**Beijing University of Posts and Telecommunications**

**School of Electronic Engineering**

**Undergraduate Course Descriptions**

**(2017)**



**School of Electronic Engineering**

**Academic Affairs Office of BUPT**

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# 1. Basic Courses

## <Electronic and Circuit Foundation> Course Description

**Course:** Electronic and Circuit Foundation

**Course No.**: 3122101025

**Credit / Course Hours:** 3 credits, 48 hours

**Preparatory Course:** Advanced mathematics, Circuit analysis foundation

**Course Description:** Electronic and Circuit Foundation is one of the fundamental courses for the majors in information, telecommunication and electronic engineering. It mainly covers basic semiconductor devices as well as their general element circuits, feed-back amplifiers, frequency response, integrated circuits and so forth. Through the study of the content above and related applications, students will be able to master the fundamental principles, basic concepts, operating principles of various functional circuits as well as analytical and design methods systematically. The course aims to help the students to develop their abilities of analyzing and solving problems, engineering evaluation, scientific thinking, experiment studying and scientific induction, which contribute to building their engineering view of integrating theory with practice. Accordingly the necessary groundwork is laid for the further engineering implementation of the electronic systems and the follow-up study.

## <Electromagnetic fields and waves> Course Description

**Course:** Electromagnetic fields and waves

**Course No.:** 3122101051

**Credit / Course Hours:** 3/48

**Preparatory Course:** Advanced Mathematics, Physics

**Course Description:**  As an important basic course for electronic information undergraduate majors, this course makes up the theoretical foundation for subsequent professional courses such as Microwave Technology, Antenna Theory, Radio Propagation, RF Techniques, Electromagnetic Compatibility, etc. Through the study of this course, students will have a correct understanding of the basic laws and the physical essence of electromagnetic fields and waves, and will possess the ability to analyze electromagnetic phenomena and solve electromagnetic problems with proper mathematical tools. In addition , students can grasp two kinds of electromagnetic analysis methods which are " field " and " road " method respectively in this course, and achieve the ability to rational selection method for specific problems, and the ability to make models and obtain solutions for them. Students' professional knowledge and methods acquired through this course will be widely used in many aspects of modern life and lay the necessary theoretical foundation for the further study of relevant professional courses.

## <Electromagnetic fields and waves> Course Description

**Course:** Electromagnetic fields and waves

**Course No.:** 3122101059

**Credit / Course Hours:** 4/64

**Preparatory Course:** Advanced Mathematics, Physics

**Course Description:**  As an important basic course for electronic information undergraduate majors, this course makes up the theoretical foundation for subsequent professional courses such as Microwave Technology, Antenna Theory, Radio Propagation, RF Techniques, Electromagnetic Compatibility, etc. Through the study of this course, students will have a correct understanding of the basic laws and the physical essence of electromagnetic fields and waves, and will possess the ability to analyze electromagnetic phenomena and solve electromagnetic problems with proper mathematical tools. In addition , students can grasp two kinds of electromagnetic analysis methods which are " field " and " road " method respectively in this course, and achieve the ability to rational selection method for specific problems, and the ability to make models and obtain solutions for them. Students' professional knowledge and methods acquired through this course will be widely used in many aspects of modern life and lay the necessary theoretical foundation for the further study of relevant professional courses.

## <Signals and Systems> Course Description

**Course:** Signals and Systems

**Course No.:** 3122101030

**Credit / Course Hours:** 4/64

**Preparatory Course:** Mathematics, Physics, Linear Algebra, Complex Functions, Fundamental of Circuit Analysis

**Course Description:** Signals and Systems is an important discipline basic course, which emphasizes on the basic theories and methods about certain signal analysis and the linear time invariant system analysis. The necessary fundamental knowledge for further learning network theory, telecommunication theory and signal processing technology etc. will be provided by learning this course. The main contents are as following:

1. The basic concepts, description, classification and models of the signals and systems. The analysis of the continuous time systems in time domain.
2. The orthogonal decomposition of the signals.
3. The analysis of the signals and the continuous time systems in frequency domain, which is Fourier transform and its applications in telecommunication systems.
4. The Laplace Transform of the signals and the analysis of the continuous time systems in complex frequency domain.
5. The analysis of the discrete time signals and the discrete time systems in time domain.
6. The z-Transform of the discrete time signals and the analysis of the discrete time systems in frequency domain.
7. The signal flow graph and the state variable analysis of the continuous time systems.

## <Signals and Systems> Course Description

**Course:** Signals and Systems

**Course No.:** 3122101032

**Credit / Course Hours:** 3/48

**Preparatory Course:** Mathematics, Physics, Linear Algebra, Complex Functions, Fundamentals of Circuit Analysis

**Course Description:** Signals and Systems is an important discipline basic course, focusing on the basic theory and method for certain signals and linear time-invariant systems analysis. The main contents include: the basic concepts, description, classification and models of the signals and the systems, time-domain analysis of continuous-time systems, the signal orthogonal function decomposition, frequency-domain analysis of continuous-time signals and systems, Fourier transform and its applications in communication systems, continuous-time signal Laplace transform and complex frequency-domain analysis of continuous-time systems, time-domain analysis of discrete-time signals and discrete-time systems, the z-transform of the discrete-time signals and complex frequency-domain analysis of discrete-time systems. Learning through the curriculum, we can lay the necessary foundation for further learning on network theory, communication theory and signal processing technology etc.

# 2. Professional Courses

## < Fundamentals of Communication Networks > Course Description

**Course:** Fundamentals of Communication Networks

**Course No.:** 3122102081

**Credit / Course Hours:** 2/32

**Preparatory Course:** Principles of Communications, Probability and Stochastic Processes

**Course Description:**

This course focuses on the basic theory of communication networks and its applications. Meanwhile, this course is closely related to the actual situation of the development of China's communication networks, elaborating the related communication network technologies. The teaching content mainly includes the basic concepts and architecture of communication networks, communication networks transmission and exchange technologies, graph theory based networks planning and design theory, and queuing theory and applications. Through this course, students can master the basic concepts and characteristics of communication networks, understand and master the basic theory and analysis methods of graph theory and queuing theory, while gaining a preliminary understanding the application of these theories and methods in communication networks. The study of this course lays a solid theoretical foundation for the follow-up professional courses and the ability of students to learn and solve practical problems in the future.

## < Fundamental Principles of Electromagnetic Compatibility > Course Description

**Course:** Fundamental Principles of Electromagnetic Compatibility

**Course No.:** 3122102070

**Credit / Course Hours:** 2/32

**Preparatory Course:** [circuit analysis](http://www.baidu.com/link?url=9UKzTPnNdXI2uK3HUmau6oaUCiWibX1huDbcY14WCgPZTvQUWRWaTZqU0lE5sq_WXXPRPg_FQtOzq0EhrD7OD0y0NQPasYCyxiMuGbpq7TyAz7r4jgh2oThx-fI31a83), [Signals and Systems](http://www.baidu.com/link?url=bDRPYjiHlVixEO_wiJX_zgWQYQyf5kvMmcN1HiN2Tg0KZqWRemmAtaxrhoWYdEL6gj7VSidPam6hthc--MAp_x_8sPu6SWr8OtB63kU5BG4YitFyuy15Xb0pkhO3JAZ-), field and wave electromagnetic, [Fundamentals of Electronic Circuits](http://www.baidu.com/link?url=ZvIbUidTaKVhJMJUCw2nyMLZpJ7rk6wF-WZmNqG0oLMAqveK0s84NIPFtiexXkUaC_4lPIJZVLc2LQMvTzHNlKAku8GbalispEOfqXbNyAoXF5lN-5sDK-4InJfnWycTGY-jIDMIUKgveSTXoDQ-yq)

**Course Description:** With the rapid development of science and technology, the electromagnetic environment faced by electronic and electrical equipment is increasingly complicated. All kinds of electromagnetic interference easily cause the system performance to be reduced or even lose its function. In order to achieve the electromagnetic compatibility of electronic equipment and systems, it is necessary to enhance understanding of the principles of electromagnetic compatibility and to master methods and means of electromagnetic compatibility analysis. Be viewed as a comprehensive interdisciplinary, electromagnetic compatibility penetrates with electronics, communications, computers and other disciplines, which is the professional courses of engineering electrical and electronic, information and communications engineering. Via learning this course, the students can have a comprehensive grasp of the fundamentals of various electromagnetic interference sources, coupling paths, electromagnetic interference suppression technologies and the basis of electromagnetic compatibility design, and lay a foundation for solving the electromagnetic compatibility problem in practical engineering. In the teaching process, teachers will focus on developing students' scientific thinking and analytical reasoning ability, as well as the ability to solve practical engineering problems.

## < Electric Circuit Aided Design and Simulation > Course Description

**Course Number:** 3122102010

**Course No.:** Electric Circuit Aided Design and Simulation

**Credit / Course Hours:** 1/16

**Preparatory Course:** Higher Mathematics, Linear Algebra,Fundamentals of Circuit Analysis

**Course Description:** Electric Circuit Aided Design and Simulationis a speciality course, which emphasizes on the MATLAB and its application in Fundamentals of Circuit Analysis. The main contents include: The introduction of MATLAB. The variables and their assignment. The elementary operations of the matrix and the element group operation. The logic judgment and process control. The basic plotting methods. The function libraries of data analysis, polynomial, numerical integration and character string. The decomposition and transform of matrix. The program design of MATLAB and its application in resistive circuits, dynamic circuits and sinusoidal steady-state circuits. By learning this course, the computer aided analysis and simulation should be learned and the programming and application ability should be cultivated.

## < Information electronic technology > Course Description

**Course:** Information electronic technology

**Course No.:** 3122102170

**Credit / Course Hours:** 2/32

**Preparatory Course:** The basis of the information network applications; C language

**Course Description:**

The rise of e-commerce, enhanced and improved the ways to achieve and realize the scope of the business activities. Electronic information technologies are the base of e-commerce implementation. From the point of view of information and electronic technology，this course introduced students e-commerce, to enable students to understand the characteristics of e-commerce framework and model, to know the background information of electronic network and communication, application development technology, electronic payment technology. The most important parts focused on information security, electronic payment technology and mobile payment technology, to enable students to grasp the technology of e-commerce in the macro constitute. In the last chapter of the course, some e-commerce solutions of well-known companies are discussed to enable students to integrate theory with practice.

## <Thermodynamics And Statistical Mechanics> Course Description

**Course:**Thermodynamics And Statistical Mechanics

**Course No.:** 3122102455

**Credit / Course Hours:** 1/16

**Preparatory Course:** Mechanics, Thermotics, Atomic physics, Advanced mathematics

**Course Description:**

Thermodynamics and statistical physics are to study the law of thermal motion, the physical property related to thermal motion and the theory of the evolution law of the macroscopic material system. The main teaching contents include the basic thermodynamic law, the basic thermodynamic properties, the phase transition, the non equilibrium state statistics and the fluctuation theory, and so on. Through the course study, it is useful to help students to establish the concept of probability theory, grasp the basic theory of the basic law of thermodynamics and statistical physics.

## <Thermodynamics And Statistical Mechanics> Course Description

**Course:**Thermodynamics And Statistical Mechanics

**Course No.:** 3122102455

**Credit / Course Hours:** 1/16

**Preparatory Course:** Mechanics, Thermotics, Atomic physics, Advanced mathematics

**Course Description:**

Thermodynamics and statistical physics are to study the law of thermal motion, the physical property related to thermal motion and the theory of the evolution law of the macroscopic material system. The main teaching contents include the basic thermodynamic law, the basic thermodynamic properties, the phase transition, the non equilibrium state statistics and the fluctuation theory, and so on. Through the course study, it is useful to help students to establish the concept of probability theory, grasp the basic theory of the basic law of thermodynamics and statistical physics.

