

# **Beijing University of Posts and Telecommunications**

## **School of Cybersecurity**



## **Course Description**

**Name: Zichuan Guo**

**Student Number: 2016522139**

**Specialty: Information Security**

## Content

Notes:.....	5
I. Mathematics and Natural Science Major Course .....	6
<Advanced Mathematics A (I)> Course Description.....	6
<Advanced Mathematics A (II)> Course Description .....	6
< Mathematic Foundations of Information Security > Course Description.....	7
<Linear Algebra>Course Description.....	7
<Probability Theory and Stochastic Processes> Course Description .....	8
<Mathematical Modeling and Computer Simulation> Course Description .....	8
<University Physics ( C ) >Course Description.....	9
II. Computer Science Basic Major Course.....	11
< The C Programming Language > (3 credits) Course Description .....	11
< The JAVA Programming Language > (3 credits) Course Description .....	11
< Data Structures > (3 credits) Course Description .....	12
< Database Technologies and Applications > (2 credits) Course Description .....	12
< Computer Network > (3 credits) Course Description .....	13
< Operating System > (3 credits) Course Description .....	13
< Basis of Circuit and Electronics >Course Description.....	14
< Digital Logic and Digital System > Course Introduction .....	14
<Signals and Systems> Course Description .....	14
< The Computer Organization and Architecture > Course Description.....	15
< Software Engineering > Course Description.....	16

1 credit = 16 hours on lecture, not including work or study time

< Communication Networks > Course Description .....	16
< Fundamental of Embedded System > Course Description .....	17
< Principle of Communication Systems (A) > Course Description .....	17
III. Information Security Major Course .....	19
< Introduction to Information Security > Course Description .....	19
< Modern Cryptography > Course Description .....	19
< Digital Contents Security > Course Description .....	20
< Network Security > Course Description .....	20
< Security of Information Systems > Course Description .....	21
< Software Security > Course Description .....	21
< Embedded System and Security > Course Description .....	21
< Fault Tolerant Computing > Course Description .....	22
< Security of Wireless Communication > Course Description .....	22
< Mobile Terminal Security > Course Description .....	23
< Analysis of Network Security > Course Description .....	24
< Cryptanalysis > Course Description .....	24
< Information Security Management > Course Description .....	24
< Cryptographic Engineering > Course Description .....	25
< Information Theory and Coding > Course Description .....	25
< Network Traffic Monitoring and Control > Course Description .....	26
< Multimedia Technology and Applications > Course Description .....	27
IV. Design Project - Major .....	28

< Programming Practice > Course Description .....	28
< Communication Cognitive Internship > Course Description .....	28
<College Physics Laboratory> Course Description .....	28
< Practice of Large Program Design > Course Description.....	29
< Experiment of Digital Contents Security > Course Description .....	29
< Experiments on Security of Information Systems > Course Description .....	30
< Network Security Experiment > Course Description.....	30
< Software Security Experiment > Course Description .....	31
< Comprehensive experiment of information security > Course Description.....	31
< Information Security Programming and Development Praticice > Course Description .....	32

## Notes:

*1 credit here means 16 hours of lecture.*

*Beijing University of Posts and Telecommunications does not count study/work time into credit hours, and teaching period here is 18+2 weeks*

## I. Mathematics and Natural Science Major Course

### <Advanced Mathematics A (I)> Course Description

**Course Number :** 3412110012

**Course :** Advanced Mathematics A (I)

**Credit(s) :** Five credits, 80 hours

**Course Description :** This course is for science & engineering students. Main contents include: Function and Limit, Derivative and Differential, Mean Value Theorem of Differential and the Application of Derivative, Indefinite Integral, Definite Integral and Application, Differential Equation and so on. As a compulsory public fundamental course, it provides the necessary basic mathematical knowledge for subsequent math courses and professional courses, and improves student's mathematics quality. Through this course, abstract thinking ability and logical reasoning ability, space imagination ability and self-educated abilities of students are improved. It also cultivates the students' ability of solving practical problems.

**Prerequisite(s) :**

**Books :**

**<Advanced Mathematics I>** Beijing University of Posts and Telecommunications, 2012

---

### <Advanced Mathematics A (II)> Course Description

**Course Number :** 3412110021

**Course :** Advanced Mathematics A (II)

**Credit(s) :** Five credits, 80 hours

**Course Description :** This course is for science & engineering students. Main contents include: Differentiation of Functions of Several Variables and Its Application, Multiple integral, line integral and Surface Integral, Infinite Series and so on. As a compulsory public fundamental course, it provides the necessary basic mathematical knowledge for subsequent math courses and professional courses, and improves student's mathematics quality. Through this course, abstract thinking ability and logical reasoning ability, space imagination ability and self-educated abilities of students are improved, and also the cultivation of students' operation ability, ability to solve practical problems.

**Prerequisite(s) :** Advanced Mathematics A (I)

**Books :**

1 credit = 16 hours on lecture, not including work or study time

## < Mathematic Foundations of Information Security > Course Description

**Course Number :** 3132131300

**Course :** Mathematic Foundations of Information Security

**Credit(s) :** 4 credits, 64 hours

**Course Description :** Mathematics is the basis of all natural science, of course, is the basic theory of information security disciplines. This course introduces the number theory and the theory of abstract algebra. The number theory main include: Euclidean algorithm, greatest common factor and least common multiple, integer only decomposition theorem, congruence, residue class function Euler, Euler's theorem, Remainder Theorem, quadratic congruence, Legendre symbol, the Jacobi symbol, the original root, primality testing, elliptic curve, and so on. The theory of abstract algebra main include: group, subgroup, normal subgroup, quotient group, cyclic groups, permutation groups, homomorphism and isomorphic, rings, ideals, polynomial rings, finite field, and so on. Through learning this course, students can understand the basic concepts of mathematics in information security, the main methods and applications. It can develop students' mathematical thinking training to solve practical problems for further study of modern information science.

