

Curricula Syllabus for International Postgraduates

(Taught in English)

留学研究生课程大纲

2018

Beihang University, Beijing, China

September, 2018

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Course Catalogue for International Postgraduates

(School of Materials Science and Engineering)

编号 No.	英文课程名称 Course Title	中文课程名称 Course Title	学时 Hours	学分 Credits	开课季节 Semester	任课教师 Lecturer
013301	Advanced Characterization and Analysis Methods of Materials	高等表征及材料分析方法	48	3	Spring	SONG Yujun
013302	Physical Chemistry	物理化学	48	3	Spring	Xiaofang Bi
013303	New Materials	新材料进展	48	3	Fall	LIU Pei-ying, LI Rui-xing
013502	Advanced Heat Treatment Technology	高等热处理技术	48	3	Fall	LIU Pei-ying
013504	Failure Analysis of Materials	失效分析	48	3	Spring	WU Sujun, Zhang zheng

Course Introduction

Code	013301	Teaching Hours	48
Course	Advanced Characterization and Analysis Methods of Materials		
Key Words	modern physics techniques; electron microscopy; atomic force microscopy		
Purpose and Role of the Course	<p>The advanced characterization methods of materials based on modern physics techniques are presented, including X-ray crystallography, X-ray diffraction, X-ray absorption (EXAFS and XANES), electron microscopy (SEM, TEM), surface and element analysis (EDS, XPS, WDXS, EPMA), atomic force microscopy, FTIR, and so on. Their basic physical principles will be introduced and the instrumentation of these methods will be briefly described. Some typical examples in materials characterization using these methods will also be included during presentation.</p> <p>Introduce the intrinsic physical principles of modern characterization and surface analysis of materials. The experimental methods and analysis procedures for each methods are presented with typical example description. These methods include X-ray crystallography, X-ray diffraction, X-ray absorption (EXAFS and XANES), electron microscopy (SEM, TEM), surface and element analysis (EDS, XPS, WDXS, EPMA), atomic force microscopy, FTIR. Students should master the routine analysis methods of crystal structures of materials and the basic principles for each characterization methods, and then know how to characterize the microstructures, crystal structures, surface morphologies, compositions and their related chemophysical properties of specific materials.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction: <ol style="list-style-type: none"> 1.1 Classification of materials 1.2 Atomic structure and interatomic bonding 1.3 Relationship of structures, properties and performances of materials 1.4 Advanced characterization methods of materials based on the progress of modern physics 2. Structure of crystalline solids <ol style="list-style-type: none"> 2.1 Lattice and Crystal structure 2.2 Unit cells and crystal systems 2.3 Crystallographic directions and planes 2.4 Closed-packed crystal structures 2.5 Specific crystal structures: quasicrystal, nanocrystals and amorphous crystals 3. X-Ray Diffraction <ol style="list-style-type: none"> 3.1 Principle of X-ray generation 3.2 Nature of X-ray 3.3 X-ray sources for Crystallographic Studies 3.3 X-ray diffraction principle in crystal structure analysis 3.4 Mathematical calculation for specific crystal structures based on X-ray diffraction 3.5 Analytical methods for specific crystal structures based on X-ray diffraction 3.6 Identification of Chemical Compound by X-ray diffraction 4. X-ray Diffraction by Crystal <ol style="list-style-type: none"> 4.1 Diffractometer for crystal structure characterization 4.2 The formation mechanism of the focal X-ray spots 		

- 4.3 X-ray wave Interference and Bragg's Law
- 4.4 Destructive and constructive wave interference in typical crystal structures
- 4.5 X-ray diffraction pattern analysis in Real Samples
- 4.6 Methods and procedures for identification of crystal phases
- 4.7 Computer asisted analysis of X-ray diffraction in real samples
- 4.8 Other application of X-ray diffraction: grain size identification, strain analysis, etc.
- 5. X-ray absorption for structure characterization of materials
 - 5.1 Fundamental in X-ray absorption spectroscopy
 - 5.2 Principle of XANES (X-ray Absorption Near Edge Structure)
 - 5.3 Principle of EXAFS (Extended X-ray Absorption Fine Structure)
 - 5.4 X-ray sources for XANES and EXAFS
 - 5.5 Capibilities of EXAFS and XANES
 - 5.6 Typical examples in crysal structure analysis by XANES and EXAFS
- 6. Surface analysis and composition identification techniques
 - 6.1 Introduction in surface analysis of materials
 - 6.2 X-ray photoelectron spectroscopy (XPS)
 - 6.3 Energy dispersive X-ray spectroscopy (EDS)
 - 6.4 Wide angle X-ray scattering (WAXS)
 - 6.5 Electron probe micro-analyzer
 - 6.6 Other related methods:UPS, PES, AES, ZEKE
- 7. SEM and HR-SEM
 - 7.1 Principle of SEM: secondary electrons and back-scattering electrons
 - 7.2 Contrast formation by SEM
 - 7.3 Characterization of microstructures by secondary electrons
 - 7.4 X-ray composition mapping using back-scattering electrons
 - 7.5 Typical sample analysis obtained by SEM
- 8. TEM and HR-TEM
 - 8.1 Capibilities of TEM and HR-TEM
 - 8.2 Principle of TEM: transmitted, diffracted and inelastically scattered electrons
 - 8.3 Components and instrumentation of TEM
 - 8.4 Sample preparation
 - 8.5Image formation and contrast by TEM
 - 8.6 High resolution TEM
 - 8.7 Selected area electron diffraction (SAED) and Nanobeam electron diffraction (NBED)
 - 8.8 Typical sample analysis and interpretation of TEM image, SAED and NBED
- 9. AFM and STM
 - 9.1 Principle of aomic force microscope (AFM) and scanning tunnelling microscopy (STM)
 - 9.2 Limits and capabilities of AFM
 - 9.3 Typical examples in surface morphology characterization by AFM
 - 9.4 Limits and capabilities of STM
 - 9.5 Typical examples in surface morphology characterization by STM, atomic resolution
- 10 FTIR
 - 10.1 Background and theory of Infrared spectroscopy
 - 10.2 Limits and capabilities of IR

	<p>10.3 Why Fourier Transform IR (FTIR)</p> <p>10.3 Typical chemical bond analysis by FTIR</p> <p>10.4 Attenuated IT for surface chemical composition analysis</p> <p>11. Recent progress in advanced characterization of Materials</p> <p>11.1 Comparison in elastic and inelastic X-ray scattering techniques</p> <p>11.2 X-ray focusing lens for high resolution X-ray imaging techniques</p> <p>11.3 Other methods for crystal structures characterization and composition analysis</p>
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	1. Homework 30% 2. Final exam (final report) 70%
Pre-request Course	Knowledge of basic crystal structure of materials, Materials Science and Engineering: an Introduction, Introduction in materials crystal structure characterization, Fundamental in X-ray diffraction, Fundamental physics for undergraduates, General chemistry for undergraduates of non-chemistry major
References	<p>[1] B D Cullity and S R Stock, Elements of X-ray diffraction, Addison-Wesley publication, Prentice-Hall, Inc. New Jersey, USA, 2002, 3 rd Ed.</p> <p>[2] Czichos, Horst; Saito, Tetsuya; Smith, Leslie M. (Eds.), Handbook of Materials Measurement Methods, Springer, German, 2006.</p> <p>REFERENCES</p> <p>[1] X-ray Absorption: principles, applications and techniques of EXAFS, SEXAFS and XANES, a cura di D.C. Koeningsberger, R. Prins, Wiley 1988</p> <p>[2] Koichi Nishikida, Selected Applications of Modern FT-IR Techniques, CRC, 1st Ed. 1996.</p> <p>[3] Ray F. Egerton, Physical Principles of Electron Microscopy: An Introduction to TEM, SEM, and AEM, Springer, German, 2005, 1st Ed.</p>

Course Introduction

Code	013302	Teaching Hours	48
Course	Physical Chemistry		
Key Words	Laws of chemical thermodynamics; multicomponent system; phase equilibria		
Purpose and Role of the Course	<p>The course is for students majoring in materials science and engineering. The contents cover the 1st, 2nd and 3rd Laws of chemical thermodynamics; multicomponent system; phase equilibria; reaction equilibria; elementary electrochemistry.</p> <p>This course is an introduction to chemical thermodynamics with applications to gases, solutions and phase equilibria to provide a firm foundation for understanding the physical principles that govern chemical systems.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction and the First Law 2. Thermochemistry 3. The Second Law of Thermodynamics Free energy and Entropy 4. Phase Transitions 5. Chemical Potential Reactions in the Gas Phase 6. Chemical Reactions in Solution 7. Solution Phenomena Solubility and Colligative Properties 8. Electrochemistry 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing homework assignments.		
Test and Examination	Final exam (open book) 100%		
Pre-request Course	None		
References	J. William Moncrief and William H. Jones, Elements of Physical Chemistry, Addison-Wesley Pub. Co. 1977		