## <Solid-State Electronics>Course Description

**Course Number：**3122102251

**Course：**Solid-State Electronics

**Credit(s)：**two credits，32 hours

**Course Description：** The theory and knowledge of solid state physics, semiconductor physics and microelectronic devices physics are included in this course. Chapter 1 Crystal Structures and Geometrical Description: typical lattices of crystals, crystal symmetries, geometrical description of crystal structures, reciprocal lattice, Brillouin zone; Chapter 2 Crystalline Cohesion and Lattice Vibration: general characteristics of crystalline cohesion, crystal binding energy, five types of crystalline cohesion, classical and quantum theories of lattice vibration, Born-von Karman cyclic boundary conditions, phonon. Chapter 3 Band Theory of Crystals: Schrodinger’s equation of crystal electrons, one-electron approximation, Bloch wave function, band structure of crystal, Kronig-Penney Model, explanations to conductive of solids, quasi-classical approach of semiconductor conduction band and valence band, electron effective mass, electron velocity and accelerate velocity, hole, band structures of common semiconductors; Chapter 4 Impurities and Defects in Semiconductors: locations and electron states of impurities, various kinds of impurities in semiconductors, compensation between impurities, intrinsic and extrinsic defects of semiconductors, line defect; Chapter 5 Carrier Density and Conductivity of Equilibrium or Nonequilibrium Semiconductor: quantum states density function of conductive band or valence band, electron Fermi-Dirac statistical function and its Boltzmann distribution approximation, Fermi energy level, carrier concentrations of nondegenerate equilibrium semiconductors or nonequilibrium semiconductors, carrier concentrations of equilibrium degenerate semiconductors, criterion of equilibrium semiconductor, injection-recombination theory of nonequilibrium carriers, carrier transport and its current, Einstein equation, equation of continuity of carrier concentrations.

**Prerequisite(s)：**College Physics, Advanced Mathematics, Quantum Mechanics, Thermodynamics and Statistical Physics

## <The Principle of Laser> Course Description

**Course:** The Principle of Laser

**Course No.:** 3122102351

**Credit / Course Hours:** 3/48

**Preparatory Course:** <Optics>, <Field and Wave Electromagnetics>, <Advanced Mathematics>, <Mathematical Method for Physics> and <Quantum Mechanics>

**Course Description:** <The Principle of Laser> is an important branch of Optics, which plays an important role in modern information science, especially in Optoelectronic Information Science. It has a strong theoretical, frontier and exploratory nature. Laser has broad application both in scientific development and in technology application.

<The Principle of Laser> is a professional required course for students majoring in optical information science and technology, which let students maser the basic principles for laser generation and formation, train students’ theoretical thinking ability, analyze and solve practical problems ability. <The Principle of Laser> provides the necessary basics for the study of <Optoelectronic Devices>, <Optoelectronic Detection> and <Fiber Optics Communications>. It also lays the necessary theoretical foundation for the future to become the senior talents of management, development and design in the field of Optics and electronics.

## < Optoelectronics > Course Description

**Course:** Optoelectronics

**Course No.:** 3122102340

**Credit / Course Hours:** 2/32

**Preparatory Course:** Physical Optics, Laser Principles, Semiconductor Physics

**Course Description:**

The course is the basic compulsory for the major of Optoelectronic information science and engineering, and the knowledge studied in this course will establish the fundamentals for the major courses of Optical communication principles, Optoelectric information processing in the next step. It includes wave nature of the light and the total internal reflection theory, the lightwave propagation theory in the dielectric waveguide media (especially in fiber), the transmission modes and mode coupling theory, the principle, structure and characteristic of light emitting diode, semiconductor, photodetector, optical amplifier, crystal optic and optical modulation principle. In addition, the structure, principle and application of some typical passive optical communication devices are introduced.

## < Optical Fiber Communication System > Course Description

**Course:** Optical Fiber Communication System

**Course No.:** 3122102400

**Credit / Course Hours:** 2/32

**Preparatory Course:** Advanced Mathematics, Physical Optics, Signal and System

**Course Description:**

Optical Fiber Communication System is a major course of the Optoelectronic Information Science and Engineering. Through this course, the students initially grasp the basic theory of optical fiber communication, the methods of analyzing the optical fiber communication system, basically master the commonly used methods of the fiber optic measuring instruments and improve the ability of analyzing and solving problems. Through the study, students understand the development of optical fiber communication system, master the basic composition of the optical fiber communication system; know well the transmission principle and the characteristic of the fiber, the method of measuring the fiber characteristics; grasp the type, principle and properties of the light source, optical detector and optical passive device, and choose appropriate components according to the actual needs of the project device. Understand the transmitter (optical transmitter and optical receiver) composition and characteristics; know well the digital optical fiber communication system and the analog optical fiber communication system, master SDH technology and understand some new technologies of optical fiber communication. This course will build a solid basis for students to study the optical fiber communication technology and devices, to do a scientific research on the modern optical fiber communication technology in the future and to solve the problems of the optical fiber communication in practical engineering. During the teaching process, we attach importance to cultivate the ability of scientific thinking and analysis as well as the ability of solving practical engineering problems.

## < Optical Information Processing > Course Description

**Course:** Optical Information Processing

**Course No.:** 3122102370

**Credit / Course Hours:** 2/32

**Preparatory Course:** Advanced Mathematics, Physical Optics, Signals and Systems

**Course Description:**

Optical information processing is a major course of the Optical Information Science and Engineering. It introduces the theory of linear system, which is in the Information Science, into the Optics, and solves the problems in the optical information processing. Through this course, students will understand the advanced modern information optics and its position in Information Science and Technology, learn how to analysis the optical information processing system by using the method of the frequency spectrum analysis, and master the basic theory and method of the optical information processing, the principle of the laser holography and optical information processing, the basic principle as well as the new components of the optical information processing system/application etc. This course will build a solid basis for students to do a scientific research on the application of modern optical information processing technology in the future and to solve the problems of the optical information processing in practical engineering. During the teaching process, we attach importance to cultivate the ability of scientific thinking and analysis as well as the ability of solving practical engineering problems.

## <Introduction of Nonlinear Optics> Course Description

**Course No.:** 3122101100

**Credit / Course Hours:** 2/32

**Preparatory Course:** College Physics, Electromagnetic Fields & Magnetic Waves, Quantum Mechanics, Optoelectronics.

**Course Description:**

Some nonlinear optical phenomena and basic rules of the interaction between laser and matter are introduced. The main contents include: wave propagation in nonlinear medium; Nonlinear optical polarization ratio; Stimulated Raman scattering; Stimulated brillouin scattering; Optical parametric amplification and four-wave mixing.

The course focuses on some direction, research ideas and methods of the forward development of nonlinear optics, combining theoretical knowledge with some engineering problems. The curriculum carries out the professional literature (including the foreign literature literature) research and the paper writing ability cultivation; It is necessary to take this course in the field of optoelectronic technology, photonic technology and emerging information technology.

## <Satellite Communication and Space Communication> Course Description

**Course:** Satellite Communication and Space Communication

**Course No.:** 3122102300

**Credit / Course Hours:** 2/32

**Preparatory Course:** College physics E (up and down ) advanced mathematics (up and down)

**Course Description:**

Satellite and space communication is one of the most important communication way. By study of the course，students can be familiar with the basic theory and consist of satellite communication system and the key technology of space optical communication .To know well basic content of satellite communication, multi-address access technology of satellite communication, the link character of satellite communication. To know encode/decode and signal process technology application in the satellite communication and space communication, and consisting network. To preliminary know well basic theory and basic technology and hot spot problem of space communication.

## < Fiber Optic Communication Systems > Course Description

**Course:** Fiber Optic Communication Systems

**Course No.:** 3122102400

**Credit / Course Hours:** 3 Credits/48 Hours

**Preparatory Course:**

None

**Course Description:**

Optical fiber communication system because of its large capacity, high speed, low loss and other advantages are widely studied and applied. It plays a key role in today’s communication system and is developed rapidly. This course is one of the major courses for the electronic information science and technology, electronic science and technology, optoelectronic information science and engineering. In this course, the basic principles and systems of optical fiber communication are introduced to let students know the technologies of optical fiber communication. The main contents of the course include: principle and characteristics of optical fiber, optical transmitters, optical receivers, lightwave systems, optical amplifier and dispersion management and optical fiber communication system and network, etc. Multiplexing technology for high-speed and large-capacity transmission is introduced. Also, all-optical optical fiber communication technology is represented for future development.

## <Optical Switching Technology> Course Description

**Course:** Optical Switching Technology

**Course No.:** 3122102420

**Credit / Course Hours:** /32

**Preparatory Course:**

None

**Course Description:**

The abilities of obtain and transmit information develop rapidly since optical fiber communication system provide high-capacity, high-speed, long-distance information transfer capability. This course systematically introduces the optical switching technology in modern communications. The main contents of the course include the development of communication exchange, the physical mechanism involved in optical switching technology, key functional devices, various optical switching modes and systems; and the network architecture and key technologies in optical packet switching and structure, key algorithm, technology and other core content in optical burst switching technologies. Through the study of this course, students are familiar with the theory, technology frontier, application prospect and development trend of optical switching technology, laying a foundation for students' follow-up study, research and work.

## < The Essence of Optical Network > Course Description

**Course:** The Essence of Optical Network

**Course No.:** 3122102430

**Credit / Course Hours:** 2credits/32hours

**Preparatory Course:**

None

**Course Description:**

In recent decades, the optical network technology has been continuously developed to meet the growing demand for bandwidth from IP services. Optical network is based on optical fiber communication technology to transmit information among various nodes of a telecommunications network. In optical network (optical transmission network) system, two aspects are focused on. One of them is the optical communication technology and system for application, the other one is networking technology. Therefore, in this course, optical network unit (ONU), transmission technology, optical network architecture, optical flow control and management are introduced at the first. Then the essence content of optical networks are presented, including the development of the optical network, the basic architecture of optical network, the essential technology in optical network, the basic optical network unit, and assessment of the optical networking architecture quality. As a major course of optoelectronic information science and engineering, students can study complex engineering problems including experiment designing, analyzing data and making reasonable and effective conclusion based on the knowledge of optical network.

## < Optical System and Optoelectronic Instruments > Course Description

**Course:** Optical System and Optoelectronic Instruments

**Course No.:** 3122102410

**Credit / Course Hours:** 2 credits/32 hours

**Preparatory Course:**

None

**Course Description:**

This course is introduced to enable students to understand the basic theory of modern optoelectronic devices and design methods, such as, the basic parameters of the optical system, the calculation method of the parameters of the photoelectric system, the principle of photoelectric conversion in a typical optoelectronic instrument, modern optoelectronic measuring instruments based on modern optical fiber communication systems. The main contents of the course include the introduction of the design of optoelectronic devices, the design method of modern instruments, the analysis and design of the precision of the instruments, the selection and adjustment of the light source and illumination system, optics, photodetectors, standards, motion and alignment, instrument principle and analysis. The objectives of this course is to cultivate the students' ability and analysis ability of engineering, scientific research thinking and comprehensive application of theoretical knowledge in the design of optoelectronic systems and optoelectronic devices for further study, research or work in the future.

## <Wireless Optical communication> Course Description

**Course:** Wireless Optical Communications

**Course No.:** 3122102220

**Credit / Course Hours:** 2 credits/32 hours

**Preparatory Course:**

None

**Course Description:**

In recent years, a growing demand by the end users for bandwidth in mobile communications to support broadband wireless service. In order to satisfy the grooming demand of the data rate, wireless optical communication is gaining more attention in recently decades. OWC is one of the most promising alternative technologies for indoor and outdoor applications. The content of this course includes introduction of optical wireless communication system, optical sources and detectors, channel modeling, modulation techniques, indoor system performance analysis, FSO link performance under the effect of atmospheric turbulence, outdoor OWC links with diversity techniques and visible light communications. This course is suitable for the undergraduate students to understand the fundamental principles of OWC, devices and systems, modulation techniques, channel models and system performance analysis.