**Prerequisite(s) :** Advanced mathematics、Linear Algebra Course

Books: <Mathematic Foundations of Information Security> Gongliang Chen, Tshinghua University Press, 2009.8

---

## <Linear Algebra>Course Description

**Course Number:** 3412110072

**Course:** Linear Algebra

**Credits:** three credits, 48 hours

**Course Description:** There are four parts in this course which are organized as follows: (1) Basic computational tools: determinant theory, matrix algebra; (2) Abstract theory: vector space consisting of basis and coordinates, eigenvalues and eigenvectors for similarity and diagonalization of matrices, quadratic form including inner product, orthonormal basis, Gram-Schmidt orthogonalization process, along with linear space, linear transformation;

1 credit = 16 hours on lecture, not including work or study time

(3) Applications in geometry: vector algebra, plane and line, surface and curve in space.

(4) Linear systems.

**Prerequisite:**

**Books:** <Linear Algebra and Geometry> Jiyou Liu, Jiao mo, Beijing University of Posts and Telecommunications Press, 2012.8

---

## <Probability Theory and Stochastic Processes> Course

### Description

**Course number:** 3412110092

**Course:** Probability Theory and Stochastic Processes

**Credit(s):** 4 credits, 64 hours

**Course Description :** Probability Theory and Stochastic Processes is a mathematical course focusing on the research of statistical law of stochastic phenomena. It is now extensively applied in the fields of nature sciences, social sciences, engineerings, technologies etc. With the rapid development of science and technology, the mathematical theory and research methods for stochastic phenomena are more and more important, so its application does. Hence, Probability Theory and Stochastic Processes is a compulsory and fundamental course for science and engineering students. Probability Theory and Stochastic Processes consists of two parts, (1) probability theory mainly includes probability space, probability distribution of random variable and its corresponding functions, moments, law of large numbers and central limit theorems; (2) Stochastic process mainly includes some definitions, Markov chain, Gaussian process, Poisson process, Wiener process, stationary process and its spectral analysis, where Markov chain and spectral analysis of stationary process are important.

**Prerequisite(s) :** Advanced mathematics, Linear algebra, Complex analysis

**Books:** <Probability theory and Stochastics Processes> Yueshi, Hongxiang Sun, Beijing University of Posts and Telecommunications Press, 2010

---

## <Mathematical Modeling and Computer Simulation> Course

### Description

**Course Number :** 3412110170

**Course :** Mathematical Modeling and Computer Simulation

1 credit = 16 hours on lecture, not including work or study time



**Credit(s) :** two credits, 32 hours

**Course Description :** This course is a bridge between the study of mathematics and the applications of mathematics to various fields. Many meaningful and practical problems chosen from common experiences are investigated. Topics of this course include: modeling process, experimental modeling, modeling with differential equations, discrete and continuous optimization modeling, simulation modeling, and the application of MATLAB. This course provides an early opportunity for the students to see how the pieces of an applied problem fit together, to practice several facets of modeling and to enhance their problem-solving capabilities. Additionally, basic knowledge of MATLAB is assumed. Students implement algorithms in MATLAB for both homework and projects.

**Prerequisite(s) :** Calculus, Linear Algebra, Probability, Basic knowledge of MATLAB

**Books :** <Mathematics Model> (4<sup>th</sup> edition )Qiyuan Jiang, Jun Ye, Higher Education Press, 2011

---

## <University Physics ( C ) >Course Description

**Course Number :** 3412120031

**Course :** University Physics (C)

**Credit(s) :** (Four credit,64hours)

**Course Description :** The primary purpose of this course is to teach you a body of knowledge about how the physical world works. The secondary goal is to impart to you the abstract general principles to specific physical situations, as well as the ability to solve problems using calculus. In this course, we will cover a wide range of Classical Mechanics, Electromagnetism, Oscillation and Wave, Wave Optics, including Newton's laws and their applications, conservation of mechanical energy, torque-angular momentum theorem, conservation of angular momentum, Gauss's law, conductors in electrostatic equilibrium, magnetic forces and magnetic field, Gauss's law for magnetism, Biot-Savart law, Ampère's law, Faraday's law, Lenz's law, Maxwell's equations, reflection and refraction, Huygens' principle, Young's interference, interference in thin film, the Michelson interferometer,

1 credit = 16 hours on lecture, not including work or study time

Fresnel and Fraunhofer diffraction, the diffraction grating, X-ray diffraction. The most important points are that the conservative laws, Gauss' theorem and Ampère's law, interference and diffraction of light. At the end of this course, you will gain an understanding of how to view the natural world within a scientific structure through the development of problem solving skills applied to the physical world.