Course Introduction

Code	013303	Teaching Hours	48
Course	New Materials		
Key Words	metallic structural; superalloys; titanium alloys		
Purpose and Role of the Course	<p>Advanced materials and their application will be introduced in this course. Two category, functional and metallic structural, materials are introduced, which are advanced ceramics, high performance structural materials as ultra high strength steels, superalloys, titanium alloys and high strength aluminum alloys.</p> <p>The goal of this course is to make the learner master basic knowledge of advanced materials as well as their application and development.</p> <ol style="list-style-type: none"> 1. Distinguish various classes of advanced ceramics 2. Interpret new terms and information on advanced ceramics 3. Identify various advanced structure ceramics and functional ceramics, their processing, properties and new applications 4. Distinguish advanced ceramics suitable for application at special conditions 		
Main Chapters and Teaching Hours	<p>Part one:</p> <ol style="list-style-type: none"> 1. Basics <ol style="list-style-type: none"> 1.1 Introduction 1.2 What is ceramics about 1.3 Classifications for solids 1.4 Stoichiometric compound & nonstoichiometric compound 2. Manufacture of Ceramic Components <ol style="list-style-type: none"> 2.1 The materials selection process 2.2 Advanced ceramics 2.3 Methods of powder synthesis 2.4 Powder shape-formin 2.5 Sintering 3. Application of Ceramics <p>Part two:</p> <ol style="list-style-type: none"> 1. Introduction: <ol style="list-style-type: none"> 1.1 New materials development 1.2 New materials application 2. High performance structure materials <ol style="list-style-type: none"> 2.1 High strength steels 2.2 High strength light alloys, aluminum\magnesium\titanium alloys 2.3 Superalloys 		
Teach Method	<p>The course is given in the form of class lectures, and students are expected to further grasp the contents through doing study assignments and extracurricular reading, class discussion is encouraged.</p>		

Test and Examination	1. Study assignments 40% 2. Final exam (open book) 60%
Pre-request Course	Fundamental Materials Science
References	[1] R. M. German, Sintering theory and practice; John Wiley & sons: New York 1996 [2] W. D. Kingery, H. K. Bowen, D. R. Uhlmann, Introduction to Ceramics, John Wiley & sons: New York 1976 [3] Michel W. Barsoum, Fundamentals of ceramics, McGraw-Hill Companies, Inc. Singapore 1997

Course Introduction

Code	013502	Teaching Hours	48
Course	Advanced Heat Treatment Technology		
Key Words	Microstructures; metallic materials; heat treatment technology		
Purpose and Role of the Course	<p>The major focus of this course is on Heat Treatment Technology applied in modern industry, which includes heat treatment of high strength steels, aluminum alloys, titanium alloys and superalloys. Solid phase transformation laws as the basic knowledge is also presented.</p> <p>The course is to make the learner master the relationship between microstructures and mechanical properties of metallic materials and the practical heat treatment technology. It is compulsory to students in materials engineering orientation.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction: Heat treatment <ol style="list-style-type: none"> 1.1 Significance of heat treatment 1.2 Application and development of heat treatment 2. The fundamental theories of Heat Treatment <ol style="list-style-type: none"> 2.1 Lows to solid phase transformations and microstructure transformation 2.2 Lows to Grain and structure refining 2.3 Interfaces problems 2.4 Precipitates and precipitation strengthening 3. Heat Treatment Technology <ol style="list-style-type: none"> 3.1 High strength steels 3.2 High strength aluminum alloys 3.3 Titanium alloys and superalloys 4. Applications of some advanced techniques <ol style="list-style-type: none"> 4.1 Vacuum technique 4.2 Surface modification 4.3 Thermomechanical treating 4.4 Others 		
Teach Method	<p>The course is given in the form of class lectures, and students are expected to further grasp the contents through reading reference materials and doing homework assignments.</p>		
Test and Examination	1. Homework 40%	2. Final exam (open book)	60%
Pre-request Course	Basic knowledge of physical metallurgy, engineering materials and mechanical properties of materials are necessary.		
References	<p>[1] Brooks, Charlies R, Heat Treatment of ferrous alloys, McGraw-Hill Press, 1979</p> <p>[2] Brooks, Charlies R, Heat treatment, structure and Properties of Nonferrous Alloys, AMERICAN SOCIETY FOR MATERIALS MATALS, 1982</p> <p>[3] M.A.Grossmann, E.C.Bain, Principles of Heat Treatment, AMERICAN SOCIETY FOR MATERIALS, Mats Park, Ohio, 5th,</p>		

Course Introduction

Code	013504	Teaching Hours	48
Course	Failure Analysis of Materials		
Key Words	macro-Observation; metallographic observation; micro-fracture analysis		
Course Description	Courses about failure analysis. The significance, basic concepts, steps, methods and tools of failure analysis were introduced together with failure case examples.		
Objective of the Course	This is an optional course for oversea students, given in English for a total of 48 hours. Through the study of this course, students should understand the significance of failure analysis, and should know the basic steps, methods and tools of failure analysis as well as mechanism of fracture failure.		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction: Concepts, characteristics, purpose, role and significance of fracture failure 2. Basic Procedures <ol style="list-style-type: none"> 2.1 The protection, investigation and information gathering of scene of action, protection of failure parts, macro-Observation and analysis of broken pieces 2.2 Principle of non-destructive testing and analysis 2.3 Destructive test, metallographic observation and micro-fracture analysis 3. Tools of the Trade <ol style="list-style-type: none"> 3.1 Optical microscope, SEM, TEM and sample preparation 3.2 X-ray analysis, stereomicroscope 4. Mechanical Aspects <ol style="list-style-type: none"> 4.1 Review of mechanical basis 4.2 Brittle fracture 4.3 Ductile fracture 4.4 Fatigue fracture and others 5. Fracture Mechanisms <ol style="list-style-type: none"> 5.1 Twin, slip and Cleavage 5.2 Intergranular fracture and ductile fracture 5.3 Fatigue fracture 5.4 Others 6. Fracture Modes: Tension, torsion, bending and fatigue 7. Crack Initiation and Propagation: Analysis of fracture characteristic and propagation path, fracture analysis 8. Case Studies 		

Teach Methods	The course is given in English in the form of class lectures.
Test and Examination	1. Class performance 30% 2. Final exam 70%
Pre-request Course	The knowledge of physical metallurgy, mechanical properties of materials
References	[1] <i>Practical Analysis of mechanical failure</i> , Zhang Dong, National Defense Industry Press [2] <i>Understanding How Components Fail</i> , D. J. Wulpi, American Society for Metals [3] English courseware prepared by teachers according to textbooks and papers and their research results.

Course Catalogue for International Postgraduates

(School of Electronic and Information Engineering)

编号 No.	英文课程名称 Course Title	中文课程名称 Course Title	学时 Hours	学分 Credits	开课季节 Semester	任课教师 Lecturer
023503	Stochastic Process Theory	随机过程理论	52	3	Spring	Xu Huaping
023507	Advanced Electromagnetic Theory	高等电磁场理论	48	3	Fall	Yan Zhaowen
023508	Computational Electromagnetic	计算电磁学	48	3	Fall	Yan Zhaowen
023509	Microwave Engineering	微波工程	48	3	Fall	ZHANG Yan
023511	Principles of Communications and Communication Networks	通信和通信网络原理	48	3	Spring	LIU Kai
023513	Satellite Navigation	卫星导航	36	2	Fall	Qin Honglei
023514	Fundamentals of optical communications	光纤通信	48	3	Fall	ZHENG Zheng
023523	Synthetic experiment of fiber optic communication & signal process	光通信与信号处理综合实验	18	1	Fall	Yan Zhaowen
023524	Engineering Electromagnetic Compatibility	电磁兼容技术基础与应用	48	3	Fall	Yan Zhaowen
023525	Cryptography Network Security-Principles and Practices	密码学与网络安全	32	2	Fall	LIU Jianwei
023527	Signal Integrity: Simplified	信号完整性分析	48	3	Fall	Yan Zhaowen
023532	Synthetic experiment of electromagnetic field & wireless technology	电磁场与无线技术综合实验	18	1	Fall	Yan Zhaowen
023506	Antenna Theory and Design	天线理论与设计	32	2	Fall	Wang Junjun
023504	Modern Digital Communications Technology	现代数字通信技术	48	3	Fall	Gao Qiang

Course Introduction

Code	023503	Teaching Hours	52
Course	Stochastic Process Theory		
Key Words	Stochastic Processes; linear transformation; random process		
Purpose and Role of the Course	<p>This course is the basic course of Electronic Engineering major. It mainly introduces the elementary concepts and theory of Stochastic Processes, the basic theory of linear transformation of Stochastic Processes, and several classic types of random process including Gaussian Process, Narrow-band Process, Poisson Process and Markov Process. It is focused how to research the statistics of random processes from distribution function and moments. Considering the practical requirements, the first two order statistics are mainly introduced.</p> <p>The purpose of the course is to help the students to master the concepts, properties and methods of stochastic processes, know well the definition and properties of several classic processes such as Gaussian process, narrowband process, Poisson process and Markov process, understand the basic knowledge of processing stochastic problems. In addition, it builds solid theory foundation for future courses including Theory of Information, Image Processing and Stochastic Signal Processing.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. probability and random variable (4 hours) <ol style="list-style-type: none"> 1.1 Probability (master) 1.2 Random Variable and Distribution Function (master) 1.3 Expected Value (master) 1.4 Characteristic Function (understand) 2. Stochastic Processes (6 hours) <ol style="list-style-type: none"> 2.1 Introduction (master) 2.2 Stationary Process (master) 2.3 Ergodicity (master) 2.4 Spectral Density (master) 2.5 White Noise Process (master) 2.6 Orthogonal Increment Process (understand) 3. Linear Transform of Stochastic Process (8 hours) <ol style="list-style-type: none"> 3.1 Introduction (master) 3.2 Mean Square Differential and Integral (master) 3.3 Impulse Response Method and Spectral Method for Linear Transform (understand) 3.4 Mutual Correlation and Mutual Spectral Density of Joint Stationary Process (master) 3.5 White Noise Passing Linear System (understand) 4. Narrowband Process (6 hours) <ol style="list-style-type: none"> 4.1 Introduction (master) 4.2 Denoting Certain Signal via Complex Signal (master) 4.3 Hilbert Transform (know well) 4.4 Complex Stochastic Process (understand) 4.5 Expected Value of the Stationary Narrowband Process (know well) 5. Gaussian Process (12 hours) <ol style="list-style-type: none"> 5.1 Multi-dimensional Gaussian Random Variable (master) 		