## < Quantum Mechanics > Course Description

**Course:** Quantum Mechanics

**Course No.:** 3122102453

**Credit / Course Hours:** 2/32

**Preparatory Course:** Optoelectronic Information Science Engineering

**Course Description:**

Quantum mechanics is the foundation of laser theory, optoelectronics, numerical computation, optical communication principle, semiconductor physics, advanced quantum mechanics and many scientific fields. Through the learning of this course, students can clearly understand the theory and method of micro particle motion law, and are familiar with the theoretical system structure, basic principles and applications. They mainly grasp the applicability of perturbation theory to many problems, and make the foundation for the study of professional courses. Due to the training standard of photoelectric information science and engineering specialty, the natural science foundation of the students majoring in this field can be enforced through this course to meet the graduation requirements of this specialty.

< ASIC Design theory and Application > Course Description

**Course:** ASIC Design theory and Application

**Course No.:** 3122102211

**Credit / Course Hours:** 3/48

**Preparatory Course:** Digital circuits and Logic Design

**Course Description:** ASIC Design theory and Application aims to enhance students understanding and design skills of VLSI-system design, include combinational and sequential digital circuit design techniques, the concepts and techniques for data path and FSM design. The course describes the latest methods in VLSI-systems design. After describing the fundamentals of digital logic design and the physical features of each ASIC type, the course turns to ASIC logic design entry, logic synthesis, simulation, and test. Digital circuit representation formats including high level hardware description languages such as Verilog-HDL will be discussed and the concept of static timing analysis with use of cell delay will be introduced. And then the course will introduce physical design-partitioning, floor planning, placement, and routing. This course will help students to understand the concept of synthesis and modern digital circuit design, and learn about the steps involved in synthesis and identify different types of circuits. The course also help student to know about the design methodologies using current computer aided design tools.

## <**Design and Application of DSP>** **Course Description**

**Course:** Design and Application of DSP

**Course No.:** 3122102480

**Credit / Course Hours:** 2/32

**Preparatory Course:** Electronic Information Science and Technology, Electronic Science and Technology

**Course Description:** In this course, the basic principle, development and application of the TMS320C54x series fixed-point DSP chip are introduced in a comprehensive and systematic way. Firstly, the application of DSP chips in different fields and some key issues in fixed point and floating point DSP processing are introduced. Secondly, the lesson will introduce the hardware structure, working principle, assembler instruction, C/C++ language, integrated development tool CCS (Code Composer Studio) of TMS320C54x DSP and the design and development examples of various hardware interface circuits in detail.

## < SoC Design Methodology > Course Description

**Course:** SoC Design Methodology

**Course No.:** 3122102500

**Credit / Course Hours:** 2/32

**Preparatory Course:** Digital Circuits Design, Analog Circuits Design, ASIC Design

**Course Description:** “SoC Design Methodology” is a [systematic](http://www.baidu.com/link?url=CYWB6LaVQ78W8B4xhQfs997NlLX6q7gmao2dd79Ctiok3uuhMoK5lRNpCRByc9Vv17JA-CexRTCErRr94PJsvxJELmlGPhk0hD16-_EoxsZCZ0kJ5SGV21jwJ7lWqJDc) and comprehensive course, including microelectronics, conputer and EDA (Electronic Design Automation), etc. It’s a professional course. Through the study of this course, the student can understand the SoC design methodology and design process, establish the systematic concept of SoC integrated circuits, master the technology of modern electronic design automation (EDA) and hardware description language such as VHDL,Verilog and System C.

## <Technology and Application of Sensor> Course Description

**Course:** Technology and Application of Sensor

**Course No.:** 3122102160

**Credit / Course Hours:** 3/48

**Preparatory Course: <**Advanced Mathematics><College Physics><Electronic Circuits>

**Course Description:** Sensing technology and application is a multidisciplinary and interdisciplinary modern science and engineering technology to identify, transform and process the source information. It is the foundation of the Internet of things, and is widely used in information communication, industrial automation, aerospace engineering, military engineering, medical diagnosis and treatment, robotics and other fields. At the same time, it is also a basic condition for the development of modern science and technology.

This course coves the sensing principles and design of different sensors which are measured and its application of information processing. Through the learning of sensor's basic theory and the learning of different sensors such as physical sensors, pressure sensors, optical fiber sensors, magneto-optic and magneto-electric sensors and chemical and biological sensors, we can make students master the basic theory of sensors, the ideas and methods for collecting information from different sources of information, the composing principle of typical sensors and the design idea of the application system of sensor. Thus, the students' ability to apply multidisciplinary knowledge to solve engineering problems is cultivated.

<Thermodynamics And Statistical Mechanics> Course Description

**Course:**Thermodynamics And Statistical Mechanics

**Course No.:** 3122102455

**Credit / Course Hours:** 1/16

**Preparatory Course:** Mechanics, Thermotics, Atomic physics, Advanced mathematics

**Course Description:**

Thermodynamics and statistical physics are to study the law of thermal motion, the physical property related to thermal motion and the theory of the evolution law of the macroscopic material system. The main teaching contents include the basic thermodynamic law, the basic thermodynamic properties, the phase transition, the non equilibrium state statistics and the fluctuation theory, and so on. Through the course study, it is useful to help students to establish the concept of probability theory, grasp the basic theory of the basic law of thermodynamics and statistical physics.

## < Circuit simulation and PCB design > Course Description

**Course:** Circuit simulation and PCB design

**Course No.:** 3122102290

**Credit / Course Hours:** 2/32

**Preparatory Course:** Fundamentals of Circuit Analysis, Fundamentals of Electronic Circuits, Digital Circuits and Logic Design

**Course Description:** This course is a training course designed for students in electronics, communications and other related majors. The main purpose of the course is to help students gain the ability to design electrocircuit,simulate circuits and printed circuit board(PCB) with the aid of Electronics Design Automation(EDA) after some theoretical study, hands-on exercises and application training. Students are expected to use PSpice and ADS to draw circuit diagrams proficiently and carry out simulation analysis after the course. They will also be able to use Altium Designer to design circuit schematics and double-sided PCBs. Moreover, they can also master the use of EDA Software for circuit design, simulation and circuit board production of the general design methods and techniques and understand the design process, rules and applications.

## <Solid State Physics>Course Description

**Course Number：**3122102460

**Course：**Solid State Physics

**Credit(s)：**two credits，32 hours

**Course Description：**This course provides a comprehensive teaching of basic theory and knowledge of solid state physics. Main contents included as follows: Chapter 1 Crystal Structures: commonly used crystal lattices, lattice symmetries，reciprocal lattice and Brillouin zone.Chapter 2 Crystalline Cohesion: general characteristics of crystalline cohesion, crystal binding energy, five basic types of crystalline cohesion, SP hybridized orbital theory to explain carbon crystalline materials (diamond, graphite, graphene, carbon nano tube). Chapter 3 Lattice Vibration: classical and quantum theories of thermal lattice vibration and its dispersion relations，Born-von Karman cyclic boundary conditions, phonon on the basis of harmonic oscillator in canonical coordinate. Chapter 4 Band Theory of Crystals: Schrodinger’s equation of crystal electrons, one-electron approximation, Bloch wave function, band structure of crystal, Kronig-Penney Model, explanations to conductive of solids, quasi-classical approach of semiconductor conduction band and valence band, band structures of common semiconductors; Chapter 5 Impurities and Defects in Crystals: locations and electron states of impurities, various kinds of impurities in semiconductors, compensation between impurities, intrinsic and extrinsic point defects, line defects.

**Prerequisite(s)：**Quantum Mechanics

< Integrated Circuits Manufacturing Technology > Course Description

**Course:** Integrated Circuits Manufacturing Technology

**Course No.:** 3122102470

**Credit / Course Hours:** 2/32

**Preparatory Course:** None

**Course Description:** This course mainly introduces semiconductor integrated circuit manufacturing technology, including the basic principle and process technology, as well as the introduction of recent developments in the world. This course starts from the basic principle and internal structure of semiconductor integrated circuit and layout design. It mainly introduces wafer preparation, chemical cleaning, thin film deposition, doping technology, lithography and lithography equipments, etching technology, metallization, integration and automation process integration. The course explain the main IC manufacturing process technology, equipment and results of testing. Through this course, students will be familiar with the IC industry chain and process principles, processes technology and equipment.

<Programmable Logic Design>Course Description

**Course:** Programmable Logic Design

**Course No.:** 3122102490

**Credit / Course Hours:** 2/32

**Preparatory Course:** Electronic Information Science and Technology, Electronic Science and Technology

**Course Description:** With the rapid development of electronic information technology, the integrated scale of digital integrated circuits rapidly grows at an alarming rate of almost doubling every 1-2 years. The design of modern electronic products has undergone revolutionary changes. At present, the electronic design automation (EDA) design method based on programmable logic device has become the mainstream of the design method of electronic systems. All colleges and universities have set up relevant courses in response to the trend of electronic information technology development and the demand for talents in international competition. To master the modern EDA design technology is a basic requirement and necessary skills of the electronic majors in colleges and universities.

The main task of this course is to enable students to understand the basic process of automated design of digital electronic systems, to understand the hardware structure, principles and characteristics of programmable logic devices such as CPLDs and FPGAs. To be familiar with and master the design methods of digital electronic systems based on programmable devices, Design tools, design tools. Through this course, students will have the basic ability to design simple digital electronic systems using hardware description languages such as programmable devices, VHDL and Verilog.

## < Design of Analog Integrated Circuits > Course Description

**Course:** Design of Analog Integrated Circuits

**Course No.:** 3122102090

**Credit / Course Hours:** 3 / 48

**Preparatory Course:** Circuit Analysis, Analog Electronic Technology

**Course Description:** This course is a general introduction to analogue integrated circuit design, and will extend the student's knowledge of analogue integrated circuit. It will cover the following areas: use of IDS equations in circuit calculations, use of large signal models to calculate and design transistor biasing; use of small signal models to calculate gain-bandwidth, transfer functions. The operation & use of analogue circuit building blocks will be introduced carefully，such as current sources/sinks, simple amplifiers, differential stages, output stages, basic op-amp design, gain and phase margin, stability, compensation, more advanced op-amp concepts. And the course will also introduce the use of SPICE to simulate MOS circuits, types of analysis available in SPICE, use of SPICE to investigate the effects on performance caused by component variation, process variation, temperature changes, parasitic components and their importance for circuit modelling. And sources of noise and distortion in MOS analogue circuits will be discussed. This course is supported throughout by Synopsys simulation, and will prepare the student for work within a design team involving interaction between analogue and digital design engineers.

## < Nanomaterials and Application > Course Description

**Course:** Nanomaterials and Application

**Course No.:** 3122102270

**Credit / Course Hours:** 2/32

**Preparatory Course:** None

**Course Description:**

It is known that nanomaterials have many good properties. Therefore, the foundamental knowledge of nanomaterials is important to the students in electronic science and technology.

In the course, the students will understand the concept and properties of nanomaterials. The students will study the methods of preparing nanomaterials, of observing surface features of nanomaterials and the methods of forming ordered nanostructure. The students will understand some application of nanomaterials in sensors and in sun energy battery. In addition, the students will improve the ability of solving problems by scientific method.

The contents of the course are as follows.

1 the concept and properties of nanomaterials 2 the methods of studying surface features of nanomaterials 3 the methods of preparing nanoparticles, nanowires, nanofilms and nanosolids 4 the methods of forming ordered nanostructure 5 the application of carbon group and semiconductor nanomaterials in sensors 6 some application of nanomaterials in sun energy battery.

## <Embedded System Design> Course Description

**Course:** Embedded System Design

**Course No.:** 3122102140

**Credit / Course Hours:** 3/48

**Preparatory Course:** Fundamentals of Computers and C programming

**Course Description:** This course aims to give a comprehensive introduction of the embedded system concept, software and hardware composition, design and development method, embedded OS, embedded software (embedded application software, device driver are included). Taking the ARM based processor an example, it lectures on embedded system hardware structure and CPU instruction set; meanwhile, taking the embedded Linux operating system as an example, it teaches the structure and basic application development of the embedded operating system. Through the interaction of teaching and experiment, students will get a deeper understanding of embedded system structure, software and hardware design method, their competence and experiences of embedded system development will be enhanced as well.