**Prerequisite(s) :** Advanced Mathematics 1 and Advanced Mathematics 2

Books: <Tutorial on Physics I & II> Wenwei Ma, Higher Education Press, 2002

## II. Computer Science Basic Major Course

### < The C Programming Language > (3 credits) Course

#### Description

**Course Number :** 3132100020

**Course :** The C Programming Language

**Credit(s) :** 3 credits, 48 hours

**Course Description :** C Programming Language course is a technology basic course to train students the programming design capability. This course mainly introduces the grammar C language, the statement, the control structure and programming design methods. At last, make students be able to use C Language to solve the practice problems. The detail purposes are: 1. Master the basic control structure and the basic control sentence of grammar and related norms, with skilled use of language to C sequence, selection and design procedures for the circulation of capacity. 2. Understand the environment and on the machine, a skilled programming on the machine and the ability to debug procedures. 3. Master some common algorithms, with skilled use of these algorithms ability to solve practical problems. 4. Understand the structure of the program design and modular design of the basic idea. 5. Makes students be able to use C Language to solve the practical problems. Help students build solid fundamentals for further studies.

**Prerequisite(s) :** College Computer Foundations

**Books:** <The C programming language> Publishing House of Electronics Industry

---

### < The JAVA Programming Language > (3 credits) Course

#### Description

**Course Number :** 3132100040

**Course :** The JAVA Programming Language

**Credit(s) :** 3 credits, 48 hours

**Course Description :** The purpose of this course is that students can firstly grasp the basic knowledge and grammar, understand and grasp object-oriented(OO) design ideas, design principles, important design patterns, and also grasp the basic methods and techniques of

Java OO programming, and then improve the abstract thinking and programming ability to solve the practice problems using Java techniques. The basic knowledge and techniques include classes, interfaces, packages, strings, generics, arrays, enumerate types, error handling with exceptions, I/O streams, graphical user interfaces (GUI), network programming, and etc.

**Prerequisite(s) :** College Computer Foundations、 Programming in C/C++

Books: <Core Java Volume I II III>

---

## < Data Structures > (3 credits) Course Description

**Course Number :** 3132100073

**Course :** Data Structures

**Credit(s) :** 3 credits, 48 hours

**Course Description :** This course is the integrated specialized basic course of computer science, and the foundation of non-numerical programming. And it also belongs to the basic course of understanding the computer for non-computer science students. This course aims to introduce the principles of organizing and operating data by computer, and the method of evaluating the efficiency of algorithms. Moreover, it sets the foundation of learning other specialized course of computer science and developing software, and cultures the ability of students to solve practical problem by learned theoretical knowledge from this course. The main contents include: linear structure, tree, graph, searching algorithms, and sorting algorithms.

**Prerequisite(s) :** C Programming / C++ Programming

Books : <Data Structures> Tsinghua University Press

---

## < Database Technologies and Applications > (2 credits)

### Course Description

**Course Number :** 3132100132

**Course :** Database Technologies and Applications

**Credit(s) :** 2 credits, 32 hours

**Course Description :** As a computer application restrictive course for non computer major students, it provides learning and training of basic information management and data processing. The teaching goal of the course is to enable students to understand some basic concepts and skills of database. Based on the basic concept of database system

1 credit = 16 hours on lecture, not including work or study time

architecture and database management system, students are trained to use SQL language for basic data operation, and to master at least a typical database management system. Through the course learning, students can have a more comprehensive understanding for the database and its application system, accurate understanding what a database is, as well as use database to solve some simple data management and processing problems.

**Prerequisite(s) :** University Computer Application Fundamentals

Books: <Principle and Applications of Database>

---

## < Computer Network > (3 credits) Course Description

**Course Number :** 3132100143

**Course :** Computer Network

**Credit(s) :** 3 credits, 48 hours

**Course Description :** In the course of the OSI reference model and TCP/IP protocol system as the clue, introduced computer network of each layer of the protocol and the principle of work; through the studying of this course, make students understand the current status of the computer network, and the development of new technology, master of computer network structure, work principle, theory and technology. The students in the future work and research have a certain amount of computer network background and foundation.

**Prerequisite(s) :** Introduction of Computer, Principle of Communication

Books: Computer Networks, Fourth Edition , Andrew S. Tanenbaum

---

## < Operating System > (3 credits) Course Description

**Course Number :** 3132111013

**Course :** Operating Systems

**Credit(s) :** 3 credits, 48 hours

**Course Description :** This course teaches the fundamentals of operating systems. The students will study the fundamental concepts and design principles of modern operating systems. The major content include: operating system concepts, processes and threads management, deadlocks, main memory, virtual memory, file-systems, mass-storage management, I/O systems, etc.

**Prerequisite(s) :** Introduction to computer and programming, Data structure, C/C++ /JAVA

Books: <Operating System Concepts>

---

## < Basis of Circuit and Electronics > Course Description

**Course Number :** 3122101021

**Course :** Basis of Circuit and Electronics

**Credit(s) :** ( 3 credit , 48hours )

**Course Description :** This course is opened for non-communication and ono-electronic majors. it covers the basic concepts and analytical methods of circuit analysis and electronic circuit, but it is not required the rigor of the theory. Course content is reflected the basic, refined, practical.