	<p>5.2 Gaussian Process (master)</p> <p>5.3 Narrowband Stationary Gaussian Process (master)</p> <p>5.4 Narrowband Gaussian Process plus Random Phase Sine Wave (understand)</p> <p>5.5 Wiener Process (understand)</p> <p>6. Poisson Process (6 hours)</p> <p>6.1 Introduction (master)</p> <p>6.2 Arrival Time, Arrival Time Interval (master)</p> <p>6.3 Conditional Distribution of Arrival Time (know well)</p> <p>6.4 Nonhomogeneous Poisson Process (understand)</p> <p>7. Markov Process (10 hours)</p> <p>7.1 Markov Chain (master)</p> <p>7.2 Markov Serial (master)</p> <p>7.3 Numerable state Markov Process (master)</p> <p>7.4 Continuous Markov Process (understand)</p>
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments and experiments.
Test and Examination	1. Homework 20% 2. Experiments 30% 3. Projects or Exam 50%
Pre-request Course	Knowledge of probability theory, basic matrix analysis, continuous and discrete time signal and systems analysis, Fourier transforms
References	<p>[1] A. Papoulis, Probability, Random Variables, and Stochastic Processes, McGraw-Hill Press, 3rd Ed, 1991</p> <p>[2] Edward P. C. Kao, "An Introduction to Stochastic Processes", China Machine Press, 2003</p>

Course Introduction

Code	023507	Teaching Hours	48
Course	Advanced Electromagnetic Theory		
Key Words	electromagnetic wave; transmission line theory; radiation and antenna theory		
Purpose and Role of the Course	<p>This course is used for advanced graduate students. It is about electromagnetic wave theory. The topics essential to the understanding of electromagnetic waves are selected and presented. Chapter 1 presents fundamental laws and equations for electromagnetic theory. Chapter 2 is devoted to the treatment of transmission line theory. Time-harmonic fields are introduced in Chapter 3 to study propagation, reflection, transmission, guidance, and resonance of electromagnetic waves. Starting with Čerenkov radiation, we study radiation and antenna theory in Chapter 4. Chapter 5 then elaborates to the various theory and limiting cases of Maxwell's theory important to the study of electromagnetic wave behavior. Scattering by spheres, cylinders, rough surfaces, and volume inhomogeneities are treated in Chapter 6. In Chapter 7, we present Maxwell's theory from the point of view of Lorentz covariance in accordance with the principle of special relativity.</p> <p>Grasp a unified macroscopic theory of electromagnetic waves in accordance with the principle of special relativity from the point of view of the form invariance of the Maxwell equations and the constitutive relations.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Constitutive Relation, Time-average Poynting Power Vector 2. Plane Wave Solutions, Phase Velocity and Group Velocity, kDB System 3. Plane Waves in Uniaxial Media 4. Plane Waves in Gyrotropic Media, Plane Waves in Bianisotropic Media 5. Phase Matching, Reflection and Transmission at a Plane Boundary, Reflection and Transmission by a Layered Medium (I) 6. Reflection and Transmission by a Layered Medium (II), Guidance by Conducting Parallel Plates 7. Cylindrical Rectangular Waveguide, Cylindrical Circular Waveguide, Resonance 8. Čerenkov Radiation, Dyadic Green's Functions, Radiation Field Approximation 9. Hertzian Electric Dipole, Hertzian Magnetic Dipole, Antenna Array 10. Equivalence Principle, Extinction Theory 11. Duality and Complementarity, Huygens' Principle, Fresnel and Fraunhofer Diffraction 12. Reaction and Reciprocity, Quantization of Electromagnetic Waves 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	1. Homework	20%	2. Final exam (open book) 80%
Pre-request Course	Knowledge of Advanced Mathematics, College Physics and Electromagnetic Field Basis		
References	<p>[1] JIN AU KONG. Electromagnetic Wave Theory, Higher Education Press, 2002</p> <p>[2] Roger F.Harrington. Time-Harmonic Electromagnetic Fields. IEEE Press, 2001</p>		

Course Introduction

Code	023508	Teaching Hours	48
Course	Computational Electromagnetic		
Key Words	Matlab; Mathcad; numerically analyze		
Purpose and Role of the Course	<p>This course presents the numerical methods of electromagnetic field. It is intended for seniors or graduate students. The main requirements for students taking the course are introductory EM courses and a knowledge of a high-level computer language, preferably FORTRAN or C. Software packages such as Matlab and Mathcad may be helpful tools. Although familiarity with linear algebra and numerical analysis is useful, it is not required.</p> <p>Grasp the finite difference time domain formulations, the finite element method and the moment method of electromagnetic field. In this course, three major objectives are borne in mind. First, the course is intended to teach students how to pose, numerically analyze, and solve EM problems. Second, it is designed to give them the ability to expand their problem solving skills using a variety of available numerical methods. Third, it is meant to prepare graduate students for research in EM. The aim throughout has been simplicity of presentation so that the text can be useful for both teaching and self-study.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Fundamental Concepts 2. Analytical Methods 3. Finite Difference Methods 4. Variational Methods 5. Moment Methods 6. Finite Element Method 7. Transmission Line Matrix Method 8. Monte Carlo Methods 9. Method of Lines 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	1. Homework 40% 2. Final exam (open book) 60%		
Pre-request Course	Knowledge of electromagnetic field basis, linear algebra and numerical analysis.		
References	<p>[1] Daniel G. Swanson, Jr. Wolfgang J.R. Hoefer. Microwave Circuit Modeling Using Electromagnetic Field Simulation. ARTECH HOUSE, INC., 2003.</p> <p>[2] Matthew N. O. Sadiku, Ph.D. Numerical Techniques in Electromagnetics(Second Edition). CRC Press, 2000.</p> <p>[3] Roger F. Harrington. Field Computation by Moment Methods. IEEE PRESS, 1993</p>		

Course Introduction

Code	023509	Teaching Hours	48
Course	Microwave Engineering		
Key Words	microwave engineering; wave propagation; network analysis		
Purpose and Role of the Course	<p>This course provides an introduction to the essential principles of microwave engineering and emphasizes the fundamental concepts of electromagnetics, wave propagation, network analysis, and design principles as applied to modern microwave engineering.</p> <p>After completing theory lectures, simulations, and measurements, students will have both understanding of the fundamentals of microwave engineering as well as the creativity to apply this knowledge to problems of practical interest.</p>		
Main Chapters and Teaching Hours	<p>A. Theory Lectures</p> <ol style="list-style-type: none"> 1. Electromagnetic Theory <ol style="list-style-type: none"> 1.1 Introduction to Microwave Engineering 1.2 Maxwell's Equations 1.3 Fields in Media and Boundary Conditions 1.4 Some Useful Theorems 2. Transmission Line Theory <ol style="list-style-type: none"> 2.1 The Lumped-Element Circuit Model for a Transmission Line 2.2 The Terminated Lossless Transmission Line 2.3 The Smith Chart 2.4 The Quarter-Wave Transformer 3. Transmission Line and Waveguides <ol style="list-style-type: none"> 3.1 Rectangular Waveguides 3.2 Circular Waveguides 3.3 Coaxial Line 3.4 Stripline 3.5 Microstrip 4. Microwave Network Analysis <ol style="list-style-type: none"> 4.1 Impedance and Equivalent Voltages and Currents 4.2 Impedance and Admittance Matrices 4.3 The Scattering Matrix 4.4 The Transmission (ABCD) Matrix 5. Impedance Matching and Tuning <ol style="list-style-type: none"> 5.1 Single-Stub Tuning 5.2 Double-Stub Tuning 5.3 The Quarter-Wave Transformer 5.4 Tapered Lines 6. Microwave Resonators <ol style="list-style-type: none"> 6.1 Transmission Line Resonators 6.2 Rectangular Waveguides Cavities 6.3 Circular Waveguides Cavities 		

	<p>6.4 Dielectric Resonators</p> <p>6.5 Excitation Resonators</p> <p>7. Power Dividers and Directional Couplers</p> <p>7.1 Basic Properties of Dividers and Couplers</p> <p>7.2 The T-Junction Power Divider</p> <p>7.3 The Wilkinson Power Divider</p> <p>7.4 Coupled Line Directional Couplers</p> <p>8. Microwave Filters</p> <p>8.1 Periodic Structures</p> <p>8.2 Filter Design by the Image Parameter Method</p> <p>8.3 Filter Design by the Insertion Loss Method</p> <p>8.4 Coupled Line Filters</p> <p>B. Simulations</p> <p>1. Waveguide Antenna Simulation</p> <p>2. Microstrip Antenna Simulation</p> <p>C. Measurements</p> <p>1. Antenna Measurement</p> <p>2. Coaxial Line Measuremen</p>
Teach Method	The course is given in the form of class lectures, simulations and measurements.
Test and Examination	1. Exercise 10% 2. Simulation 10% 3. Measurement 10% 4. Final exam (open book) 70%
Pre-request Course	Knowledge of electromagnetic field theory and analog electronic circuits
References	<p>[1]David M. Pozar, Microwave Engineering, 3rd Ed., John Wiley & Sons, 2004</p> <p>[2] R. E. Collin, Foundations for Microwave Engineering, 2nd Ed., John Wiley & Sons, 2000</p> <p>[3] Thomas Lee, Planar Microwave Engineering, Cambridge University Press, 2004</p>

