically search, resolution principle, rule based deduction systems, production systems; deterministic reasoning and non-classical reasoning high-level resolution is introduced, including neural computing, fuzzy computing, evolutionary computation and artificial life;allkinds of expert system model and structure is discussed; main strategy of machine learning about the basic structure of some commonly used learning methods. **Artificial Intelligence and Information Society:** This elective course explores artificial intelligence's impact on modern society. It introduces AI concepts like machine learning and reasoning, emphasizing data science as a core driver—covering data collection, analysis, and modeling to derive insights. Students examine ethical and societal

implications, linking AI innovations to real-world applications. The course enhances technical and analytical skills for informatics challenges.

Deep Learning Principle and Application:

This course introduces the fundamental principles of deep learning, focusing on its methods and techniques. Students will explore the essentials of machine learning as a foundation, followed by an in-depth study of key deep learning architectures. Topics include Artificial Neural Networks (ANNs) for modeling complex patterns, Convolutional Neural Networks (CNNs) for image processing, and Recurrent Neural Networks (RNNs) for sequential data analysis. The course also covers advanced object detection frameworks, such as RCNN, SPP-Net, Fast R-CNN, and Faster R-CNN, which are pivotal in computer vision applications. Additionally, students will examine Deep Autoencoders for unsupervised learning and feature extraction. Through theoretical lectures and hands-on projects, learners will gain practical skills in designing, training, and evaluating deep learning models. By the end of the course, students will understand how these techniques power applications like image recognition, natural language processing, and autonomous systems, preparing them for further study or industry roles in artificial intelligence.

Information Retrieval:

“Information Retrieval”is the elective course for the major of the computer science and technology,and its teaching objectives is to train students with the ability to analyze, solve and realize the project of Internet information processing and to make them familiar with the fundamental knowledge of natural language processing, Chinese information processing and machine learning etc. (1) Introduction to Internet:to be familiar with the basic workflow for text information processing in internet, and the fundamental knowledge of natural language processing, text mining,machine learning and so on. (2) Information Retrieval: to master the basic models of information retrieval,technology of web spider, query expansion and page-rank. (3) Text Classification/Clustering: to master text features selection, algorithm for text classification and clustering, to be familiar with the evaluation approaches. (4) Question & Answer System: to master the basic approaches for Question & Answer system, such as question analysis, retrieval strategies and answer exaction, and to be familiar with the QA system oriented domain and QA system based on FAQ. (5) Recommendation System: to master recommendation based on content and recommendation based on collaboration, such as the modeling of user profile, the implementation of recommendation system and the evaluation of recommendation. (6) Sentimental Analysis:to master the basic approaches for text sentimental analysis and opinion mining nowadays, and to be familiar with the application to several domains using sentimental analysis and opinion mining. To serve the purpose of practice, we adopt the technical evaluation as the main means of learning means and methods to enhance students’ability to analyze and solve problems in the era of big data in the internet.

7. Signals and systems theory

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Signal and System Lab	0.5	0.685	2018-2019 SEMESTER 2
Signal and System A	4	5.48	2018-2019 SEMESTER 2
Total	**4.5**	**6.165**	

Brief description of the courses
Signal and System Lab: Experiment of Signal and System is a major technical course for Electronic Information Engineering.

The purpose of the experiment course is to help students better understand and master the zero-state response of linear time invariant system and the solution of zero-input response, master the calculation of signal spectrum, plot the signal amplitude-frequency characteristic curve and phase-frequency characteristic curve, master the relation between system stability and poles and zeros, understand signal sampling theorem, and use Simulink to simple circuit simulation. Through these experiments, students will strengthen the ability analyzing and solving problems independently.

Signal and System A:

"Signals and Systems" is one of the required courses for the undergraduate students in the major of Electronic and Information Engineering. Both continuous-time and discrete-time signals and systems will be covered. The signals and systems will be studied both in time domain through convolution summation and integral and in frequency domain through Fourier series, Fourier transforms Laplace transform, and z transform. The purposes of this course are to provide students with systemic concepts and theories on signals and systems, and to establish a solid foundation for their later studies.

8. Graduation Design Thesis

8.1. Graduation Design Thesis

Course Title	Credits (China)	Credits (ECTS)	Course Place on the Transcript
Graduation Design (Thesis) A	15	20.55	2020-2021 SEMESTER 2
Total	**15**	**20.55**	

Brief description of the courses

Graduation Design (Thesis) A:

This compulsory capstone course for computer science students integrates knowledge from prior studies into a comprehensive research project. Students independently design, implement, and evaluate a technical solution, such as a software system or hardware prototype, addressing a real-world problem. The process involves formulating objectives, applying algorithms and programming skills, and analyzing outcomes through rigorous testing. Guided by faculty, students document their work in a detailed thesis, demonstrating proficiency in system design, critical thinking, and innovation. This course fosters advanced problem-solving abilities and prepares students for professional or academic pursuits in informatics.