**Prerequisite(s) :** Mathematical Analysis, University Physics

Books: <Basis of Circuit and Electronics> Publishing House of Electronics Industry

---

## < Digital Logic and Digital System > Course Introduction

**Course Number :** 3132113020

**Course :** Digital Logic and Digital System

**Credit(s) :** 4 credits, 64 hours

**Course Description :** As the basic required course of Computer Science and Technology, Digital Logic and Digital System aim to combine the knowledge of the two aspects as the name mentioned. The course not only includes the traditional content but also high lights the systematic knowledge that keeping pace of the times. There are six chapters: Chapter1 to chapter 4—Basic Digital Logic: definition of logic function, simplification of logic function, combinational logic circuit analysis and design, application of medium scale integrated circuit, sequential logic circuit analysis and design, stored logic, etc. Chapter 5 to chapter 6—Design of Modern Digital Logic: Programmable Array Logic, Field Programmable Gate Array, Hardware Description Language VHDL, definition of digital system, etc.

**Prerequisite(s) :** Basis of Circuit and Electronics, The one who intend to take the course should be aware of the knowledge of circuit structure the way of circuit analysis, etc.

Books: <Digital Logic> Tsinghua University Press

---

## <Signals and Systems> Course Description

**Course Number :** 3122101032

**Course :** Signals and Systems

**Credit(s) :** 3 credits , 48 hours

1 credit = 16 hours on lecture, not including work or study time

**Course Description :** Signals and Systems is an important discipline basic course, focusing on the basic theory and method for certain signal 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.

**Prerequisite(s) :** Mathematics, Physics, Linear Algebra, complex functions, Fundamentals of Circuit Analysis

Books: <Signal and Systems> Higher Education Press

---

## **< The Computer Organization and Architecture > Course Description**

**Course Number :** 3132113120

**Course :** The Computer Organization and Architecture

**Credit(s) :** 5 credits, 64+16 hours

**Course Description :** This course is a professional basic courses in computer science, so that students in-depth understanding of the inner workings of the computer system, understand the concept of hierarchical structure of the computer system, and are familiar with the interface between the hardware and software, to master the basic knowledge and basic implementation of the instruction set architecture understanding of parallel computing basic concepts of to master parallel computer architecture. Mainly taught: Introduction to computer systems, algorithms and computation, storage systems, command systems, central processing unit, the bus system, peripheral devices, the I/O system. The theory and practice of learning through the curriculum, so that students master the composition of the single-processor system theory and realization, the whole concept of the clear establishment of a computer, and preliminary hardware design and debugging capabilities.

**Prerequisite(s) :** Digital logic system

1 credit = 16 hours on lecture, not including work or study time

Books: Patterson and Hennessey. Computer Organization & Design: the hardware/software Interface

---

## < Software Engineering > Course Description

**Course Number :** 3132131150

**Course :** Software Engineering

**Credit(s) :** 2 credits, 32 hours

**Course Description :** As one of the fundamental courses in computer science, software engineering focuses on the techniques for standardized and high-quality software development. The basic concepts of traditional and object-oriented software engineering methods in the process of software developing, testing and maintenance are explained in this course. The purpose of this course is to enable students to grasp the basic methods of software engineering and to apply them in the process of actual software development.

**Prerequisite(s) :** Advanced programming language

Books: <Software Engineering> Xiaofeng lu, Tsinghua University Press

---

## < Communication Networks > Course Description

**Course Number :** 3132121060

**Course :** Communication Networks

**Credit(s) :** 2 credits, 32hours

**Course Description :** There are three parts in this course. The first part introduces definitions and key technologies of communication networks, such as routing technology, switching technology, error control, congestion control, quality of service, mobility management, etc. The second part describes the principle mechanism of typical communication networks. The networks introduced in this part are as follows: Voice Communication Networks (PSTN, PLMN and No.7 Signaling Network), Data Communication Networks (LAN, WLAN and Internet), Digital Video Networks, Multimedia Communication Networks, Satellite Communication Networks and Ad Hoc. Finally, the Internet of Things (IoT) and wireless sensor networks (WSN) are introduced in the third part.

**Prerequisite(s) :** The Introduction of Network Technology, Computer Networks, Switching Technologies

1 credit = 16 hours on lecture, not including work or study time



Books: <Modern Communication Network> Posts and Telecomm Press

---

## < Fundamental of Embedded System > Course Description

**Course Number :** 3132101140

**Course :** Fundamental of Embedded System

**Credit(s) :** 2 credits, 32 hours

**Course Description :** This course is one of the basic courses to the students major in computer science and electronics. In major introduce the basic knowledge about the embedded system design, including embedded system software, embedded system design, embedded system hardware and so on. The purpose of this course is to let students understand the concepts of embedded system, the application status and development history of embedded system, the knowledge of embedded system structure, and the typical hardware structure of embedded system.

**Prerequisite(s) :** Digital system and logic design, Course Design for Microcomputer System and Interface Technique, C-Programming Fundamentals

Books: <Embedded System Hardware and Architecture> Posts and Telecomm Press

---

## < Principle of Communication Systems (A) > Course Description

**Course Number :** 3132121220

**Course :** Principle of Communication Systems (A)

**Credit(s) :** 4 credits, 64 hours

**Course Description :** This course provides the basic concept, principle and analysis method of point-to-point communication including analog communication, digital transmission, and error control techniques. The study mainly includes: the basic principle and performance analysis of typical analog modulation (DSB - SC, AM, SSB, VSB, FM); the problems in digital baseband transmission, such as the mathematical formulation of digital signal and power spectral density, inter-symbol interference, Nyquist criteria, etc.; the basic principle and performance analysis of typical digital modulation (OOK, 2, FSK and PSK, 2 DPSK, QPSK, DQPSK, OQPSK, MASK, MPSK, MQAM, MSK); Analog signal sampling, quantization and coding; And error control coding.