- [3]William Stallings, Wireless Communications and Networks, Prentice Hall.
- [4]Handbook of Sensor Networks: Compact Wireless and Wired Sensing Systems, CRC Press, 2005. (edited by M. Ilyas and I. Mahgoub)
- [5]Standard documents: IEEE 802.11, 802.11e, 802.15.3, 802.15.4, Bluetooth, Mobile IP.
Leon W. Couch II, Digital and analog communication systems, 6th ed., Macmillan, New York, 2001.
- [6]Rodger E. Ziemer, and William H. Tranter, Principles of Communications: Systems, Modulation and Noise, 5th ed., John Wiley and Sons, Inc., New York, 2002.
- [7]Ian Glover, and Peter M. Grant, Digital communications, China Machine Press, 2004.
- [8]John G. Proakis, Digital communications, 4th ed., McGraw-Hill, New York, 2001.
- [9]Bernard Sklar, Digital communications: fundamentals and applications, Upper Saddle River, N.J.: Prentice Hall, 2001.
- [10]P. Nicopolitidis, M. Obaidat, G. Papadimitriou, and A. Pomportsis, Wireless Networks, Wiley Pub.
- [11]The Handbook of Ad Hoc Wireless Networks, CRC Press, 2003. (edited by M. Ilyas)

Course Introduction

Code	023513	Teaching Hours	36
Course	Satellite Navigation		
Key Words	satellite navigation system; Navigation Algorithms; GPS Augmentation System		
Purpose and Role of the Course	<p>This course is foundational course of graduate students which major in radio navigation. Through study this course, the students must to know the state of arts, developing trend, foundational principle, application fields of satellite navigation system.</p> <p>When they finish this course, they should master basic knowledge about satellite navigation system which provides foundation for them to engage in relative fields research work for the future.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Overview of Satellite Navigation System 2. Time and Space Coordinate System of Satellite Navigation System 3. Satellite Motion Law and Positioning Calculation 4. GPS Signal Structure 5. GPS Navigation Data 6. GPS Receivers and Navigation Algorithms 7. GPS Performance and Error Effects 8. GPS Augmentation System 9. Integrated Navigation Systems of GPS and other Navigation System <p style="text-align: center;">GPS Navigation Applications</p>		
Teach Method	<p>The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.</p>		
Test and Examination	1. Homework 40%	2. Final exam (open book)	60%
Pre-request Course	Knowledge of communication, digital signal processing, detection and estimation theory		
References	<p>[1]. Understanding GPS Principles and Applications, Edited by Elliott D.Kaplan, Christopher J.Hegarty, ARTECh House, Boston London.</p> <p>[2]. Fundamentals.of.Global.Positioning.System Receivers , Edited by James Bao-YenTsui , Published by WILEY INTERSCIENCE INC, Hoboken, New Jersey, USA.</p>		

Course Introduction

Code	023514	Teaching Hours	48
Course	Fundamentals of optical communications		
Key Words	optical fiber communications; Optical Transmitters; Fiber networks		
Purpose and Role of the Course	<p>Optical fiber communication technologies are becoming an essential part of the high speed communication systems. This course is to introduce the latest technologies of the state-of-the-art optical fiber communications, as well as the fundamental theories and physics behind these technologies.</p> <p>The students are expected to have a good math, physics as well as communication theory background, and can expect to have a solid understanding of many new technologies in this exciting area through taking this course and may apply it to the studies and design of fiber networks.</p>		
Main Chapters and Teaching Hours	<p>Ch 1. Introduction</p> <p>Ch 2. Optical Fibers</p> <p>Ch 3. Optical Transmitters</p> <p>Ch 4. Optical Receivers</p> <p>Ch 5. Optical Fiber Transmission Systems</p> <p>Ch 6. Optical Amplifiers</p> <p>Ch 7. WDM and Fiber networks</p>		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through self study.		
Test and Examination	Final exam (open book) 100%		
Pre-request Course	Knowledge of basic math, physics and communication theory		
References	<p>[1] Govind P. Agrawal, 光纤通信系统 (第三版) Fiber-Optical Communication Systems, 清华大学出版社 (Tsinghua university press), 2004/07</p> <p>[2] Gerd Keiser, 光纤通信 (第三版) Optical Fiber Communications 3/E, 电子工业出版社 (Electronics industry press), 2002/07</p>		

Course Introduction

Code	023523	Teaching Hours	18
Course	Synthetic experiment of fiber optic communication & signal process		
Key Words	signal processing; embedded system; fiber optic communication bench		
Purpose and Role of the Course	<p>This course contains three parts: digital signal processing bench, fiber optic communication bench and embedded system bench. Every experiment is 6 hours.</p> <p>Grasp the basic experiment approach of digital signal processing, fiber optic communication systems simulation and embedded system.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Synthetic experiment of digital signal processing 2. Synthetic experiment of fiber optic communication systems simulation 3. Synthetic experiment of embedded system 		
Teach Method	Firstly, the teacher explains the principle and steps of the experiments. Secondly, students do the experiments. Finally, students finish the experiment report.		
Test and Examination	In terms of the experiment report.		
Pre-request Course	Students must study these courses: digital signal processing , communication systems, embedded system principle before learning the experiment course.		
References	None		

Course Introduction

Code	023524	Teaching Hours	48
Course	Engineering Electromagnetic Compatibility		
Key Words	electromagnetic interference; electromagnetic compatibility; Spectrum Conservation		
Purpose and Role of the Course	<p>This course presents an overview of the field of electromagnetic interference (EMI) and electromagnetic compatibility (EMC) and in-depth accounts of several topics, including recently reported results in these areas. The course is organized into five major topic areas: Changing the way we think about electrical phenomena; what do we mean by the term “ground”?; printed circuit board design; system configuration and design; and diagnostic tools.</p> <p>This course is used for the advanced undergraduate or introductory graduate level. Let students grasp a comprehensive account of the EMI sources and models, procedures for measurement and characterization of EMI / EMC, and techniques and technologies for achieving EMC.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction 2. Natural and Nuclear Sources of EMI 3. EMI from Apparatus and Circuits 4. Probabilistic and Statistical Physical Models 5. Open-Area Test Sites 6. Radiated Interference Measurements 7. Conducted Interference Measurements 8. Pulsed Interference Immunity 9. Grounding, Shielding, and Bonding 10. EMI Filters 11. Cables, Connectors and Components 12. Frequency Assignment and Spectrum Conservation 13. EMC Computer Modeling and Simulation 14. Signal Integrity 15. EMC Standards 16. Selected Bibliography 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	1. Homework 20% 2. Final exam (open book) 80%		
Pre-request Course	Knowledge of Advanced Mathematics, College Physics and Electromagnetic Field Basis		
References	<p>[1] V. Prasad Kodali. Engineering Electromagnetic Compatibility, IEEE PRESS, 2001</p> <p>[2] CLAYTON R. PAUL. Introduction to Electromagnetic Compatibility. John Wiley & Sons, Inc. 2006.</p>		

Course Introduction

Code	023525	Teaching Hours	32
Course	Cryptography Network Security-Principles and Practices		
Key Words	electronic eavesdropping; electronic fraud; cryptography		
Purpose and Role of the Course	<p>In this age of universal electronic connectivity, of viruses and hackers, of electronic eavesdropping and electronic fraud, there is indeed no time at which security does not matter. Two trends have come together to make the topic of this course of vital interest. First, the explosive growth in computer systems and their interconnections via networks has increased the dependence of both organizations and individuals on the information stored and communicated using these systems. This, in turn, has led to a heightened awareness of the need to protect data and resources from disclosure, to guarantee the authenticity of data and messages, and to protect systems from network-based attacks. Second, the disciplines of cryptography and network security have matured, leading to the development of practical, readily available applications to enforce network security.</p> <p>This is a 10-week, 3-hour course to introduce cryptography and network security. The course is organized in five parts:</p> <p>Part One. Conventional Encryption: A detailed examination of conventional encryption algorithms and design principles, including a discussion of the use of conventional encryption for confidentiality.</p> <p>Part Two. Public-Key Encryption and Hash Functions: A detailed examination of public-key encryption algorithms and design principles. This part also examines the use of message authentication codes and hash functions, as well as digital signatures and public-key certificates.</p> <p>Part Three. Network Security Practice: Covers important network security tools and applications, including Kerberos, X.509v3 certificates, PGP, S/MIME, IP Security, SSL/TLS, and SET.</p> <p>Part Four. System Security: Looks at system-level security issues, including the threat of and countermeasures for intruders and viruses, and the use of firewalls and trusted systems.</p> <p>Part Five. Network Security Experiments: including the management operations of Firewall, VPN, IDS, and the using of hacking tools.</p> <p>The purpose of this course is to provide a practical survey of both the principles and practice of cryptography and network security. In the first two parts of the course, the basic issues to be addressed by a network security capability are explored by providing a tutorial and survey of cryptography and network security technology. The latter part of the course deals with the practice of network security: practical applications that have been implemented and are in use to provide network security.</p> <p>By the end of this course, students will obtain the knowledge of the followings:</p> <ol style="list-style-type: none"> (1) Understanding the theory of cryptography; (2) Understanding the principles of network security products; (3) Using security equipments and software to design a solution for your private network. (4) Doing the setup configuration for various network devices, including Router and Switch. 		