## <Antenna Theory> Course Description

**Course:** Antenna Theory

**Course No.:** 3122102040

**Credit / Course Hours:**  3/48

**Preparatory Course:** Electromagnetic Field and Wave, Foundation of Microwave Engineering

**Course Description:** The main contents of this course are the basic theory of the antenna and the introduction of typical antennas. The specific contents include the radiation characteristic of current element, the radiation characteristic of magnetic current element, duality theorem, characteristic parameters of transmitting antenna, receiving antenna theory, dipole antenna in free space, matching and  balanced-unbalanced transform; basic knowledges of antenna array and its applications, the influence of conductive surface to the antenna performance, general linear array, linear phase gradient equally spaced linear arrays, uniformly excited equally spaced linear arrays, typical common used uniformly excited equally spaced linear arrays, standing wave antenna,  broadband antenna, the basic knowledge of the aperture antenna, the equivalence principle, the general formulation of aperture field , general analysis of the radiation characteristics of the aperture field,  horn antenna, parabolic antenna, Cassegrain antenna; slot antenna , microstrip antenna and smart antenna.

## <Monolithic Microwave Integrated Circuit > Course Description

**Course:** Monolithic Microwave Integrated Circuit

**Course No.:** 3122102310

**Credit / Course Hours:** 2/32

**Preparatory Course:** Electronic circuit, Electromagnetic field and electromagnetic wave, Microwave engineering

**Course Description:**

A Monolithic Microwave Integrated Circuit, or MMIC (sometimes pronounced "mimic"), is a type of integrated circuit (IC) device that operates at microwave frequencies (300 MHz to 300 GHz). The course will introduce some fundamentals and design skills in monolithic microwave integrated circuits, meanwhile, the course will introduce MMIC circuit design basic principles, design method and technology. Through the studying of the course, the students will understand monolithic microwave integrated circuit present situation and development, some monolithic microwave integrated circuit characteristics and design method.

## <Fundamentals of Micro-electronics Devices> Course Description

**Course Number：**3122102330

**Course：**Fundamentals of Micro-electronics Devices

**Credit(s)：**four credits，64 hours

**Course Description：**The goal of the course is to give students a comprehensive understanding of basic theory and knowledge of micro-electronic devices which are vital to the operation of present devices and future development in the field. Chapter 1 Crystal Structures and Band Theory of Semiconductor: semiconductor crystal structures, energy band theory, energy bands quasi-classical approach, energy bands of common semiconductors. Chapter 2 Impurities and Defects in Semiconductors: properties of impurities and defects in semiconductors. Chapter 3 Equilibrium Semiconductor Theory: theory of equilibrium semiconductor and its carrier concentration calculation. Chapter 4 Carrier Transport under Electrical Field: carrier drift and drifting conduction under electrical field. Chapter 5 Theory of Nonequilibrium Semiconductors: nonequilibrium carrier theoretical models (including generation, diffusion, recombination, drifting，and continuity equation). Chapter 6 The pn Junction: Equilibrium pn junction, Nonequilibrium pn junction, current through pn junction diode verse an applied voltages, pn junction breakdown, pn tunnel diode, npn transistor; Chapter 7 Metal-Semiconductor Contact: work function model and surface state model of MS contact, theories of Schottky barrier diode, Ohmic contact theory; Chapter 8 Metal-Insulator-Semiconductor Structure and MOS Transistor: ideal MIS structures and effects on semiconductor surface under different applied voltages, influences of work function difference and insulator charges in MIS structures, N channel MOSFET theory and characteristics; Chapter 9 Semiconductor Heterojunctions: semiconductor heterojunctions and its band diagrams, semiconductor heterojunction quantum well and resonant tunneling, strained semiconductor heterojunctions.

**Prerequisite(s)：** Solid State Physics

## < Microelectromechanical systems>Course Description

**Course Number：**3122102510

**Course：**Microelectromechanical systems (MEMS)

**Credit(s)：**(two credits，32hours)

**Prerequisite(s)：**University Physics

**Applicable specialty：**Electronic science and technology, Electronic information science and technology, Optical information science and technology

**Course Description：**

Microelectromechanical systems (MEMS) is a cross disciplines that brings mass production to the micro-mechanical structure, device and system, is a platform to support people to detect and use a variety of phenomena in microscopic scientific world. Microelectromechanical systems has great prospect of application in a variety of engineering and scientific fields; its priority application areas including aerospace, biomedical, micro flow control, micro-probe microscopy, information science, micro-optics technology, micro-robots and environmental monitoring. Microelectromechanical systems is a foundation for the modernization of national defense and the high-tech industry.

MEMS refers to a system that designs, manufactures and integrates a variety of components within micrometers, and is adapted to low-cost mass production. MEMS consists of the sensor, the information unit, the actuator and communication / interface unit, etc. Through learning of the course, mastering the basic knowledge of MEMS and basic principle of other fields associated with MEMS, understanding the design of MEMS device and system, numerical simulation, and manufacturing processes and packaging, laying the foundation that engaged in the research and development of MEMS technology.

## < Wireless Transmission Technologies and Networking > Course Description

**Course:** Wireless Transmission Technologies and Networking

**Course No.:** 3122102150

**Credit / Course Hours:** 2/32

**Preparatory Course:** Theory of Probability and Random Processes，Signal and System，principle of communication

**Course Description:**

This course will introduce the fundamental concepts of wireless communication systems, and provide in-depth explanations about the characteristics and analysis method of radio transmission channels, important wireless transmission technologies including modulation/demodulation, multicarrier technology, multiple-input-multiple-output (MIMO) technology, anti-fading technology, multiple access, etc., as well as the architectures, networking schemes, service and applications of some important wireless networks, e.g. cellular mobile communication networks, wireless broadband access networks, wireless Ad/Hoc networks, and satellite communication networks, etc.. In addition, this course will also introduce the latest advances and trend of future development about the wireless transmission technologies and networking. From this course, student should obtain the fundamental knowledge, some important principles and analysis methods of wireless communications, and get to know how to apply the fundamental professional knowledge to wireless communications, and thus grasp abilities of research, design and development for wireless communications.

## <The Terminal and Networking of IOTs>Course Description

**Course Number：**

**Course：**  The Terminal and Networking of IOTs

**Credit(s)： (**2 credits，32hours)

**Course Description：**

Taking the development of the terminal and networking of IoTs as the principle line of time, and the architecture of IoTs as its principle line of technology, this course aims to teach about the terminal and networking of IoTs and reinforces the understanding of its key technologies of students, meanwhile, the awareness of IoTs serving the world should be taken consideration. The main content includes the terminal and sensing technologies, the wireless transmission requirement of IoTs, the principle concept of wireless transmission and its type including NB-IoT, 3/4/5G wireless networks, the networking requirement of IoTs, the concept of network convergence and cloud computing, the concept of M2M and its architecture, the standardization of IoTs and its application, smart planet and smart city etc.

**Prerequisite(s)：**No requirement

## < Information electronic technology > Course Description

**Course:** Information electronic technology

**Course No.:** 3122102170

**Credit / Course Hours:** 2/32

**Preparatory Course:** The basis of the information network applications; C language

**Course Description:**

The rise of e-commerce, enhanced and improved the ways to achieve and realize the scope of the business activities. Electronic information technologies are the base of e-commerce implementation. From the point of view of information and electronic technology，this course introduced students e-commerce, to enable students to understand the characteristics of e-commerce framework and model, to know the background information of electronic network and communication, application development technology, electronic payment technology. The most important parts focused on information security, electronic payment technology and mobile payment technology, to enable students to grasp the technology of e-commerce in the macro constitute. In the last chapter of the course, some e-commerce solutions of well-known companies are discussed to enable students to integrate theory with practice.

## <Smart Antenna Technology> Course Description

**Course:** Smart Antenna Technology

**Course No.:** 3122102130

**Credit / Course Hours:** 2/32

**Preparatory Course:** Higher Mathematics, Communication Theory, Electromagnetic Fields and Waves

**Course Description:**

This course will introduce some fundamentals and key technologies, which have been researched in modern wireless communication systems. The target is to enable students to fully grasp the basic concept of the smart antenna, especially to understand and master the fixed-beam smart antenna system, adaptive antenna system, smart antenna beamforming algorithm of base station and mobile station and receiver, as well as smart antenna in the fourth generation mobile communication applications. It can lay the necessary foundation for further smart antenna technology research and engineering design for students.

## <Smart Antenna Technology> Course Description

**Course:** Smart Antenna Technology

**Course No.:** 3122102130

**Credit / Course Hours:** 2/32

**Preparatory Course:** Higher Mathematics, Communication Theory, Electromagnetic Fields and Waves

**Course Description:**

This course will introduce some fundamentals and key technologies, which have been researched in modern wireless communication systems. The target is to enable students to fully grasp the basic concept of the smart antenna, especially to understand and master the fixed-beam smart antenna system, adaptive antenna system, smart antenna beamforming algorithm of base station and mobile station and receiver, as well as smart antenna in the fourth generation mobile communication applications. It can lay the necessary foundation for further smart antenna technology research and engineering design for students.

## <Application Design on Intelligent Terminal> Course Description

**Course:** Application Design on Intelligent Terminal

**Course No.:** 3122102280

**Credit / Course Hours:** 2/32

**Preparatory Course:** Fundamentals of Computers and C programming

**Course Description:** The main purpose of this course is to cultivate students' design and development ability of intelligent terminal application system, so that students can understand the concept and characteristics of the development based on intelligent terminal application system. Taking the intelligent terminal Android operating system as an example. Talking about the basic features and key concepts of the system. Learning the specific methods of application development, including intelligent terminal development foundation, Android development environment, interface development foundation, Android core concept, testing, data storage, network and communication, advanced interface components, etc. By teaching a large number of examples in class, students can gain the ability to solve all kinds of practical difficulties in intelligent terminal application and development.

## < Microelectromechanical systems >Course Description

**Course Number：**3122102510

**Course：**Microelectromechanical systems (MEMS)

**Credit(s)：**(two credits，32hours)

**Prerequisite(s)：**University Physics

**Applicable specialty：**Electronic science and technology, Electronic information science and technology, Optical information science and technology

**Course Description：**

Microelectromechanical systems (MEMS) is a cross disciplines that brings mass production to the micro-mechanical structure, device and system, is a platform to support people to detect and use a variety of phenomena in microscopic scientific world. Microelectromechanical systems has great prospect of application in a variety of engineering and scientific fields; its priority application areas including aerospace, biomedical, micro flow control, micro-probe microscopy, information science, micro-optics technology, micro-robots and environmental monitoring. Microelectromechanical systems is a foundation for the modernization of national defense and the high-tech industry.

MEMS refers to a system that designs, manufactures and integrates a variety of components within micrometers, and is adapted to low-cost mass production. MEMS consists of the sensor, the information unit, the actuator and communication / interface unit, etc. Through learning of the course, mastering the basic knowledge of MEMS and basic principle of other fields associated with MEMS, understanding the design of MEMS device and system, numerical simulation, and manufacturing processes and packaging, laying the foundation that engaged in the research and development of MEMS technology

## <Microelectromechanical Systems>Course Description

**Course Number：**3122102510

**Course：**Microelectromechanical systems (MEMS)

**Credit(s)：**(two credits，32hours)

**Prerequisite(s)：**University Physics

**Applicable specialty：**Electronic science and technology, Electronic information science and technology, Optical information science and technology

**Course Description：**

Microelectromechanical systems (MEMS) is a cross disciplines that brings mass production to the micro-mechanical structure, device and system, is a platform to support people to detect and use a variety of phenomena in microscopic scientific world. Microelectromechanical systems has great prospect of application in a variety of engineering and scientific fields; its priority application areas including aerospace, biomedical, micro flow control, micro-probe microscopy, information science, micro-optics technology, micro-robots and environmental monitoring. Microelectromechanical systems is a foundation for the modernization of national defense and the high-tech industry.