**Prerequisite(s) :** Circuits and Electronics Foundation, Probability Theory and Stochastic Statistics

1 credit = 16 hours on lecture, not including work or study time

Books: <Principle of Communication System> Changxin Fan, National Defense Industry Press

---

### III. Information Security Major Course

#### < Introduction to Information Security > Course Description

**Course Number :** 3132131060

**Course :** Introduction to Information Security

**Credit(s) :** 2 credits, 32 hours

**Course Description :** This course is an introductory course in information security specialty. The objective is to make the students to fully understand the basic concepts of information security, information security model, the laws, regulations and standards in China and abroad, the theories and technologies. The main contents include the concepts of cryptography, network security technology, content security technology, disaster backup and recovery technology, and information security management, etc.

**Prerequisite(s) :** None

---

#### < Modern Cryptography > Course Description

**Course Number :** 3132131080

**Course :** Modern Cryptography

**Credit(s) :** 3 credits, 48 hours

**Course Description :** Modern cryptography is one of the specialized core courses for students majoring in information security. It is an important application of mathematics in information security, combining theory and application. According to the basic security attributes of information security (confidentiality, authentication, integrity, non-repudiation, availability), the course introduces the basic concepts, development history, design principles and application scenarios of various cryptographic primitives (non-key cryptosystem, symmetric cryptography and asymmetric cryptography), as well as simple cryptographic protocols. Through the curriculum taught make students master the basic knowledge of design and analysis techniques in modern cryptography. And foster their ability to apply cryptography knowledge so that students accurately infer risks in the reality and design an effective defense system.

**Prerequisite(s) :** Mathematic Foundations of Information Security, Introduction to Information Security (or have the related knowledge of number theory, abstract algebra, probability theory, information theory and algorithmic complexity theory. )

**Books:** <Modern Cryptography> Lize Gu, Beijing University of Posts and Telecomm Press

1 credit = 16 hours on lecture, not including work or study time

---

## < Digital Contents Security > Course Description

**Course Number :** 3132131090

**Course :** Digital Contents Security

**Credit(s) :** 2 credits, 32 hours

**Course Description :** The purpose of this course is to enable students to master the technologies of digital contents security, grasp the method of protecting multimedia content through class teaching, group discussion and writing paper. Eight chapters are included, i.e. the selective encryption, robust hash, digital watermarking, digital rights management, content filtering and digital forensic. Through these chapters, students can master the concept of the digital contents security, and master the technologies such as cryptography, watermarking and rights control.

**Prerequisite(s) :** C++ Programming, Modern Cryptography.

**Books:** <Management of Digital Content> Ruzhang, BUPT Press

---

## < Network Security > Course Description

**Course Number :** 3132131100

**Course :** Network Security

**Credit(s) :** 2 credits, 32 hours

**Course Description :** This course mainly introduces the concept, technology of network security and related system. The main content includes several aspects as followed: understanding the basic concept of network security; learning related foundation of network security; understanding the principle of network attack techniques and the work mechanism of malicious code etc; studying malicious code capture and analysis technology; understanding the mainstream network security protect technology, including firewall, VPN and IDS, etc.; understanding safety related technology in communication network; understanding application security system such as WEB security, E-mail security and e-commerce security; understanding the development trend and new technology of network security.

**Prerequisite(s) :** The course adapts to majors of information security, computer science and automation. The prerequisite courses include Computer Network and Cryptology.

**Books:** <Network Security> Guoai Xu, BUPT Press

---

## < Security of Information Systems > Course Description

**Course Number :** 3132131110

**Course :** Security of Information Systems

**Credit(s) :** 2 credits, 32 hours

**Course Description :** This course deals with two topics: security principles of information systems and technical countermeasures. The former focuses on security threats with which information systems have to face as well as theories and/or models employed for description, while the latter emphasizes on security of hardware, operating systems, databases, trusted computing, etc. Contents mentioned above are arranged deliberately along the axis formed by equipment security, data security, content security and behavior security, with the purpose of guiding students to conceive security solution systematically, which is beneficial to ensure the security of information during its acquisition, storage, processing or transmission.

**Prerequisite(s) :** Operating systems, Techniques and Applications of Databases, Modern Cryptography, Network Security

Books <Theory and Technology of Information System Security>

---

## < Software Security > Course Description

**Course Number :** 3132131120

**Course :** Software Security

**Credit(s) :** 2 credits, 32 hours

**Course Description :** Topics include: basic concepts of software security; software security threats, viruses, Trojan horses, worms, malicious code, application security threats; software security testing, vulnerability scanning, application security scanning, fuzzing; software offense and defense technology, encryption and decryption software crack, dynamic debugging and disassembly; software protection technology, authentication and authorization, encryption algorithm, and secure communications.

**Prerequisite(s) :** Operating system, C++ advanced language program design /JAVA advanced language program design, Information security

---

## < Embedded System and Security > Course Description

**Course Number :** 3132131210

**Course :** Embedded System and Security

1 credit = 16 hours on lecture, not including work or study time

**Credit(s) :** 2 credits, 32 hours

**Course Description :** This course is one of the basic courses to the students major in computer science and electronics. In major introduce the basic knowledge about the embedded system design, including embedded system software, embedded system system design, embedded system hardware, the security of the embedded system and so on. The purpose of this course is to let students understand the concepts of embedded system, the application status and development history of embedded system, the knowledge of embedded system structure, the typical hardware structure of embedded system and the security of the embedded systems.