Main Chapters and Teaching Hours	Chapter 1. Introduction
	1.1 Security Trends
	1.2 The OSI Security Architecture
	1.3 Security Attacks
	1.4 Security Services
	1.5 Security Mechanisms
	1.6 A Model for Network Security
	Chapter 2. Classical Encryption Techniques
	2.1 Symmetric Cipher Model
	2.2 Substitution Techniques
	2.3 Transposition Techniques
	2.4 Rotor Machines
	2.5 Steganography
	Chapter 3. Block Ciphers and the Data Encryption Standard
	3.1 Block Cipher Principles
	3.2 The Data Encryption Standard
	3.3 The Strength of Des
	3.4 Differential and Linear Cryptanalysis
	3.5 Block Cipher Design Principles
	Chapter 4. Advanced Encryption Standard
4.1 Evaluation Criteria For AES	
4.2 The AES Cipher	
Chapter 5. More on Symmetric Ciphers	
5.1 Multiple Encryption and Triple DES	
5.2 Block Cipher Modes of Operation	
5.3 Stream Ciphers and RC4	
Chapter 6. Confidentiality Using Symmetric Encryption	
6.1 Placement of Encryption Function	
6.2 Traffic Confidentiality	
6.3 Key Distribution	
6.4 Random Number Generation	
Chapter 7. Public-Key Cryptography and RSA	
7.1 Principles of Public-Key Cryptosystems	
7.2 The RSA Algorithm	
Chapter 8. Key Management; Other Public-Key Cryptosystems	
8.1 Key Management	
8.2 Diffie-Hellman Key Exchange	
8.3 Elliptic Curve Arithmetic	
8.4 Elliptic Curve Cryptography	
Chapter 9. Message Authentication and Hash Functions	
9.1 Authentication Requirements	
9.2 Authentication Functions	
9.3 Message Authentication Codes	
9.4 Hash Functions	

	<p>9.5 Security of Hash Functions and MACs</p> <p>Chapter 10. Authentication Applications</p> <p>10.1 Kerberos</p> <p>10.2 X.509 Authentication Service</p> <p>10.3 Public-Key Infrastructure</p> <p>Chapter 11. Electronic Mail Security</p> <p>11.1 Pretty Good Privacy</p> <p>11.2 S/MIME</p> <p>Chapter 12. IP Security</p> <p>12.1 IP Security Overview</p> <p>12.2 IP Security Architecture</p> <p>12.3 Authentication Header</p> <p>12.4 Encapsulating Security Payload</p> <p>12.5 Combining Security Associations</p> <p>12.6 Key Management</p>						
Teach Method	<p>The course will be a mix of lecture and lab. Students are required to both study the theory of cryptography and network security, and the experiments of how to actually manage the network security equipments such as Internet firewall, VPN and IDS, and how to use the hacking tools. Homework will be assigned after each lecture.</p> <p>Lectures are the primary vehicle for introducing and motivating new material, some of which is not in the book. All lectures will be given live. In the classroom, we will arrange lecture, example demos and practice alternatively.</p> <p>The course has one final exam, which is designed to test your theory level and operation skills of the network security devices.</p>						
Test and Examination	<table> <tr> <td>1 Classroom participation and recitations</td> <td>20%</td> </tr> <tr> <td>2 Home works</td> <td>30%</td> </tr> <tr> <td>3 Exam</td> <td>50%</td> </tr> </table>	1 Classroom participation and recitations	20%	2 Home works	30%	3 Exam	50%
1 Classroom participation and recitations	20%						
2 Home works	30%						
3 Exam	50%						
Pre-request Course	None						
References	[1] William Stallings, "Cryptography and Network Security. Principles and Practices, 4th Edition (Reupload)", Publishing House of Electronics Industry, Beijing.						

Course Introduction

Code	023527	Teaching Hours	18
Course	Signal Integrity: Simplified		
Key Words	engineering estimates; multilayer circuit boards; electrical parameters		
Purpose and Role of the Course	<p>This course provides the tools to enable all students involved in chip packaging and board, connector and interconnect design, to understand how these passive elements affect the electrical performance of a system and how they can be incorporated in system simulation. It illustrate how to perform engineering estimates of important electrical parameters and evaluate technology trade-offs. Examples are selected from a wide variety of common systems, including on-chip interconnects, wire bonds, flip chip attach, multilayer circuit boards, DIPs, PGAs, BGAs, QFPs, MCM connectors, and cables.</p> <p>Grasp the concept, theory and techniques of signal integrity analysis. Understand the electrical properties of interconnects and materials that apply across the entire hierarchy from on-chip, through the packages, circuit boards, connectors, and cables.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Signal Integrity is in your future 2. Time and Frequency Domains 3. Impedance and Electrical Models 4. The Physical Basis of Resistance 5. The Physical Basis of Capacitance 6. The Physical Basis of Inductance 7. The Physical Basis of Transmission Lines 8. Transmission Lines and Reflections 9. Lossy Lines, Rise-Time Degradation, and Material Properties 10. Cross Talk in Transmission Lines 11. Differential Pairs and Differential Impedance 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	1. Homework 20%	2. Final exam (open book)	80%
Pre-request Course	Knowledge of Electromagnetic Field Basis and Electromagnetic Compatibility.		
References	<p>[1] Eric Bogatin. Signal Integrity: Simplified. Pearson Education Inc., 2007.</p> <p>[2] Geoff Lawday, David Ireland, Greg Edlund. A Signal Integrity Engineer's Companion. Pearson Education Inc., 2008.</p>		

Course Introduction

Code	023532	Teaching Hours	18
Course	Synthetic experiment of electromagnetic field & wireless technology		
Key Words	electromagnetic compatibility bench; electromagnetic wave bench; wireless communication bench		
Purpose and Role of the Course	<p>This course contains three parts: electromagnetic compatibility bench, electromagnetic wave bench and wireless communication bench. Every experiment is 6 hours.</p> <p>Grasp the basic experiment approach of electromagnetic compatibility, electromagnetic wave and wireless communication.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Conducted interference measurements 2. Radiated interference measurements 3. Shielding effectiveness measurements 4. Polarization, Michelson interference, and Bragg diffraction 5. The generation and detection of linear and circular polarization wave 6. Reflection and refraction of circular polarization wave 7. Mobile communication terminals experiments 		
Teach Method	Firstly, the teacher explains the principle and steps of the experiments. Secondly, students do the experiments. Finally, students finish the experiment report.		
Test and Examination	In terms of the experiment report.		
Pre-request Course	Students must study these courses: electromagnetic compatibility, electromagnetic wave theory, wireless communication principle before learning the experiment course.		
References	None		

Course Introduction

Code	023506	Teaching Hours	32
Course	Antenna Theory and Design		
Key Words	antenna theory and design, Antenna Parameters, antenna type		
Brief Description of the Course	<p>This course is designed for the postgraduates who are in electromagnetic fields and microwave techniques or some other majors related. Based on the theory of microwave technology foundation and electromagnetic field and electromagnetic wave, this course will systematically introduce the most basic and practical antennas' design and measurement as well as the basic principle and technology of the antenna.</p>		
Main Chapters and Teaching Hours	<p>At first, it will introduce what an antenna is. At the same time, physics explanation will be given to explain the antenna radiation. Based on the electromagnetism, we will systematically introduce the antenna parameters, including radiation intensity, directivity and gain, etc. This course will show some basic and practical forms of antenna, such as the wire antenna, microstrip antenna and broadband antenna. Those antennas' design principles will be discussed in details, and their radiation pattern will be illustrated as well. The students will learn how to use antenna design software through some computer experiments. At the same time, antenna test experiments will help them to understand the antenna measurement method, including the parameters such as return loss.</p>		
Teach Method	Classroom-based lecture, Experiments, Discussion		
Test and Examination	The students are required to submit a detailed curriculum design paper. They may use their learning from this course to complete the report.		

Course Introduction

Code	023504	Teaching Hours	48
Course	Modern Digital Communications Technology		
Key Words	Digital Communication system, Modulation Technique, Multiple-user Communications		
Brief Description of the Course	<p>This is a one-semester course designed to introduce modern digital communication technology to master's degree candidates.</p> <p>This course introduces functions and interdependence of various components of digital communication systems and principles of networking and protocols. Modern digital modulation techniques, spread-spectrum techniques, multiple access techniques, channel fading and diversity techniques, multiple-user communications, mobile ad hoc networks will be covered in this course.</p> <p>This course is aimed to develop fundamental design and analysis techniques necessary for understanding and working with modern digital communication system and network.</p>		
Main Chapters and Teaching Hours	<p>Chapter I Telecommunications overview (2hrs)</p> <p>Chapter II Modern Digital Modulation Techniques (6hrs)</p> <p>Chapter III Spread-spectrum Techniques (5 hrs)</p> <p>Chapter IV Multiple Access Techniques (6 hrs)</p> <p>Chapter V Channel Fading and Diversity Techniques (5 hrs)</p> <p>Chapter VI Multiple-user Communications (6 hrs)</p> <p>Chapter VII Mobile Ad Hoc Networks (6hrs)</p>		
Teach Method	Classroom-based lecture, Discussion, Reading papers		
Test and Examination	Closed-book examination plus Technique Report		

Course Catalogue for International Postgraduates (School of Automation Science and Electrical Engineering)

编号 No.	英文课程名称 Course Title	中文课程名称 Course Title	学时 Hours	学分 Credits	开课季节 Semester	任课教师 Lecturer
033502	Linear System Theory	线性系统理论	40	2	Spring	Yan Lin
033503	Optimal Control	最优控制	32	2	Fall	Jiang jiahe
033504	Computer Control System	计算机控制系统	32	2	Spring	Haibin DUAN
033506	Inertial Technology	惯性技术	48	3	Spring	Zhang Cheng Yun
033507	Principle of Guidance	制导原理	36	2	Spring	Jiang jiahe
033508	Optimal Estimation	最优估计	40	2	Spring	ZhangHai
033509	Navigation Principle	导航原理	36	2	Fall	FU Li
033510	System Identification	系统辨识	32	2	Fall	Shen Xiaorong
033511	Electro-hydraulic Servo Control Systems	电液伺服系统控制	32	2	Fall	Yu Liming
033512	Reliability Engineering	可靠性工程	32	2	Spring	Wang Shaoping
033513	Intelligent Control	智能控制	32	2	Spring	Liu Jinkun
033514	Computer Interface	计算机接口	32	2	Spring	Sun Qi
033515	Microcomputer Theory and Application	微机原理和应用	32	2	Fall	Sun Qi
033520	Control System for Electrical Drive	电力传动控制系统	36	2	Spring	Wang Lina
033521	The modern control strategies applied to Electro-hydraulic servo systems	现代电液伺服系统控制	32	2	Spring	Yu Liming
033599	Robust Control	鲁棒控制	40	2	Spring	Wu Huaining
033801	Guidance and Control Systems Hardware-in-the-loop Simulation Experiments for Vehicle	飞行器制导控制系统半实物仿真系列实验	16	1	Spring	Jiang jiahe
033523	Service Computing	服务计算	32	2	Spring	Tao Fei