MEMS refers to a system that designs, manufactures and integrates a variety of components within micrometers, and is adapted to low-cost mass production. MEMS consists of the sensor, the information unit, the actuator and communication / interface unit, etc. Through learning of the course, mastering the basic knowledge of MEMS and basic principle of other fields associated with MEMS, understanding the design of MEMS device and system, numerical simulation, and manufacturing processes and packaging, laying the foundation that engaged in the research and development of MEMS technology

## < Foundation of Microwave Engineering > Course Description

**Course:** Foundation of Microwave Engineering

**Course No.:** 3122102030

**Credit / Course Hours:** 3/48

**Preparatory Course:** <Advanced Mathematics>, <Engineering Mathematics>, <Physics, Fundamentals of Circuit Analysis>, <Electromagnetic Fields and Waves>

**Course Description:**

The main content of this course is the basic theory and basic application knowledge of microwave frequency range from 300MHz to 300GHz. Analysis of circuit knowledge transition to microwave course from the familiar to students, including the characteristics of transmission line theory, transmission line equivalent circuit model, five characteristic parameters, terminal load and arbitrary impedance matching concept. The course will show the detail of the Smith chart including its the basic idea, structure and function of Smith chart. The application in transmission line solution and the impedance matching will be shown. The small reflection theory will be explained and binomial and Chebyshev multi-section impedance converter will be explained. Besides, the microwave network parameters, including Z,Y and A matrix and S parameters and the signal flow graph will be introduced. The conversion between the Z, Y, A and S parameters will be introduced. The course will also show how to use the microwave network theory to analyze and solve problems. In addition, the course introduces the introduction of practical microwave transmission lines, simple microwave devices, and microwave systems and applications. This course is a basic course in the field of electronic communications, with emphasis on theory and emphasis on application. It is the essential foundation for the students to study, design and apply the practical engineering of electronic communications in the future.

## < Information expression and intelligent processing> Course Description

**Course:** Information expression and intelligent processing

**Course No.:** 3122105600

**Credit / Course Hours:** 2/32

**Preparatory Course:** The foundation of network information system

**Course Description:**

This course is intended for the third graders of electronic information science and technology, and introduces the latest application layer information processing technology in electronic information science and technology. By learning the course, we make students master the expression methods of information in the network environment, information analysis method, information processing tools, Python language and data analysis library system. Information expression methods in the network environment include the expression of HTML page, the expression of non-HTML documents, and the expression of multimedia information. Information analysis methods include data discovery, data mining modeling, model evaluation and so on. On the basis of the above explanation of the theory norms and analysis of information through the Python examples, we make students learn to use Python access to the network of the different formats of environment data, extract features and intelligently parse the user-defined data.

## < Fundamentals of Sensing and Information Processing > Course Description

**Course:** Fundamentals of Sensing and Information Processing

**Course No.:** 3122102161

**Credit / Course Hours:** 2/32

**Preparatory Course:** Probability Theory and Stochastic Process, Fundamentals of Electronic Circuits, Digital Circuit and Logic Design, Signals and Systems, Digital Signal Processing

**Course Description:**

Sensing and Information Processing has become one of the key technologies for Internet of Things and Artificial Intelligence, and it is also the driver for the development of future information technologies. This course will introduce the principle of sensors, the architecture and designing of intelligent sensors, the principle of multi-sensors system, the process and key technologies for the data collection, transmission and processing, the theoretical basis of multi-source data fusion and processing, typical algorithms for the data fusion, and typical applications for sensing and information processing. After the course, the students will get the ability to study, design and develop intelligent sensing and information processing systems. Meanwhile, the students can prepare knowledge well for the future work and graduated researches.

## <Introduction to Electronic Information> Course Description

**Course: Introduction to Electronic Information**

**Course No.: 3122102100**

**Credit / Course Hours:** 1/16

**Preparatory Course:** None

**Course Description:**

This course is intended for freshmen in the School of Electronic Engineering, which is a professional introductory course for three majors, including Electronic Information Science and Technology, Electronic Science and Technology, and Optical Information Science and Technology. The course introduces the basic content of electronic information technology, and describes the main content and development frontiers of modern information science and technology from an overall perspective. By learning this course is aimed to give students preliminary understand the emerging background, major goals, education requirements, professional features, development history, trend of development, major curriculum, essential content and career prospects of electronic information specialty, and establish initial understanding on the professional knowledge.

## < The foundation of network information system> Course Description

**Course:** The foundation of network information system

**Course No.:** 3122102021

**Credit / Course Hours:** 3/48

**Preparatory Course:** Computer foundation and C programming

**Course Description:**

With the rapid development and popularization of Internet technology and applications, information technology based on network environment has become an important knowledge for electronic engineering students. This course focuses on concept of longitudinal information network application environment and highlights the principle and methods of the operating system, network application layer protocols, network programming languages (HTML, XML, JSP). The course also combines with practical applications to enhance the understanding of basic principles, and cultivate students’ ability to solve problems of information application under the network environment.

## <Fundamental of Mixed Reality Technology> Course Description

**Course:** Fundamentals of Mixed Reality Technology

Course No.: 3122102231

**Credit / Course Hours:** 2/32

**Preparatory Course:** Advanced Mathematics, Linear algebra

**Course Description:**

Mixed Reality Technology (including Enhanced Virtual and Augmented Reality) is merging real and virtual worlds and creates a new virtual environment. The physical and digital objects exist in the new visual environment at the same time and interact in real time. Mixed Reality is a further development of virtual reality technology, which introduces realistic scenarios in a virtual environment, and puts up an interactive feedback of the information loop among the virtual world, the real world and the users, to enhance the reality sense of the user experience.

This course is a basic specialized course of Mixed Reality Technology, and is also important knowledge for information science students to master. It has been applied to various industries. The course is designed to enable students to master the basic concept, basic theory and basic analysis methods of Mixed Reality Technology, master the principle of Mixed Reality systems, understand the hardware equipment, related technologies and application status of Mixed Reality systems, and focus on the combination of theoretical research and practical applications. The course can also cultivate students’ abstract thinking ability, the abilities of analysis and calculation, and preliminary ability to combine theory with practice.

## <Smart Card System> Course Description

**Course:** Smart Card System

**Course No.:** 3122102120

**Credit / Course Hours:** 3/48

**Preparatory Course:** Electronic Circuit Foundation**,** Computer foundation and C language

**Course Description:**

With the rapid development of the mobile Internet, terminal security becomes more and more important. With a single chip CPU and the chip operating system (COS), Smart card can be the carrier of electronic identity, electronic wallet, electronic passbook and various certificates. Smart card plays an irreplaceable role in various security applications of mobile terminal, so this course has very realistic significance and practical value. This course introduces physical structure, logic characteristics, implementation technology, and application system of common IC card (memory card, logic encryption card and CPU card). This course introduces smart card system development by Java language. Through the learning of this course, students can master the basic principles of smart card system, relevant standards and developing technology of Java card. This course trains students' ability to apply and develop smart card system.

## <Digital Integrated Circuit Design > Course Description

**Course Number：**3122102221

**Course：**Digital Integrated Circuit Design

**Credit(s)：**three credits，48 hours

**Preparatory Course:** Fundamentals of Microelectronics Device

**Course Description：**The goal of the course is to give students a comprehensive understanding of basic theory and knowledge of digital integrated circuit design, which are vital to the operation and basic design of present digital integrated circuit, the basic rule and method of designing digital integrated circuit, and the future development in the field. 1) MOS transistors: structural features and fundamentals of MOS transistors, threshold voltage, current equations, transient characteristics; 2) Process flow of CMOSIC and parasitic effects in circuits: overview of IC manufacturing processes and its basic process steps of CMOS IC, parasitic effect in CMOS ICs; 3) CMOS inverters and transmission doors: DC characteristics of CMOS inverters, transient characteristics, power dissipation, CMOS inverter design, CMOS transmission gate; 4) CMOS static logic circuit design: composition characteristics of static CMOS logic gate, NAND gate and NOR gate analysis, NAND and NOR design , combinational logic circuit design, similar circuit to NMOS, transmission gate logic circuit ; 5) Dynamic and timing logic circuit design: features of dynamic and timing logic circuit, domino CMOS circuits, clock CMOS , timing logic circuits; 6) Input / output buffers: input buffers, input protection circuits, output buffers, designs for off-chip output driver stages, three-state outputs and bidirectional buffers; 7) Design methodology and layout design: VLSI design method, semi-custom design method, integrated circuit layout design; 8) In the part of design practice, there are integrated circuit design tools and some practice, including integrated circuit design and design tools, environment, the basic design training.

## < Introduction to Microelectronic> Course Description

**Course Number：**3122102050

**Course：** Introduction to Microelectronic

**Credit(s)：**2 credits，32 hours

**Course Description：**The goal of the course is to give students a comprehensive understanding of basic theory and knowledge of microelectronic. The course includes 10 chapters. Chapter 1 The Crystal Structure and Electronic States of Semiconductors: the introduction, as well as the lattice structure of semiconductors, the electronic states and energy bands in semiconductors, the motion and effective mass of electrons in semiconductors, the conduction mechanisms and holes of intrinsic semiconductors, the band structures of silicon, germanium, and compound semiconductors. Chapter 2 Impurity and defect levels in semiconductor: impurity levels, defects, and dislocation levels in crystals. Chapter 3 Statistic distribution of carriers in semiconductors: state density, statistical distribution of Fermi levels and carriers, carrier concentration of intrinsic semiconductors, carrier concentration of impurity semiconductors, carrier statistical distribution in general, degenerate semiconductor. Chapter 4 Semiconductor conductivity: carrier drift momentum and mobility, carrier scattering, mobility vs. impurity concentration and temperature, resistivity and impurity concentration and temperature. Chapter 5 Non-equilibrium carriers: injection and recombination of non-equilibrium carriers, lifetime of non-equilibrium carriers, quasi-Fermi level, complex theory, diffusion of carriers, drift of carriers and Einstein relationship, continuity equation. Chapter 6 p-n Junction: p-n junction and its band diagram, p-n junction current-voltage characteristics, p-n junction capacitance, p-n junction breakdown, p-n junction tunneling. Chapter 7 Metal semiconductor contacts and heterojunctions: metal semiconductor contacts and their band diagrams, metal semiconductor contact and rectifier theory, minority carrier injection and ohmic contacts, heterojunctions, band diagrams and heterojunction applications. Chapter 8 MOS field effect transistor: MIS structure and surface electric field effect, MOS FET fundamentals, threshold voltage analysis, current equation, transient characteristics, other parameters. Chapter 9 bipolar transistors: transistor overview, DC characteristics and current gain, reverse current, breakdown voltage, base resistance; transistor frequency, power, noise, switching characteristics. Chapter 10 semiconductor manufacturing technology: single-step process technology, process integration technology, integrated circuit devices.

**Prerequisite(s)：** Modern Physics, Mathematical Physics

## <High Frequency Circuits> Course Description

**Course:** High Frequency Circuits

**Course No.:** 3122102061

**Credit / Course Hours:** 2/32

**Preparatory Course:** Fundamental Electronic Circuits

**Course Description:** High Frequency Circuits is a core course of Communication and Information related majors. Based on communication systems, this course will enable students to gain a systematic understanding of how different types of functional unit circuits work, and to develop analyzing and designing skills. This course will also equip students with ability in engineering computing, hardware analysis and design. As a bridge between fundamental and required major courses, it plays an important role to develop students’ experiment and research skills and innovation, and lays a solid foundation for electronic system developing in the future.

The course includes the following parts: structure of communication system, high-frequency amplifying circuit, sine-wave oscillation circuit, modulation and demodulation circuit, feedback control circuit, etc.

## <High Frequency Circuits> Course Description

**Course:** High Frequency Circuits

**Course No.:** 3122102060

**Credit / Course Hours:** 3/48

**Preparatory Course:** Fundamental Electronic Circuits

**Course Description:** High Frequency Circuits is a core course of Communication and Information related majors. Based on communication systems, this course will enable students to gain a systematic understanding of how different types of functional unit circuits work, and to develop analyzing and designing skills. This course will also equip students with ability in engineering computing, hardware analysis and design. As a bridge between fundamental and required major courses, it plays an important role to develop students’ experiment and research skills and innovation, and lays a solid foundation for electronic system developing in the future.