**Prerequisite(s) :** Digital system and logic design, Course Design for Microcomputer System and Interface Technique, C-Programming Fundamentals

Books : <0 day Security : analysis technology to software vulnerability>

---

## < Fault Tolerant Computing > Course Description

**Course Number :** 3132131220

**Course :** Fault Tolerant Computing

**Credit(s) :** 2 credits, 32 hours

**Course Description :** Fault tolerant computing is one of the most important basic computer research directions, which is to design a system that can recover autonomously from partial failures without affecting correctness or significantly impacting overall performance. The major contents of the course include: basic conceptions, fundamental theory and the architecture with implementation techniques, the major character of different fault-tolerant design alternatives, the current scientific difficulties with the newest research findings, and the future trend in development. The course contributes to raise the students' capacities of designing a complex dependable and secure system, and thus increase the experiences of solving the practical problems.

**Prerequisite(s) :** Computer Organization and Architecture (or Computer Organization Principles or Computer Architecture)

Books: <Principle of Fault Tolerating Computing> HIT Press

---

## < Security of Wireless Communication > Course Description

**Course Number :** 3132131320

**Course :** Security of Wireless Communication

**Credit(s) :** 3 credits, 48 hours

1 credit = 16 hours on lecture, not including work or study time

**Course Description :** As one of the professional courses in information security, *Security of Wireless Communication* focuses on the techniques of wireless communication security. The main contents include the basic concepts of the wireless communication security, theoretical foundation, authentication, encryption and key management in the mobile communication network and wireless communication network, etc. Learning through the curriculum, the students can grasp the application knowledge of cryptography in wireless communications security field, and learn the basic knowledge about how the theory and technology of information security and cryptography is put into practice.

**Prerequisite(s) :** Introduction of Information Security, Modern Cryptography

Books: <Wireless Communication Security Technologies> BUPT press Hui li

---

## < Mobile Terminal Security > Course Description

Course: Mobile Terminal Security

**Course No.:** 3132131360

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

**Preparatory Course:** Network security, software security, cryptography

**Course Description:**

This course introduces the current situation of mobile terminal security, analyze its existing security threats, and introduces the coping strategies and methods. The priorities of this course include: mobile technology architecture and application development technology, mobile terminal operating system model and security mechanisms, the principles of implementation of mobile application software and the reverse analysis, the flaws and threats of mobile network protocol, the prevention theory and the identification analysis of mobile malicious code, and the protection techniques of mobile terminal security . This course combines the course teaching with the hands-on experience by several analyses of real cases and experiments such that college students can grasp the knowledge of mobile terminal security and have the ability of analyzing several mobile terminal security.

Books:<Mobile Terminal Security> BUPT press

1 credit = 16 hours on lecture, not including work or study time

---

## < Analysis of Network Security > Course Description

**Course Number :** 3132131190

**Course :** Analysis of network security

**Credit(s) :** 2 credits, 32 hours

**Course Description :** This course further explains the theory of network attack and defense and also demonstrates the operation of the network attack and defense. Based on the explanation, this course also deeply introduces the network security assessment and the audit. The main content including: the theory of network scanning, the operation of classical net scanning software; network vulnerabilities mining; Trojan hiding and detection; network cheating and defense; DDOS attack and defense; introduction of botnets, detection of botnets; introduction of honeypot and honeynet; network security assessment; network security audit.

**Prerequisite(s) :** Network Security; Modern Cryptography; Firewall; Intrusion Detection

---

## < Cryptanalysis > Course Description

**Course Number :** 3132131310

**Course :** Cryptanalysis

**Credit(s) :** 3 credits, 48 hours

**Course Description :** The contents of cryptology mainly cover cryptography design and cryptanalysis, and both of them are reciprocity and promoting the development of cryptology. This optional course is intended for the college senior students who are major in information security or related. With the purpose to help students mastering the basic ideas, methods and techniques of evaluating the security of cryptographic algorithms and information systems, this course will introduce modern cryptanalysis from methods based on mathematics, theory of provable security, as well as issues related to physical implementations.

**Prerequisite(s) :** Mathematics Foundations for Information Security, Modern Cryptography

**Books:** Algebraic Cryptanalysis, Springer-Verlag, 2009

---

## < Information Security Management > Course Description

**Course Number :** 3132131250

**Course :** Information Security Management

1 credit = 16 hours on lecture, not including work or study time



**Credit(s)** : 2 credits , 32 hours

**Course Description** : The course is aimed at introducing the basic knowledge and skills of information security management. It covers the main content of information security management system (ISMS) including the basic techniques of information security, information security risk evaluation, physical security, information system Operation and maintenance, ranked protection, Disaster Recovery and Backup, testing and certification, and information security standards and laws. After the course, the students will have the preliminary ability of using various practical and theoretical tools to performing various types of security risk analysis and carry out the task of information security management.