Course Introduction

Code	033502	Teaching Hours	40
Course	Linear System Theory		
Key Words	linear systems; Linear Dynamical Equations; Linear Operators		
Purpose and Role of the Course	<p>This course is intended for first-year graduate students in engineering who are interested in control systems, signal processing, and communication systems. The course introduces the fundamental theory and analysis techniques of linear systems with the purpose of helping students to have a thorough investigation of main properties of a system, and laying foundation for further studies subject to other control courses.</p> <p>The goal of this course is to clearly present the fundamental concepts of linear system theory. In addition to covering the fundamental principles, it provides sufficient background in analysis and algebra, to enable students to move on advanced topics in the systems area. The contents of the course are designed to highlight the main results of linear systems. Furthermore, this course presents the material in a sufficiently broad context to give students a clear picture of the dynamical behavior of linear systems and the limitations of such systems.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction 2. Linear Spaces and Linear Operators 3. Mathematical Descriptions of Systems 4. Linear Dynamical Equations and Impulse-Response Matrices 5. Controllability and Observeability of Linear Dynamical Equations 6. Irreducible Realizations, Strict System Equivalence, and Identification 7. State Feedback and State Estimators 8. Stability of Linear Systems 9. Linear Time-Invariant Composite Systems: Characterization, Stability, and Designs 		
Teach Method	<p>The course is given in the form of class lectures. The students are expected to finish the problems designed to help them understand and utilize the concepts and results introduced in the course.</p>		
Test and Examination	<p>1. Homework 20%; 2. Final exam: 80%.</p>		
Pre-request Course	<p>The mathematical background assumed for this course is a working knowledge of linear algebra and an elementary knowledge of differential equations.</p>		
References	<p>[1] C. T. Chen, <i>Linear System Theory and Design</i>, CBS College Publishing, 1984.</p> <p>[2] (日)须田信英等, 曹长修译:《自动控制中的矩阵理论》 科学出版社 1979</p> <p>[3] 韩京清, 许可康, 何关钰:《线性系统理论的代数基础》, 辽宁科技出版社 1987</p> <p>[4] 黄琳:《系统与控制理论中的线性代数》, 科学出版社 1984</p> <p>[5] T. KAILATH: <i>Linear Systems</i>, Prentice-Hall, 1980.</p> <p>[6] 郑大钟:《线性系统理论》 清华大学出版社, 1992</p>		

Course Introduction

Code	033503	Teaching Hours	32
Course	Optimal Control		
Key Words	automatic control; optimal controller; Dynamic Programming		
Purpose and Role of the Course	<p>As one of the main part of Modern Control Theory, Optimal Control has been widely used in many fields, especially in the field of aeronautics and astronautics. It is an important specialized basic course, and is essential for all the students of subjects related to automatic control. The course discusses contents involved in minimum principle and dynamic programming, including basic theory, basic methods and applied examples.</p> <p>The aim of the course is to let students master not only the basic theory of optimal control, but also how to use it, especially grasp to design optimal controller based on MATLAB.</p>		
Main Chapters and Teaching Hours	<p>1 Introduction (2 hours)</p> <p>2.Static optimization (2 hours)</p> <p>3 Variation (5 hours)</p> <p>4 Minimum Principle and Applications (6 hours)</p> <p>5 Linear Quadratic Regulator (6 hours)</p> <p>6 Dynamic Programming (5 hours)</p> <p>7 Applications of Optimal Control (4 hours)</p>		
Teach Method	<p>The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.</p>		
Test and Examination	1. Homework 40%	2. Final exam (open book)	60%
Pre-request Course	Knowledge of basic matrix analysis, automatic control principle and linear system theory		
References	<p>[1] Athans, M and Falb, P L. Optimal Control: an Introduction to the Theory and its Application. Mc Graw-Hill New York, 1966</p> <p>[2] A. Sage, C. white, Optimum Systems Control, 1977</p> <p>Optimal control teaching materials</p>		

Course Introduction

Code	033504	Teaching Hours	32
Course	Computer Control System		
Key Words	Continuous Control; Discrete Systems Analysis; Optimal Control		
Purpose and Role of the Course	<p>Today computer control techniques are successfully used in various fields. This course is one of the most important courses for control, mechatronics, electronics, computer science, aeronautics and astronautics major.</p> <p>The main object of this course is to learn the basic concepts, methods and applications of computer control theory. This course also contains up-to-date materials on state-space design, and the innovative assignment gives students more opportunities to practice.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction (demo and practice) 2. Review of Continuous Control (demo and practice) 3. Introductory Computer Control (demo and practice) 4. Discrete Systems Analysis (demo and practice) 5. Sampled-Data Systems (demo and practice) 6. Discrete Equivalents (demo and practice) 7. Design Using Transform Techniques (demo and practice) 8. Design Using State-Space Methods (demo and practice) 9. Multivariable and Optimal Control (demo and practice) <p>Final Exam (Open-book exam)</p>		
Teach Method	Lectures will be presented mainly by blackboard and PPT. In every chapter, there are 1-2 exercises to be given to students who should complete at home for a good understanding of the current contents. Question-and-answer is also needed. Practices on computer control theory with Matlab will be encouraged.		
Test and Examination	<ol style="list-style-type: none"> 1. Final Open-book Exam: 60% 2. Assignments: 30% 3. Attendance: 10% 		
Pre-request Course	Knowledge of basic matrix analysis, Fourier transforms		
References	<p>[1] Gene F. Franklin, J. David Powell, Michael L. Workman. Digital Control of Dynamic Systems(3rd edition). Tsinghua University Press, ISBN: 7302047472, 2006</p> <p>[2] Gene F. Franklin, J. David Powell, Michael L. Workman. Digital Control of Dynamic Systems(3rd edition). Prentice Hall Inc., ISBN: 0201820544, 1998</p>		

Course Introduction

Code	033506	Teaching Hours	48																																																										
Course	Inertial Technology																																																												
Key Words	inertial components; inertial instruments; inertial measurement methods																																																												
Purpose and Role of the Course	<p>Inertial Technology is a science concerning with inertial components 、 inertial instruments 、 inertial measurement methods , It is the foundation of inertial navigation system , which has been widely used in areonautical aviation 、 astronautical aviation 、 naval aviation as well as precision guidance .</p> <p>The intention of this course is to conduct knowledge on inertial component and inertial instrument to foreign students , so that they have a comprehensive master at the principle 、 structure 、 designing method and developing tendency of gyroscope 、 accelerometer and instrument systems , and have an ability to utilize 、 research and develop the inertial technology .</p>																																																												
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 20px;">Introduction to gyroscope</td> <td style="text-align: right; padding-right: 20px;">1 hour</td> </tr> <tr> <td style="padding-left: 20px;">1. Foundation on mechanics 、 kinematics and dynamics</td> <td style="text-align: right; padding-right: 20px;">5 hours</td> </tr> <tr> <td style="padding-left: 40px;">1.1 Frame transformation</td> <td></td> </tr> <tr> <td style="padding-left: 40px;">1.2 Theorem of angular momentum</td> <td></td> </tr> <tr> <td style="padding-left: 20px;">2. Characteristics of gyroscope</td> <td style="text-align: right; padding-right: 20px;">4 hours</td> </tr> <tr> <td style="padding-left: 40px;">2.1 Precession</td> <td></td> </tr> <tr> <td style="padding-left: 40px;">2.2 Orientation stabilization</td> <td></td> </tr> <tr> <td style="padding-left: 20px;">3. Dynamics analysis of gyros</td> <td style="text-align: right; padding-right: 20px;">10 hours</td> </tr> <tr> <td style="padding-left: 40px;">3.1 Dynamic equation of 2-d gyro</td> <td></td> </tr> <tr> <td style="padding-left: 40px;">3.2 Dynamic analysis of 2-d gyro</td> <td></td> </tr> <tr> <td style="padding-left: 40px;">3.3 Impacts of damping and elasticity</td> <td></td> </tr> <tr> <td style="padding-left: 40px;">3.4 Measurement of angular rate</td> <td></td> </tr> <tr> <td style="padding-left: 40px;">3.5 Modeling of gyro drift</td> <td></td> </tr> <tr> <td style="padding-left: 20px;">4. Measurement of acceleration</td> <td style="text-align: right; padding-right: 20px;">6 hours</td> </tr> <tr> <td style="padding-left: 40px;">4.1 Liquid floated pendulum accelerometer</td> <td></td> </tr> <tr> <td style="padding-left: 40px;">4.2 Flexible accelerometer</td> <td></td> </tr> <tr> <td style="padding-left: 40px;">4.3 Gyro integrated accelerometer</td> <td></td> </tr> <tr> <td style="padding-left: 20px;">5. Measurement of angular displacement</td> <td style="text-align: right; padding-right: 20px;">8 hours</td> </tr> <tr> <td style="padding-left: 40px;">5.1 Gyro horizon</td> <td></td> </tr> <tr> <td style="padding-left: 40px;">5.2 Azimuth gyro</td> <td></td> </tr> <tr> <td style="padding-left: 40px;">5.3 Gyro compass</td> <td></td> </tr> <tr> <td style="padding-left: 40px;">5.4 Platform compass</td> <td></td> </tr> <tr> <td style="padding-left: 20px;">6. Dynamically tuned gyro</td> <td style="text-align: right; padding-right: 20px;">6 hours</td> </tr> <tr> <td style="padding-left: 40px;">6.1 Principle of dynamic tuning</td> <td></td> </tr> <tr> <td style="padding-left: 40px;">6.2 Structural stabilization analysis</td> <td></td> </tr> <tr> <td style="padding-left: 40px;">6.3 Rebalance loop</td> <td></td> </tr> <tr> <td style="padding-left: 20px;">7. Static electrically suspended gyro</td> <td style="text-align: right; padding-right: 20px;">4 hours</td> </tr> <tr> <td style="padding-left: 40px;">7.1 Principle of static electrical suspension</td> <td></td> </tr> <tr> <td style="padding-left: 40px;">7.2 Reading of angular displacement</td> <td></td> </tr> </table>			Introduction to gyroscope	1 hour	1. Foundation on mechanics 、 kinematics and dynamics	5 hours	1.1 Frame transformation		1.2 Theorem of angular momentum		2. Characteristics of gyroscope	4 hours	2.1 Precession		2.2 Orientation stabilization		3. Dynamics analysis of gyros	10 hours	3.1 Dynamic equation of 2-d gyro		3.2 Dynamic analysis of 2-d gyro		3.3 Impacts of damping and elasticity		3.4 Measurement of angular rate		3.5 Modeling of gyro drift		4. Measurement of acceleration	6 hours	4.1 Liquid floated pendulum accelerometer		4.2 Flexible accelerometer		4.3 Gyro integrated accelerometer		5. Measurement of angular displacement	8 hours	5.1 Gyro horizon		5.2 Azimuth gyro		5.3 Gyro compass		5.4 Platform compass		6. Dynamically tuned gyro	6 hours	6.1 Principle of dynamic tuning		6.2 Structural stabilization analysis		6.3 Rebalance loop		7. Static electrically suspended gyro	4 hours	7.1 Principle of static electrical suspension		7.2 Reading of angular displacement	
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	8. Ring laser gyro and fiber optical gyro 8.1 Laser gyro 8.2 Fiber optical gyro	4 hours
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.	
Test and Examination	Final exam (open book) 100%	
Pre-request Course	Theory of matrix automatic control	
References	[1] 郭秀中、于波、陈云相编著，陀螺仪理论及应用，航空工业出版社，1987 No suitable text written in English is found Any text on gyro and accelerometer	