The course includes the following parts: structure of communication system, high-frequency amplifying circuit, sine-wave oscillation circuit, modulation and demodulation circuit, feedback control circuit, etc.

## <The Principle of VLSI and EDA> Course Description

**Course No.：**3122102220

**Course：**The Principle of VLSI and EDA

**Credit / Course Hours:** 3/48

**Preparatory Course：**Digital Circuit and Logic Design

**Course Description：**

This course is about the basic principles of digital CMOS VLSI and EDA design. It is as follows. Part 1: The basic principle of MOS transistor, the threshold voltage, the electric current characteristic, the transient characteristic and so on; Part 2: The introduction of CMOS fabrication, including steps of process and important technological process, parasitic effect in the process et.; Part 3: The DC characteristics of CMOS inverter, transient characteristics, power dissipation characteristics and design, CMOS transmission gate; Part 4: The composition characteristics of static CMOS logic gate, the analysis and design CMOS NAND gate and NOR gate, combinational logic circuit Design, transmission logic gate circuit; Part 5: The features of dynamic and sequential logic circuit and corresponding representative circuits, the examples of timing logic circuit; input and output buffer, three-state output and bidirectional buffer. The overview of CMOS VLSI design methods and layout design includes full custom and semi-custom design methods. In the part of design practice, there are integrated circuit design tools and some practices, including integrated circuit design and design tools, environment and the basic design training.

# 3. Practice

## <Experiment of Electronic Surveying and Electronic Circuits> Course Decription

**Course Number：**3122108015(1st) 3122108016 (2nd)

**Course：**Experiment of Electronic Surveying and Electronic Circuits

**Credit(s)：**3 /72

**Preparatory Course:** Fundamentals of Circuit Analysis, Signals and Systems, Fundamentals of Electronic Circuit

**Course Description：**

This course is a basic experimental course for students majoring in electronics or communication. By learning this course, students could correctly use oscilloscope, signal generator, multimeter, AC millivoltmeter, DC power supply and other electronic equipment; It also aims to acquire basic knowledge, basic methods and relevant skills of the design, simulation, manufacture and debugging of electronic circuits and systems. Students can grasp ways of inquiry parameters and application information of electronic devices, master the use of the electronic circuit design software—EDA while master the assembly, testing and debugging of experimental circuit., in order to improve the ability of the practice, analysis and problem-solving skills of electronic design, thus develop a good habit of experiments and rigorous experimental style, so as to enhance students’ awareness of innovation and develop students' creative thinking and innovation capability.

## < Electronic Technics Exercitation > Course Description

**Course:** Electronic Technics Exercitation

**Course No.:** 3122104023

**Credit / Course Hours:** 1.5/1.5 weeks

**Preparatory Course:** Fundamentals of Circuit Analysis、Fundamentals of Electronic Circuit、Digital Circuit and Logic Design

**Course Description:**

Electronic Technics Exercitation is an important practical link in the electronic information specialty teaching and a significant way of exercising studentsto apply relevant professional knowledge to engineering practice, improving the practical skills, and simulating innovative consciousness. Through lectures, demonstrations and practice, students are guided to complete the function designand implementation, assembling and debugging, performance evaluation and summary of an electronic product. After the training, students should basically understand the process of electronic products research and development and production, learn basic theory of electronic technology, master basic skills of electronic technology, develop elementary engineering design ability and innovative thinking and team spirit, train rigorous and practical work style and lifelong learning habit, improve the capability of solving practical problems. Also, this course lays a solid foundation for the subsequent course design, graduation project and career development in the future.

## < Experiment of Digital Circuits and Logic Design (1st)> Course Description

**Course:** Experiment of Digital Circuits and Logic Design(1st)

**Course No.:** 3122108025

**Credit / Course Hours:**1/24

**Preparatory Course:** Fundamentals of Circuit Analysis, Fundamentals of Electronic Circuit, Digital Circuits and Logic Design

**Course Description:**

This course is a basic experimental course of majors of electronics or communications and so on. By learning this course, students could well control the basic knowledge and skills of digital logic design experiments, master the basic analysis and design methods of digital logic circuit, understand the development and application of new technologies in modern digital circuits. Students could also understand the basic idea of modern digital system design, preliminary master the use of the EDA tools and the basic design method of the hardware description language, understand and master the basic methods and skills such as design, simulation, fabrication and debugging of digital system. As learning this course, we could enhance the students’ understanding and application of the basic theory of digital logic, improve the students’ ability of analyze and solve problems and engineering practice literacy, develop the students’ experimental habit and rigorous academic style. The course also could enhance the students' awareness of innovation, cultivate creative thinking and innovation capability of students.

## < Experiment of Digital Circuits and Logic Design (2nd)> Course Description

**Course:** Experiment of Digital Circuits and Logic Design(2nd)

**Course No.:** 3122108026

**Credit / Course Hours:**1/24

**Preparatory Course:** Fundamentals of Circuit Analysis, Fundamentals of Electronic Circuit, Digital Circuits and Logic Design

**Course Description:**

Through the learning of this experiment course, students can master the basic analysis and design method of digital logic circuit and system, deepen the understanding and application of the new technology in modern digital circuit design method, master the use of the software of EDA and the basic design method of the hardware description language, deepen the understanding and application of the basic theory of digital logic in the design of system level. As learning this course, we could improve the students’ ability of hands-on, analysis and solving problems and engineering practice literacy, develop the students’ experimental habit and rigorous academic style. The course also could enhance the students' awareness of innovation, cultivate creative thinking and innovation capability of students.

## < Experiment of Signals and System > Course Description

**Course:** Experiment of Signals and System

**Course No.:** 3122104011

**Credit / Course Hours:** 0.5 credits/12 hours

**Preparatory Course:** Fundamentals of Circuit Analysis、Signals and Systems、Fundamentals of Electronic Circuit

**Course Description:**

By learning this course, students could master the basic concepts of signal & system, understand the working principles of signal generating and analyzing instruments, such as spectrum analyzer and DDS source, as well as the correct measurement method. And then students can also master system characteristics analysis method of signal time domain, the frequency domain, as well as the measurement method of a variety of circuit parameters. Further, students should be able to design, analyze, debug and measure typical circuits like sampling & recovery of signals, second-order network and filters by relative theoretical knowledge, and to achieve the goals that students can strengthen the understanding of theories and make good use of them, and enhance practice abilities, analyzing problems abilities and solving problems abilities as well as engineering practice literacy. And meanwhile, they should also develop good habits and rigorous styles of experiments. By this course, the awareness of innovation should be enhanced, and the students’ creative thinking and innovation ability should also be well developed.

## < Professional Experiments I of Electronic Science and Technology > Course Description

**Course:** Professional Experiments I of Electronic Science and Technology

**Course No.:** 3122103056

**Credit / Course Hours:** 2/48

**Preparatory Course:** <C Advanced Language Programming>, <Data Structure>, <Object Oriented Programming>, <Database Technology and Application>, <Circuit Analysis Foundation>, <Analog Electronic Circuit>, <Digital Electronic Circuit>, <Advanced Mathematics>, <College Physics>, etc.

**Course Description:** Professional Experiments I of Electronic Science and Technology is set up in the second grade of the University, with a total of 48 hours.

Through the pre training courses, students have mastered the theoretical knowledge of mathematical physics, circuit principles, communication principles, databases, computer languages and so on. In this course, students use the developed environment and software language to design. The development process through the course of learning to enable students to understand the basic structure of the program design technology; understand the advanced programming language; master program design process and basic skills; master the basic method of program debugging and testing; understand the basic process of computer science to solve the Electronic Science and Technology major‘s practical problems. Students will grasp the basic analysis of the use of software and programming language to solve the professional ability of the problem.

This course sets up 5 to 7 design exercises related to Electronic Science and Technology major, and the results are made up of two parts of the students' design results and report results.

## < Professional Experiments I of Electronic Information Science and Technology > Course Description

**Course:** Professional Experiments I of Electronic Information Science and Technology

**Course No.:** 3122103054

**Credit / Course Hours:** 2/48

**Preparatory Course:** <C Advanced Language Programming>, <Data Structure>, <Object Oriented Programming>, <Database Technology and Application>, <Circuit Analysis Foundation>, <Analog Electronic Circuit>, <Digital Electronic Circuit>, <Advanced Mathematics>, <College Physics>, etc.

**Course Description:** The Experimental I of Electronic Engineering is set up in the second grade of the University, with a total of 48 hours.

Through the pre training courses, students have mastered the theoretical knowledge of mathematical physics, circuit principles, communication principles, databases, computer languages and so on. In this course, students use the developed environment and software language to design. The development process through the course of learning to enable students to understand the basic structure of the program design technology; understand the advanced programming language; master program design process and basic skills; master the basic method of program debugging and testing; understand the basic process of computer science to solve the Electronic Information Science and Technology major‘s practical problems. Students will grasp the basic analysis of the use of software and programming language to solve the professional ability of the problem.

This course sets up 5 to 7 design exercises related to Electronic Information Science and Technology major, and the results are made up of two parts of the students' design results and report results.

## < Professional Experiments I of Optoelectronic information science and Engineering > Course Description

**Course:** Professional Experiment I of Optoelectronic information science and Engineering

**Course No.:** 3122102058

**Credit / Course Hours:** 2/48

**Preparatory Course:** <C Advanced Language Programming>, <Data Structure>, <Object Oriented Programming>, <Database Technology and Application>, <Circuit Analysis Foundation>, <Analog Electronic Circuit>, <Digital Electronic Circuit>, <Advanced Mathematics>, <College Physics>, etc.

**Course Description:** The Experimental I of Electronic Engineering is set up in the second grade of the University, with a total of 48 hours.

Through the pre training courses, students have mastered the theoretical knowledge of mathematical physics, circuit principles, communication principles, databases, computer languages and so on. In this course, students use the developed environment and software language to design. The development process through the course of learning to enable students to understand the basic structure of the program design technology; understand the advanced programming language; master program design process and basic skills; master the basic method of program debugging and testing; understand the basic process of computer science to solve the Optoelectronic information science and Engineering major‘s practical problems. Students will grasp the basic analysis of the use of software and programming language to solve the professional ability of the problem.

This course sets up 5 to 7 design exercises related to Optoelectronic information science and Engineering major, and the results are made up of two parts of the students' design results and report results.

## < Professional Course Design of Electronic Science and Technology > Course Description

**Course:** Professional Course Design of Electronic Science and Technology

**Course No.:** 3122103034

**Credit / Course Hours:** 2 / 2 week

**Preparatory Course:** Fundamentals of Circuit Analysis, Electronic Circuits, Digital Circuits and Logic Design, Analog Circuits, Analog Integrated Circuits Design, Digital Signal Processing, Computer Fundamentals and C Language, Advanced Mathematics, etc.

**Course Description:** This course strengthens the understanding of theoretical courses in analogue, digital circuit and signal processing. Also it consolidates their expertise in electronic circuit analysis, signal processing and analog integrated circuits. By designing and the practice of practical projects, students can gain a deep understanding of the theory and have a better horizon of the combination of theory and practice, as well as a promotion in personal ability of applying theory. This course lays the foundation of students in theoretical research and engineering in the field of electronic engineering. It use oscilloscopes, signal generators, multi-meters, vector network analyzers, power meters and other measuring instruments to help designing and developing in the practical projects, which improve students' practical ability and comprehensive ability of Electronic Science and Technology professionals.

## < Professional Course Design of Electronic Information Science and Technology > Course Description

**Course:** Professional Course Design of Electronic Information Science and Technology

**Course No.:** 3122103033

**Credit / Course Hours:** 2 / 2 week

**Preparatory Course:** Fundamentals of Circuit Analysis, Electronic Circuits, Digital Circuits and Logic Design, Analog Circuits, Analog Integrated Circuits Design, Digital Signal Processing, Computer Fundamentals and C Language, Advanced Mathematics, etc.