**Prerequisite(s)** : Modern Cryptography, Information System Security

Books: <Information Security Management> Guoai Xu, BUPT press, 2011.11

---

## < Cryptographic Engineering > Course Description

**Course Number** : 3132131340

**Course** : Cryptographic Engineering

**Credit(s)** : 2 credits, 32 hours

**Course Description** : Cryptographic engineering is aimed at major in information security. Firstly, this course introduces some base concept and basic realization in message security, key agreement and key management. Secondly, this course includes: introduction of cryptography engineering, block cipher, message authentication, hash functions, random number, public key cryptography, PKI and their realizations and standards in engineering fields. Finally, students learn mainly basic concepts, the application technique of cryptographic algorithm and realization of algorithm in C/C++/Java etc., the students will be involved in the development of cryptographic engineering, in order to accumulate the practical experience of project for future employment too.

**Prerequisite(s)** : Linear Algebra , C Programming, Information Security, Modern Cryptography

Books: Cryptography Engineering: Design Principles and Practical Applications Kohno, Tadayoshi, JOHN WILEY & SONS INC

---

## < Information Theory and Coding > Course Description

**Course Number** : 3132131140

**Course** : Information Theory and Coding

1 credit = 16 hours on lecture, not including work or study time

**Credit(s) :** 2 credits, 32 hours

**Course Description :** This course is a professional basis for students whose majors are information security, computers, electronic information science and technique. In this course, the students know the model of communication channel, the concept of entropy and information, grasp the theories of channel coding and channel capacity; grasp the methods of coding and decoding for linear block code, understand the concepts of generation matrix, odd check matrix, the minimal distance, the abilities of check and correct errors; understand cyclic code, BCH code, tree, state graph and polynomial expressions of convolution code; understand the nearest international developments. This course cultivates the abilities of theory deduction and logical thought. It helps the students to have a good basis for the solutions of many engineering problems in the fields of information security and computers, etc.

**Prerequisite(s) :** Probability Theory, Linear Algebra

Books: 《Introduction to Coding Theory》 Springer-Verlag J. H. VAN LINT 2003

---

## **< Disaster Tolerance Technology of Information System > Course Description**

**Course Number :** 3132131260

**Course :** Disaster Tolerance Technology of Information System

**Credit(s) :** 2 credits, 32 hours

**Course Description :** This course covers the basic principles and techniques in information systems disaster recovery, as well as the basic implementation technology of information systems disaster recovery. This course contains the main elements: the concept of information system disaster recovery, data disaster recovery technology, including data storage, data backup and recovery, local data disaster recovery, remote data disaster recovery; system disaster recovery technology, including spatial and temporal redundancy, system replication, virtualization technology; the business disaster recovery technology, including failure detection, service migration technology; disaster recovery planning and management of information systems.

**Prerequisite(s) :** Computer Network, Information Security

Books: <Principle and application of Disaster Tolerance Technology of Information System>

---

## **< Network Traffic Monitoring and Control > Course Description**

**Course Number :** 3132131350

1 credit = 16 hours on lecture, not including work or study time

**Course :** Network Traffic Monitoring and Control

**Credit(s) :** 2 credits, 32 hours

**Course Description :** As the explosive growth of Internet data and traffic, the network traffic monitoring and control has become a crucial problem. The objective of this course is to popularize the network traffic monitoring & control knowledge among college students. This course will mainly study the basic concepts of network, abnormal traffic attack (attack for protocols of different level, scanning, Denial of Service, network worm attack, etc.), single-computer traffic monitoring (Wireshark and Sniffer), Winpcap, MRTG, xFlow, IPFIX, network monitoring hardware, network business analysis, user behavior analysis, network traffic control, etc.

**Prerequisite(s) :** Computer Network

---

## **< Multimedia Technology and Applications > Course Description**

**Course Number :** 3132100150

**Course :** Multimedia Technology and Applications

**Credit(s) :** 2 credits, 32 hours

**Course Description :** This course includes 6 parts: 1) definition of multimedia, key technologies, present state and developing trend, 2) multimedia data compression coding technologies and the current International standards, 3) obtaining and processing technologies of audio, image, and video, 4) Hardware/software system architecture of multimedia computer, 5) multimedia communication, and 6) experiments. This course focuses on understanding the basics of multimedia, promoting the ability to analyze problems, strengthening practical application, and training the students' abilities to solve problems.

**Prerequisite(s) :** Advanced Mathematics

---

## IV. Design Project - Major

### < Programming Practice > Course Description

**Course Number :** 3132102010

**Course :** Programming Practice

**Credit(s) :** 2 credits, 32 hours

**Course Description :** This course is the continuation of < Introduction to Computing and How to Program > . Given the actual problems of certain degree of difficulty and scale, students are divided into several groups to analyze the problems, design the solution and realize the program. Through the practical process, students can understand the concepts of software engineering, grasp the basic problem-solving method and master standardized software development process. This course develops the capability of abstraction, modeling, program analysis, program design and team collaboration of students.

**Prerequisite(s) :** Introduction to Computing and How to Program

---

### < Communication Cognitive Internship > Course Description

**Course Number :** 3132102050

**Course :** Communication Cognitive Internship

**Credit(s) :** 1 credit, 16 hours

**Course Description :** This course through Program control exchange technology, network switching and routing configuration technology, VOIP technology, soft-switching technology and information security technology demo, a preliminary and general working principle and application technology of the next generation network communication system built emotional understanding, good basic knowledge of reserves to learn further professional courses.