Course Introduction

Code	033507	Teaching Hours	36
Course	Principle of Guidance		
Key Words	guided missile; vehicle dynamical equations; kinematic equations		
Purpose and Role of the Course	<p>The course is a major course for navigation, guidance and control major. It introduces guidance and control principle of tactical missiles. It includes basic concepts of guided missile, vehicle dynamical equations and kinematic equations, mathematic models of vehicle, guidance law, command guidance systems, homing guidance systems.</p> <p>Require students to grasp contents as follows:</p> <ol style="list-style-type: none"> 1. Guidance laws; 2. Missile autopilot design; 3. Guidance system analysis and design. 		
Main Chapters and Teaching Hours	<p>Chapter 1 Introduction to Missile Guidance (3h)</p> <p>Chapter 2 Basic Knowledge of Flight Dynamics (3h)</p> <p>Chapter 3 Equation of Motion for Vehicle (3h)</p> <p>Chapter 4 longitudinal Motion (2h)</p> <p>Chapter 5 Lateral Motion (2h)</p> <p>Chapter 6 Flight Control of Missile (3h)</p> <p>Chapter 7 guidance (6h)</p> <p>Chapter 8 Command Guidance Systems (6h)</p> <p>Chapter 9 Homing Guidance Systems (6h)</p>		
Teach Method	The teacher gives lectures in classroom, and students do homework after classes		
Test and Examination	1. Homework 40% 2. Final exam (open book) 60%		
Pre-request Course	Principle of Automatic Control		
References	<p>[1] Jiang Jiahe. Guidance Principle of Missiles. BUAA press, 2012. Guidance principle teaching materials</p> <p>[2] P.Garnell. Guided Weapon Control Systems. Pergamon Press,1980. Guidance principle teaching materials</p>		

Course Introduction

Code	033508	Teaching Hours	40
Course	Optimal Estimation		
Key Words	filtering theories; anti-diverge; Optimal Smoothing		
Purpose and Role of the Course	<p>Optimal Estimation is one of the main contents of modern control theory. It plays important roles in control, navigation, guidance and measurement systems. Based on the correct system model, noise features and measurements, more accurate states can be obtained by proper filtering methods. The main purpose of this course is to introduce the filtering theories and skills.</p> <p>The main estimation methods especially the states estimation methods are introduced. Based on the Linear Minimum Mean Square Error method, the most popular Kalman filtering methods are introduced. Then the stability, anti-diverge and many other skills are explained. Several main nonlinear filtering methods are also introduced. These contents are very important to get more accurate information from the noise polluted measurements.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Traditional estimation methods <ol style="list-style-type: none"> 1.1 Concept of filtering and estimation 1.2 MMSE 1.3 ML and MAP 1.4 LMMSE 1.5 LS 2. Basic Kalman filtering <ol style="list-style-type: none"> 2.1 Preparing for Kalman filtering 2.2 Reasoning of Predicting 2.3 Reasoning of Filtering 2.4 Filtering with Correlated noises 2.5 Filtering with input 3. Optimal Smoothing <ol style="list-style-type: none"> 3.1 Fixed Interval Smoothing 3.2 Fixed Point Smoothing 3.3 Fixed Lag Smoothing 4. Filtering Stability <ol style="list-style-type: none"> 4.1 Stability definition 4.2 Stability judgments 5. Diverge and diverge avoiding <ol style="list-style-type: none"> 5.1 phenomenon and reasoning of diverges 5.2 Fading Memory algorithm 5.3 Limited Memory algorithm 5.4 Square Root Filtering 5.5 Adaptive Filtering 6 Nonlinear Kalman Filtering <ol style="list-style-type: none"> 6.1 Nominal orbit filtering 6.2 Extended Kalman Filtering 6.3 Unscented Kalman filter 		

Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments
Test and Examination	1. Homework 100%
Pre-request Course	Knowledge of basic matrix analysis, linear system, probability theory
References	[1] Chenxinhai. Optimal Estimation. BUAA press. [2] Arthur Gelb ,Applied Optimal Estimation, MIT,16 th Ed, 2001 [3] Dan Simon, Optimal State Estimation, John Wiley, 2 nd Ed, 2006

Course Introduction

Code	033509	Teaching Hours	36																
Course	Navigation Principle																		
Key Words	Inertial navigation system , GPS, integrated navigation system																		
Purpose and Role of the Course	The course introduces classification of navigation system, basic concept of navigation system, platform inertial navigation system, strapdown navigation system, error analysis of navigation system, GPS, integrated navigation system. Through studying the course, students master basic theory knowledge and research methods about navigation system																		
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Chapter 1 Introduction</td> <td style="width: 20%; text-align: right;">2h</td> </tr> <tr> <td>Chapter 2 basic concept of navigation system</td> <td style="text-align: right;">4h</td> </tr> <tr> <td>Chapter 3 platform inertial navigation system</td> <td style="text-align: right;">6h</td> </tr> <tr> <td>Chapter 4 strapdown navigation system</td> <td style="text-align: right;">6h</td> </tr> <tr> <td>Chapter 5 error analysis of navigation system</td> <td style="text-align: right;">5h</td> </tr> <tr> <td>Chapter 6 alignment</td> <td style="text-align: right;">3h</td> </tr> <tr> <td>Chapter 7 GPS</td> <td style="text-align: right;">4h</td> </tr> <tr> <td>Chapter 8 integrated navigation system</td> <td style="text-align: right;">6h</td> </tr> </table>			Chapter 1 Introduction	2h	Chapter 2 basic concept of navigation system	4h	Chapter 3 platform inertial navigation system	6h	Chapter 4 strapdown navigation system	6h	Chapter 5 error analysis of navigation system	5h	Chapter 6 alignment	3h	Chapter 7 GPS	4h	Chapter 8 integrated navigation system	6h
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Chapter 7 GPS	4h																		
Chapter 8 integrated navigation system	6h																		
Teach Method	Teaching Discuss in classes Do homework																		
Test and Examination	Open written examination																		
Pre-request Course	Principle of Automatic Control Optimal filter																		
References	Teaching materials																		

Course Introduction

Code	033510	Teaching Hours	32
Course	System Identification		
Key Words	system identification; Impulse Response; prediction Error method		
Purpose and Role of the Course	<p>System identification is one of the most important courses in modern control theory. It deals with the problem of building mathematical models of dynamical systems based on observed data from the system. This course provides a broad theoretical basis for system identification, such as least square, Maximum Likelihood, Time series model, etc. Furthermore, the closed- loop system are provided. Finally, some points for the application of system identification are also introduced.</p> <ol style="list-style-type: none"> 1. Grasping basic methods of system identification, including least square, Maximum Likelihood, Time series model. 2. Grasping the application principle of system identification; 3. Grasping the system identification design process in practice. 		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction of system identification 2. system identification basis with Impulse Response 3. Least-Squares estimation methods 4. Maximum Likelihood estimation method and prediction Error method 5. Time series analysis and modeling 6. Closed-loop system identification 7. Other points in system identification 		
Teach Method	<p>The course will combine theory deducing with examples in practice to introduce complex concepts and conclusions. Require students to analyze the papers selected from famous english journal papers with the system identification knowledge learned in the class. In this course. How to identify system models will be practiced with examples.</p>		
Test and Examination	<ol style="list-style-type: none"> 1. Home work 2. Simulation Experiment Report 		
Pre-request Course	Automatic control Principal, Linear system theory, Probability theory.		
References	<p>[1]Zhang Hongyue. System Identification. self-made teaching material.</p> <p>[2]Lennart Ljung System Identification: Theory for the User (2nd Edition), Prentice Hall PTR, 2003.</p> <p>[3]QI Xiao-hui; TIAN Qing-min; DONG Hai-rui. System Modeling Based on System Identification Toolbox in Matlab, Ordnance Industry Automation, 2006:88-91.</p> <p>[4]E. A. Morelli. System IDentification Programs for AirCRAFT (SIDPAC), 2002.</p> <p>[5]A. Berman. System identification of structural dynamic models theoretical and practical sounds. American Institute of Aeronautics and Astronautics, 1984.</p>		