**Course Description:** This course strengthens the understanding of theoretical courses in analogue, digital circuit and signal processing. Also it consolidates their expertise in electronic circuit analysis, signal processing and analog integrated circuits. By designing and the practice of practical projects, students can gain a deep understanding of the theory and have a better horizon of the combination of theory and practice, as well as a promotion in personal ability of applying theory. This course lays the foundation of students in theoretical research and engineering in the field of electronic engineering. It use oscilloscopes, signal generators, multi-meters, vector network analyzers, power meters and other measuring instruments to help designing and developing in the practical projects, which improve students' practical ability and comprehensive ability of Electronic Information Science and Technology professionals.

## < Professional Course Design of Optoelectronic Information Science and Engineering > Course Description

**Course:** Professional Course Design of Optoelectronic Information Science and Engineering

**Course No.:** 3122103035

**Credit / Course Hours:** 2 / 2 week

**Preparatory Course:** Fundamentals of Circuit Analysis, Electronic Circuits, Digital Circuits and Logic Design, Analog Circuits, Analog Integrated Circuits Design, Digital Signal Processing, Computer Fundamentals and C Language, Advanced Mathematics, etc.

**Course Description:** This course strengthens the understanding of theoretical courses in analogue, digital circuit and signal processing. Also it consolidates their expertise in electronic circuit analysis, signal processing and analog integrated circuits. By designing and the practice of practical projects, students can gain a deep understanding of the theory and have a better horizon of the combination of theory and practice, as well as a promotion in personal ability of applying theory. This course lays the foundation of students in theoretical research and engineering in the field of electronic engineering. It use oscilloscopes, signal generators, multi-meters, vector network analyzers, power meters and other measuring instruments to help designing and developing in the practical projects, which improve students' practical ability and comprehensive ability of photoelectric information science and engineering professionals.

## < Professional Experiments II of Electronic Science and Technology > Course Description

**Course:** Professional Experiments II of Electronic Science and Technology

**Course No.:** 3122103057

**Credit / Course Hours:** 3/72

**Preparatory Course:** Digital circuit and logic design, Solid state physics, Microelectronics devices, the design principle and application of ASIC

**Course Description:** This course is one of the major courses for the majors of electronics technology. This course is a digital integrated circuit design course. Students from shallow to deep, from simple to complex CPU circuit system design experiment, so that students master the ASIC chip design process and EDA tools. Through the studying of this course can master the digital integrated circuit modeling, simulation and hardware integrated closely linked, eventually completed the modeling, integrated circuit, IC layout design and verification.

## < Professional Experiments II of Electronic Information Science and Technology > Course Description

**Course:** Professional Experiments II of Electronic Information Science and Technology

**Course No.:** 3122103055

**Credit / Course Hours:** 3/72

**Preparatory Course:** <Microcomputer Principle and Interface Technology>, < C high-level language programming>, <Data structure>, <Digital Signal Processing>, <Embedded System Design>

**Course Description:** The course covers the embedded system hardware drivers and application design. The embedded system applications design is mainly based on the ARM10 and PXA270 Linux operating system hardware drivers and application design, including QT program application design. The experiment contains the development of hardware and software environment, configuring the serial port, Ethernet port communication and opening TFTP and NFS services. Also human-computer interface experiment and VGA display, Web servers, network file transfer, multi-threaded applications, including many comprehensive experimental, such as GPS, GSM/GPRS communication, NFS file server, the GSM mobile phone in the design and implementation of embedded Linux system, game design and so on .

## < Professional Experiments II of Optoelectronic Information Science and Engineering > Course Description

**Course:** Professional Experiments II of Optoelectronic Information Science and Engineering

**Course No.:** 3122102059

**Credit / Course Hours:** 3 credits /72 hours

**Preparatory Course:** Principles of Communication Systems, communication Introduction, computer networks and communication

**Course Description:** Optoelectronic information science and engineering is one of the important branches of information technology, and it is an interdisciplinary discipline of physics, electronics, optics and computer science. This course, Experiments of Optoelectronic Information Science and Engineering, is designed for the major students to understand broadband communications, optoelectronic information and so on. The course contents include the experiments in the devices and related technologies of new optoelectronic information processing, optoelectronic device design and broadband communication system. In order to improve experimental and research ability of student, the techniques about how to use the device and how to design the experimental system are introduced in this course. The aim of this course is to develop students' abilities of practical ability, innovation ability, design ability and practical problem solving.

## < Measurement of Electromagnetic Field and Wave > Course Description

**Course:** Measurement of Electromagnetic Field and Wave

**Course No.:** 3122103010

**Credit / Course Hours:** 2/48

**Preparatory Course:** Electromagnetic Field Theory, Foundation of Microwave Engineering, University Physics

**Course Description:** There are 12 experiments in this course. Each experiment has four class hours. 8 experiments can be selected. The experiments are as follows: 1.Introduction of microwave equipment; 2. Measurement of the parameters of electromagnetic wave and uniform lossless medium; 3. Experiment of the diffraction and interference of electromagnetic wave; 4. Measurement of electric field strength; 5. Experiment of the polarization of electromagnetic wave; 6. Measurement of frequency spectrum character; 7. Measurement of the parameter of microwave using  a microwave Measuring-line; 8. Measurement of load impedances using a microwave Measuring-line and impedance matching using single stub matching; 9. Measurement of dielectric constant using resonant cavity perturbation method; 10. Antenna pattern measurement; 11. Measurement of microwave devices using a spectrum analyzer; 12. Network parameter Measurement.

## < Professional Practice > Course Description

**Course:** Professional Practice

**Course No.:** 3122103071

**Credit / Course Hours:** 1 / 1 week

**Preparatory Course:** Principles of Communication Systems, communication Introduction, computer networks and communication

**Course Description:** This course can enable students to have the specific feelings and understanding of the status and trends in the field of electronic information industry development with new technologies, at the same time enhance students the academic background of electronic information and the love of the profession.

Main arrangements:

(1) PTN, LTE, Cloud Computing program design, project implementation and system construction.

(2) Broadband networks, wireless communications, optical fiber communication settings and measurements.

# 4. Elective course for quality education

## <Signals and systems Using Matlab> Course Description

**Course:** Signals and systems Using Matlab

**Course No.:** 3122105060

**Credit / Course Hours: 2/32**

**Preparatory Course:** The basis of circuit analysis, C Programming Language, Signals and Systems (or opened with the same period of signals and systems course)

**Course Description:**

This course can be used as a practical link of signals and systems course, also can be used as the basis for students to use computer on signal processing and system design.

This course is a combination of the key concepts and teaching examples involved in signals and systems course aimed to demonstrate and analyze signals and systems by programming. This course could help students to deepen their understanding of the concepts of signals and systems course, improve the practical ability, lay a solid foundation for the further study of communications and digital signal processing course.

## < New-concept Weapon Systems in the Future War > Course Description

**Course:** New-concept Weapon Systems in the Future War

**Course No.:** 3122105330

**Credit / Course Hours:** 2/32

**Preparatory Course:** This course first introduces the basic concepts and connotation of the future war weapon system, and introduces the characteristics and classification of the weapon system. Next, we introduce the directional weapon, the stealth weapon, the environmental weapon, the information weapon and the precision weapon according to the classification of the future weapon system. Guided weapons, the future of biological and chemical weapons, soft-weapons and other characteristics, performance and basic operational principles and related knowledge of the relevant disciplines; Finally, the course concludes the similarities and differences between domestic and foreign weapons systems and differences.

By opening this course, military science and technology including multi-disciplinary knowledge will be taught to undergraduates to make them aware of the differences in military technology between our country and the developed countries so as to stimulate students to study the differences in their professional knowledge and stimulate students' interest in learning this professional knowledge. So that students have a basic knowledge of weapons knowledge, enhance students' awareness of national defense and national defense awareness, and promote the overall quality of college students.

## < The new concept smart car > Course Description

**Course:** The new concept smart car

**Course No.:** 3122105310

**Credit / Course Hours:** 2/32

**Preparatory Course:** None

**Course Description:**

The course introduces the basic concepts and key technologies of intelligent vehicle firstly. Then it introduces the vehicle electronic control technology, which is the core of the new intelligent vehicle. This part of the course content to explain some follow-up basis. Then it introduces the vehicle positioning technology, the environmental sensing technology, and the artificial intelligence technology, respectively. Those technologies are the foundation and the core of the unmanned vehicles. Students can study the new intelligent vehicles and unmanned vehicles through the introduction of these technologies. Finally, we introduce the development of the new concept of intelligent vehicle.

## < Programming for Circuit Analysis > Course Description

**Course:** Programming for Circuit Analysis

**Course No.:** 3122105010

**Credit / Course Hours:** 32

**Preparatory Course:** Basis of Circuit Analysis, C/C++ Programming.

**Course Description:** This course introduces relevant methods of circuit analysis by computer programming, including solving linear equations by Gauss Jordan elimination method and LU method, the algorithm for finding trees by the assimilation node method, Runge Katta method for transient circuit analysis. At the same time, this course also introduces the method of circuit analysis by circuit simulation software, including the use of Multisim to verify circuit theorem and volt ampere relation of circuit components, resistance circuit analysis, circuit transient analysis, AC circuit analysis, basic amplifying circuit, amplifier circuit and feedback circuit analysis etc. Through the study of this course, students can grasp the computer analysis method of the circuit and consolidate the related knowledge of the circuit.

## < Introduction to Life Science > Course Description

**Course:** Introduction to life science

**Course No.:** 3122105140

**Credit / Course Hours:** 2/32

**Preparatory Course:** None

**Course Description:**

Introduction to Life Science is an elective course for quality education for all majors. The course offers a wide knowledge of life science, which covers the fundamentals, frontiers interdisciplinary and application of life. The main contents include the origin of life, the history of life on earth, evolution, DNA, cell, metabolism, plant and animal, sensory and nervous system, and biological technology. This course can help students understand the basic concepts, ideas and research methods of life science, understand the role of life science in social and economic development, establish a correct outlook on life, enhance awareness of health and environmental protection, enhance social responsibility. Besides, this course can assist students in understanding the main research areas and progress of life science and cross-links with other disciplines, providing the basis for the training of interdisciplinary talents.

## < Precious Metal Jewelry > Course Description

**Course:** Precious Metal Jewelry

**Course No.:** 3122105390

**Credit / Course Hours:**2/32

**Preparatory Course:** None

**Course Description:** Jewelry is one of the important areas for the applications of the noble metals such as gold and silver, which are widely used in human life. The types, colors and purity of jewelry and precious metal jewelry as well as the cleaning and maintenance of jewelry are introduced. The fabrication process of the jewelry and the introduction on the noble metals and their alloys are the most important contents of this course. The pictures, videos and exhibition materials are used for introducing the jewelry and the corresponding new technology for its fabrication. The variation in the materials and the functions of the jewelry from the past to the future is shown. The variations of the applications of the noble metal from history to future are also discussed. Furthermore, the fabrication of the jewelry will be finished by the students themselves by using the materials that being given.

## < Experiment of Communication Electronic Circuit > Course Description

**Course:** Experiment of Communication Electronic Circuit

**Course No.:** 3122105210

**Credit / Course Hours:** 2 credits ,48 hours

**Preparatory Course:** Fundamentals of Electronic Circuit、 Experiment of Electronic Surveying and Electronic Circuits、Communication Electronic Circuit

**Course Description:** By learning this course, students could understand the definition and theorem of the Circuits , Signals and Systems, master analyzing and experiment operation skills in Circuits , Signals and Systems, and learn the basic principle and correct use of Signals and Systems test equipment on the basis of Fundamentals of Circuit Analysis and Signal and System Analysis. The course also employs both theoretical teaching and experimental teaching, in which the former consists of 6 lessons and the latter consists of 26 lessons. The learning of this course helps students' analytical ability to understand communication signal and system and further enhance the students' experimental operational skills and creativity.