**Prerequisite(s) :** None

---

### <College Physics Laboratory> Course Description

**Course Number :** 3412130030

**Course :** College Physics Laboratory

**Credit(s) :** 2 credits, 32hours

1 credit = 16 hours on lecture, not including work or study time

**Course Description :** Physics Laboratory is a compulsory course that is useful to improve the students' experiment skills and cultivate the scientific methods of thinking. It is a beginning of the systemic and scientific training their experimental methods and skills for the undergraduate students. By doing physical experiments, students will be acquainted with the course requirements, the experimental processes, the basic knowledge about error theory, and the ways to accomplish an eligible report. The course offers a wide range of class-tested experiments, including fundamental experiments, comprehensive and designing experiments, and innovative experiments. These experiments can effectively improve the students' operation capabilities and the abilities to discover and solve problems. The course also provides some experiments that are based on the combinations of information technology, applications, and physics to open up horizons and broaden thinking.

**Prerequisite(s) :** Advanced Mathematics 、 University Physics (I)

---

### < Practice of Large Program Design > Course Description

**Course Number :** 3132102150

**Course :** Practice of Large Program Design

**Credit(s) :** 3 credits, 48 hours

**Course Description :** This course puts the object-oriented programming methodology, analysis and design of large programs, into practice. Students can experience the entire process of large software, which can develop students' practical programming capabilities, and independent analysis and problem-solving abilities.

**Prerequisite(s) :** Data Structure, C++ Programming, JAVA Programming

---

### < Experiment of Digital Contents Security > Course Description

**Course Number :** 3132102180

**Course :** Experiment of Digital Contents Security

**Credit(s) :** 1 credits, 16 hours

**Course Description :** The course uses a variety of validation, design experiments, to make students in-depth understand the basic concepts of digital content security, basic theory; understand and learn how to use some kind of the mature market commercial digital content security software, master digital content security related technologies:

1 credit = 16 hours on lecture, not including work or study time

Cryptography, digital watermarking, digital rights management, content filtering and other basic theory and skills, develop the students to identify problems, recognize problems, analyze problems and solve problems.

**Prerequisite(s) :** Mathematic Foundations of Information Security, Modern Cryptography

---

## < Experiments on Security of Information Systems > Course Description

**Course Number :** 3132102200

**Course :** Experiments on Security of Information Systems

**Credit(s) :** 1 credits, 16 hours

**Course Description :** The course consists of 7 elementary experiments, including smartcard-based authentication, security of operating systems, security of databases, access control, fault-tolerance techniques of disks, auditing, forensics, and a composite experiment, in order to enhance students' capacity of both analysis and operation.

**Prerequisite(s) :** Security of Information Systems, Modern Cryptography, Firewalls, IDS, C++ Programming Language

---

## < Network Security Experiment > Course Description

**Course:** Network Security Experiment

**Course No.:** 3132102190

**Credit / Course Hours:** 1 credits, 16 hours

**Course Description:** Network Security Experiment is a Professional experiment course.

Through the learning and practice of the course, it aims to consolidate the professional knowledge of network security, and train the practical ability in analyzing, practicing and programming in the direction of network security.

**Preparatory Course:** Computer Network, Introduction to Information Security, Network Security

1 credit = 16 hours on lecture, not including work or study time

---

## < Software Security Experiment > Course Description

**Course Number :** 3132102210

**Course :** Software Security Experiment

**Credit(s) :** 1 credit, 16 hours

**Course Description :** Software security experiment is a professional experimental course, the aim is to teach the information security professional knowledge; enable students to integrate theory with practice, train them in software security technical ability and practical skills, and strengthen the understanding of the basic theory of software security. The main contents include: software security threats (virus, Trojan, malicious code), software security testing (software vulnerability scanning tools, Fuzzing testing tools), software security experiment (software compilation tools, software cracking experiment), software security vulnerabilities ( buffer overflow vulnerability, shellcode).

**Prerequisite(s) :** Operating system, C++ advanced language program design /JAVA advanced language program design, Information security

---

## < Comprehensive experiment of information security > Course Description

**Course Number :** 3132102220

**Course :** Comprehensive experiment of information security

**Credit(s) :** 1 credit, one week

**Course Description :** Comprehensive experiment of information security is a comprehensive experiment which requires students to design. Experiment's content includes 4 main aspects: network environment, network monitoring experiment, server configuration, network penetration test experiment. In the course, the students will use the network and security hardware equipment to build network attack and defense environment. And they will design and complete the network attack and defense experiments in the environment. Based on the previous courses of information security, network security, network traffic monitoring, network security analysis, software security analysis, the students will improve their ability of practical application on information security technology.

**Prerequisite(s) :** Information security, information system security, network security,

1 credit = 16 hours on lecture, not including work or study time

## < Information Security Programming and Development

### Pratcice > Course Description

**Course Number :** 3132102230

**Course :** Information security Programming and Development Practice

**Credit(s) :** 1 credit, 16 hours

**Course Description :** The course of Information security Programming and Development Practice includes network security concepts, network security programming, network security scanning( such as ICMP scanning, TCP scanning, SYN scanning, FIN scanning, FIN scanning, NULL scanning ), network protocol Analysis, CryptoAPI security service programming, OpenSSL programming, OpenSSL application and its advanced programming, network security advanced application its programming( network security monitoring, network security Vulnerability scanning, network security protection), this course will lead students to a higher level of network security programming, and can make good progress and innovations in network security programming and practice, and this course can help students build good research innovation and practice training.

**Prerequisite(s) :** C/C++ Programming, Computer network, information security introduction.

---