## < Molecular cell biology > Course Description

**Course:** Molecular cell biology

**Course No.:** 3122105040

**Credit / Course Hours:** 2 / 32

**Preparatory Course:** None

**Course Description:**

This course covers basic properties of cells and cell organelles. It also examines properties of differentiated cell systems and tissues. The principal aim of the course is to equip students with a basic knowledge of the structural and functional properties of cells. From this fundamental perspective, students are introduced to important scientific literature on the subject of cell biology and are shown how to critically examine data and interpretations presented by researchers. Cell organelles are studies to determine how cells function in harmonious ways while molecular biology is examined to indicate how genetic information is passed on and how genes create and control the structure of living cells. The course culminates in a brief study of cancer, a disease that involves the most complex aspects of cell biology and molecular genetics.

## < Bioinformatics > Course Description

**Course:** Bioinformatics

**Course No.:** 3122105300

**Credit / Course Hours:** 2 / 32

**Preparatory Course:** None

**Course Description:**

Bioinformatics is an interdisciplinary scientific field that develops methods for storing, retrieving, organizing and analyzing biological data. This course begins with a brief review of elementary molecular biology and statistical genetics. The primary emphasis will be on understanding the concepts and principles that form the basis for topical issues. It then covers some bioinformatics relevant to Human Genome Project, Cancer and Gene Therapy, antiaging mechanism and technology, Biochip Technology, Molecular Biology Network and so on.

## < Network Synthesis and MATLAB Application > Course Description

**Course:** Network Synthesis and MATLAB Application

**Course No.:** 3122105030

**Credit / Course Hours:** 2/32

**Preparatory Course:** Higher Mathematics, Linear Algebra, complex function, Fundamentals of Circuit Analysis

**Course Description:** Network Synthesis and MATLAB Application is a continuing and widen course for Fundamentals of Circuit Analysis, which emphasizes on the basic concepts, theories and methods of network synthesis, and make aided design using MATLAB. The main contents include: The basic functions and programming of MATLAB. The nonlinear circuits. The Laplace transform. The network functions and their properties. The properties of the network function and the basic design methods of the passive one-port networks. The properties of the network function and the basic design methods of the passive two-port networks. The basic active elements. The sensitivity and the basic design methods of the active networks. The students should master the basic methods of network synthesis, know the basic idea of computer aided design, and have the ability of computer aided design by learning this course.

## < Wireless Personal Area Network and Sensor Network > Course Description

**Course:** Wireless Personal Area Network and Sensor Network

**Course No.:** 3122105080

**Credit / Course Hours:** 2 /32

**Preparatory Course:** None

**Course Description:**

This course introduces the concepts and technology of wireless personal networks and sensor networks. Course is divided into two parts: the first part is the wireless network technologies, including ZigBee, RFID, UWB, Bluetooth, NB-IoT, RoLa etc.. The second part introduces the related content of wireless sensor networks, including the basic concepts and characteristics of sensor networks, node design, routing protocol, MAC protocol, positioning, synchronization, topology control, data aggregation and other key technologies and protocols. Course will also introduce several typical application cases. Based on the abovementioned, this course will be a steppingstone for students to enter the area of wireless personal area network, wireless sensor network, Internet of things.

## < Programming for Circuit Analysis > Course Description

**Course:** Programming for Circuit Analysis

**Course No.:** 3122105010

**Credit / Course Hours:** 32

**Preparatory Course:** Basis of Circuit Analysis, C/C++ Programming.

**Course Description:** This course introduces relevant methods of circuit analysis by computer programming, including solving linear equations by Gauss Jordan elimination method and LU method, the algorithm for finding trees by the assimilation node method, Runge Katta method for transient circuit analysis. At the same time, this course also introduces the method of circuit analysis by circuit simulation software, including the use of Multisim to verify circuit theorem and volt ampere relation of circuit components, resistance circuit analysis, circuit transient analysis, AC circuit analysis, basic amplifying circuit, amplifier circuit and feedback circuit analysis etc. Through the study of this course, students can grasp the computer analysis method of the circuit and consolidate the related knowledge of the circuit.

## < Space Technology Overview> Course Description

**Course:** Space Technology Overview

**Course No.:** 3122105150

**Credit / Course Hours:** 2 /32

**Preparatory Course:** None

**Course Description:**

a) Introduce space environment, classification and subsystems by using Groda and Salaya spacecrafts.

b) Introduce aerospace observe and control networks by using GPS and Galilean satellites.

c) Introduce environment-control & life-support subsystems by using Russian Soyuz capsule.

d) Introduce attitude and orbit control subsystem by using Falcon satellite (Undead bird).

e) Introduce reliability design and emergency management by using examples in 'accidents and disasters in manned space flight' book.

f) As a student-group form, discuss how to design ‘Chinese’ Hubble telescope, and analyze the importance of scientific goals for a designing spacecraft.

## < Introduction to Optical Computer >Course Description

**Course Number：**3122105050

**Course：**Introduction to Optical Computer

**Credit(s)：** 2 credits，32 hours

**Course Description：**

The basic content of this course are optical digital computing and optical simulation mechanism and structure of the various optical bistable devices and logic gates, optical 'and', 'not', 'or', '', 'ornon-',' XNOR ',' half-adder ',' register 'digital computing and its optical path, the optical image of' multiplication ',' related ',' convolution ',' added ',' phaseSave ',' differential 'analog computing, optical Fourier transform, an optical plum cup transform, the spatial light modulator (E-SLM and the mechanism and structure of the O-SLM) and Its applications, free space, optical fiber, opticalwaveguide interconnection and network the various structures of the optical matrix and its parallel computing, non-erasable and erasable optical disc storage mechanism and applications, optical neural network simulation system, optical inference engine, and describes the last tencomputing Nianguang the latest research and progress, to enable students to understand the optical computing is the forefront of the development direction of the optical information processing, optical computing technology advantages and applications, in order to widen the students' knowledge.

**Prerequisite(s)：**General Physics，Higher Mathematics

## < Mathematical Thought and Information Technology> Course Description

**Course Number：**3122105360

**Course：**Mathematical Thought and Information Technology

**Credit(s)：**two credits，36 hours

**Course Description：**This course will demonstrate the development of the mathematics and how it influences the human civilization in terms of the history and culture. It will also describe mathematical thought and methods from different perspectives. In addition, this course will also show how the mathematics develops with the arts and how they influence each other. Nowadays, the mathematics starts to have a deeper connection with the humanities, especially with the involvement of the information science. By attending this course, students will enjoy and learn the great human wisdom. The course will broaden their horizons and arouse their interests in learning the mathematics. It will also enable students to master mathematical ideas to meet the challenges of information science and help them to lay a solid foundation for future learning, research, work and life**.**

**Prerequisite(s)：**Advanced mathematics

## < Matlab language and its applications in signal process and system analysis > Course Description

**Course No：3122105020**

**Course Name:** **Matlab language and its applications in signal process and system analysis**

Matlab language and its applications in signal process and system analysis(32 study hours)

**Major Requirement：**

Science and Engineering, such as electrical or information specialties

**The prerequisite courses:**

Fundamentals of Computer Applications

**Main Contents:**

This course is divided into 2 parts: The First part introduces the rules and the use of the language; The second part gives some examples of the major applications under the background of the electrical or information specialties. The contents below are included in the course:

1. The introduction of the MATLAB variables and their data constructions
   * + The definition and use of variables, characters and character strings；
     + The construction and use of arrays；
     + The operations of matrices.

2．The fundamentals of MATLAB programming

* The rules and use of the operators；
* The use of the M file；
* The syntax and use of the language stream；
* The operations of the data files.

3．The drawing functions of MATLAB

* 2-D drawing and the figure controls；
* 3-D drawing and the figure controls；
* The reading and writing of an image.

In the second part, some basic applications in the electrical or information specialties are introduced:

* The system analysis and Computer simulations
* The presentation and process of the signals
* The presentation, analysis and simulation of a system in frequency domain, complex frequency domain and Z domain, such as: the solutions of convolution and pulse response; frequency domain analysis of period signals; the analysis of continuous and discrete systems; the design and simulation of the Butterworth filter, and so on.

**Teaching Material：**

<<Matlab Programming and Applications >> the author:Zhang Zhixing, TsingHua Univ. Press, 2002.4

## <Laser Systems and Applications> Course Description

**Course:** Laser Systems and Applications

**Course No.:** 3122105240

**Credit / Course Hours:** 2/32

**Preparatory Course:** None

**Course Description:**

This course is designed to equip students with the basic principles, generate conditions and properties of lasers. Optical resonators, laser modes, laser modulation techniques are also introduced. Meanwhile, typical laser systems, technology and applications in weapons, radar, display, sensing and medicine are discussed in this course. By studying the course, the students can gradually master the basic principle and methods of laser systems and application. At the same time of acquiring knowledge, the students can be trained in the ability of establishing physical models, analyzing and solving practical problems, which can pave the way of follow-up professional courses studying. It can lay a solid foundation for students in scientific research, teaching and production of optical communications and optoelectronic technologies.

## < C Language and Application System Design in MCU > Course Description

**Course:** C Language and Application System Design in MCU

**Course Number：**3122106120

**Credit/Course Hours：**2/32

**Prerequisite(s)：**Fundamentals of Circuit Analysis、Fundamentals of Electronic Circuit、Digital circuit and logic design、Data structure

**Course Description：**

By learning this course, Students should master the use of a MCU that is now used primarily. Include the system architecture, instruction system, infrastructure of embedded C language and so on. Students also should master the design of the application system based on MCU. They should understand the complex interface and program to control the MCU. This course could develop abilities, such as analyzing of problems, the skills of problem-solving and a spirit of collaboration. Teaching mode combines theory teaching and experiment teaching. Theory teaching and experimental teaching were 16 class hours and 16 class hours, respectively.

## <Matlab language and its applications in signal process and system analysis> Course Description

**Course Name:** Matlab language and its applications in signal process and system analysis

**Applicable Major:** Electronic Information

**Pre-requisite：**Basic courses about computer culture and applications

**Content Outline:**he content of this course is divided into two parts: Part one consists of the basic rules and orders of Matlab; Part two consists of the main applications of the Matlab language in some specific fields such as signal process, system analysis and so on. This course mainly discusses contents as described below:

1．Introduction of the variable and data structure. This part including:

* The usage and definition of the variable, character, string;
* The array date structure and usage;
* Handle and calculations of the matrix structure.

2．The basic concepts of MATLAB program design. This part including:

* The usage and definition of the calculators;
* The rules of M files;
* The grammar and usage of program stream;
* The operations of files.

3．The introduction of powerful drawing functions of MATLAB. This part including:

* 2-D drawing orders and control;
* 3-D drawing orders and control;
* Read and writing functions of images.

In the second part of this course, we discusses the basic applications in some courses of Electronic Information. The contents mainly deal with the presentations and process of basic signals and the simulations and analysis of regular systems. Including: the presentations of signals and systems in time domain, frequency domain, complex frequency domain and Z domain, performance analysis and computer simulations. The contents mainly cover followings: the convolution calculations of the linear systems, the solution of impulse response, the frequency domain analysis of periodic signals and linear systems, the analysis and implementations of continuous systems in S domain, the analysis and implementations of discrete systems in Z domain, normal filters design principles such as the Butterworth filters and its simulations.

## < Fundamentals of Radio Astronomy > Course Description

**Course:** Fundamentals of Radio Astronomy

**Course No.:** 3122105370

**Credit / Course Hours:** 2 Credit/32 Course Hours

**Preparatory Course:** Physics; Advance Mathematics

**Course Description:**

"Fundamentals of Radio Astronomy" introduce the development of radio astronomy exploration, key technologies on radio astronomy detection, and an introductory course on air exploration programs. This course will review the development history of domestic and foreign radio astronomy exploration achievements. This course also presents the existing radio detection systems and discusses the future development plan of China's aerospace and the basic structure of astronomical detectors.

The key technology of the radio astronomy includes the use of electromagnetic waves to detect celestial bodies, the formation of celestial objects and other astronomical phenomena and astronomy phenomenon from its discipline. In the discussion section, we will focus on the electronic communication systems in radio-based detection systems (such as RF receiving systems, antenna systems, communication mechanism), powertrain and other advanced technologies.