Course Introduction

Code	033511	Teaching Hours	32
Course	Electro-hydraulic Servo Control Systems		
Key Words	Electro-hydraulic, Power elements, Servo valve, Control Systems		
Purpose and Role of the Course	<p>This lecture is focus on the introduction of hydraulic closed loop control systems with electro-hydraulic servo valve step by step, from hydraulic components (valve, pump, motor, jack and so on), fluid mechanics, to electro-hydraulic servo control systems.</p> <p>Through this course students will mainly understand the structure, working functions, performance analysis and classical control theory design of electro-hydraulic servo control displacement systems based on fluid mechanics and feedback control theory.</p>		
Main Chapters and Teaching Hours	<p>The firstly part, In chapter 1, after some introductory remarks and basically a review of applicable topics in fluid mechanics, the physical and chemical properties of the working fluid are discussed.</p> <p>The next four chapters are devoted to components encountered in hydraulic servo controlled systems, which Hydraulic control valves, chiefly spool and flapper types in chapter 2; Hydraulic pump and motor in chapter 3, The basic power element mainly such as the combination formed by a valve or pump controlling an actuator in chapter 4, the principle types of electrohydraulic servo-valve and static and dynamics analysis in chapter 5.</p> <p>The third part, chapter 6 is the design and analysis of electrohydraulic servo control displacement systems by employing feedback control.</p>		
Teach Method	Lectures will be presented mainly by PowerPoint PPT files.All simulation examples showed in class are programs of Matlab, Simulink or AMEsim. In every chapter students will be asked to complete one paper for concluding the study and understanding.		
Test and Examination	1、 Assignments: 60% 2、 Final Exam: 40%		
Pre-request Course	Hydraulics, Fluid transmission and control		
References	<p>1, Merritt H.E. <i>Hydraulic control systems</i>, John Wiley, New York, 1967, BeiHang Library</p> <p>2, Wang Zhanlin, <i>Modern Hydraulic Servo control</i>, Beihang Press, 1989, Beihang Library in Chinese</p> <p>3, Mohieddine Jelali and Andreas Kroll, <i>Hydraulic servo-systems : modelling, identification, and control</i>. Springer, 2003</p>		

Course Introduction

Code	033512	Teaching Hours	32
Course	Reliability Engineering		
Key Words	Reliability prediction; fault-tolerant techniques; reliability test		
Purpose and Role of the Course	<p>Reliability definition and general distribution of random variables. Reliability prediction, reliability design, reliability test, fault-tolerant techniques and redundancy.</p> <p>Introduce the theory and analytical methods of reliability engineering. The emphasis is on applications of reliability engineering and evaluation of system reliability and safety.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction: Reliability <ol style="list-style-type: none"> 1.1 Concept of reliability 1.2 Elementary reliability theory 1.3 General statistical distribution 2. Reliability Block Diagram <ol style="list-style-type: none"> 2.1 Series system reliability 2.2 Parallel system reliability 2.3 k out of n system reliability 2.4 Spare system reliability 3. Reliability Prediction of Complex System <ol style="list-style-type: none"> 3.1 Fault tree analysis (FTA) 3.2 Failure mode and effect analysis (FMEA) 3.3 Markov state transfer method 4. Reliability Design <ol style="list-style-type: none"> 4.1 Reliability design of electrical component 4.2 Reliability design of mechanical component 4.3 Reliability design of software 5. Reliability test <ol style="list-style-type: none"> 5.1 Reliability test of hardware component 5.2 Reliability test of software 6. Fault-tolerant Technology <ol style="list-style-type: none"> 6.1 Redundancy and techniques 6.2 Fault-tolerant techniques 6.3 Reliability analysis of fault-tolerant control system 7. Introduction of Relex 		
Teach Method	The course is given in the series of chapters, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	1. Homework	40%	2. Final exam (open book) 60%
Pre-request Course	Reliability analysis with monitoring, dynamic fault tree analysis and reliability verification and validation		

References	<p>[1] Gregory Levitin (ed.), Probability, Computational intelligence in reliability engineering. Evolutionary techniques in reliability analysis and optimization, Springer, 2002</p> <p>[2] S.S. Rao, Reliability Based Design, McGraw-Hill International Edition, Taiwan: 2002</p> <p>[3] Bazovsky, Reliability Theory and Practice, Prentice-Hall, Englewood Cliffs, New Jersey, 1961</p> <p>[4] R. Billinton and R.N. Allan, Reliability Evaluation of Engineering Systems: Concepts and Techniques, Plenum Press, New York, 1983.</p> <p>[5] Wang Shaoping, Reliability Engineering, Beijing University of Aeronautics and Astronautics Press, 2000 (in Chinese)</p>
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Course Introduction

Code	033513	Teaching Hours	32
Course	Intelligent Control		
Key Words	Expert Control; Adaptive Fuzzy Control; Fuzzy Neural Network		
Purpose and Role of the Course	<p>Today intelligent control techniques are successfully used in control applications. This course include mainly Expert Control, Fuzzy Control, Neural Network Control and Genetic Algorithm.</p> <p>Grasping basic principle of intelligent control theory, including expert control, fuzzy control, neural control, and genetic algorithm;</p> <p>Grasping adaptive neural controller design and adaptive fuzzy controller design;</p> <p>Grasping basic design methods of intelligent controller, including expert controller, fuzzy controller, and neural controller;</p> <p>Using Matlab language to design classical intelligent controllers and genetic algorithm.</p>		
Main Chapters and Teaching Hours	<p>Introduction to Intelligent Control</p> <p>Expert Control</p> <p>Theory Foundation of Fuzzy Control</p> <p>Fuzzy Control</p> <p>Adaptive Fuzzy Control</p> <p>Theory Foundation of Neural Network</p> <p>Typical Neural Network</p> <p>Fuzzy Neural Network</p> <p>Adaptive Neural Network Control</p> <p>Genetic Algorithm and its Applications</p>		
Teach Method	The course will be introduced with examples and illustrations selected from famous english journal papers. In this course, controller design example simulations with matlab will be arranged.		
Test and Examination	Home work Simulation Experiment Report		
Pre-request Course	Principle of Automatic Control		
References	<ol style="list-style-type: none"> 1. 刘金琨, 编著, 《智能控制》, 北京: 电子工业出版社, 2005, 5 2. Sigeru Omatu, Marzuki Khalid, Neural-Control and its Applications, Spring-Berlag, 1995 3. S.S.Ge, T.H.Lee and C.J.Harris, Adaptive Neural Network Control of Robotic Manipulators, World Scientific, London, 1998 4. Li-Xin Wang, A Course in Fuzzy Systems and Control, Prentice-Hall International, Inc., 1997 5. Feng G. A compensating scheme for robot tracking based on neural networks. Robotics and Autonomous Systems, 1995, 15: 100~206 6. Lewis F L, Liu K, Yesildirek A. Neural Net Robot Controller with Guaranteed Tracking Performance. IEEE Transactions on Neural Networks, 1995, 6(3): 703~715 <p>Yoo B K, Ham W C. Adaptive Control of Robot Manipulator Using Fuzzy Compensator. IEEE Transactions on Fuzzy Systems, 2000, 8(2): 186~199</p> <ol style="list-style-type: none"> 7. Liu Jinkun, Intelligent Control 		

Course Introduction

Code	033514	Teaching Hours	32
Course	Computer Interface		
Key Words	Interrupt controller; interface chip; DMA controller		
Purpose and Role of the Course	<p>In this course, students will study the computer's architecture and acquire the knowledge of programming and interfacing of the Intel family of microprocessors. Students will learn how to use and design some computer interface circuits with chips, such as parallel port, serial port, timer/counter, analogue to digit converter, digit to analogue converter, interrupt controller and the human-computer interfacing circuit. This course can provide some fundamental techniques to the students specialized in measurement and control system with a computer.</p> <p>Through the learning this course, students can acquire the basic knowledge of how to use and how to design a computer interface circuit. Students will learn the methods of how to use some interfacing chips.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. The history of Inter CPU. 2. The architecture of 8088/8086 CPU. 3. DAC, ADC. 4. Interrupt controller 8259A. 5. Serial port communication interface chip 8250. 6. Parallel communication interface chip 8255A. 7. Timer 8253. 8. DMA controller 8237A. 9. The device of human-computer interface 		
Teach Method	The course is given mainly in the form of class lectures. The total hours include three hardware experiments.		
Test and Examination	<ol style="list-style-type: none"> 1. Experiments: 30% 2. Final exam (open book) 70% 		
Pre-request Course	Students should have the knowledge of Analogue and Digital Circuits.		
References	[1] Barry B. Brey, The Intel Microprocessors (8086/8088,80186/80286,80386,80486,Pentium, and Pentium Pro Processor Architecture, Programming and Interfacing), 5th Edition, 2001		

Course Introduction

Code	033515	Teaching Hours	32
Course	Microcomputer and Application		
Key Words	Architecture; Digital-to-Analog Experiment; interface circuits		
Purpose and Role of the Course	<p>This course offers the fundamental and practical knowledge of designing a computer check and control system. It introduces the CPU's architecture of the Intel 8086 family, its instruction set, the method of designing a assembly language program. Students can also learn to use some programmable interface chips, such as programmable Timer/Counter 8253, programmable peripheral interface 8255A, programmable interrupt controller 8259A, and Digital-to-Analog Converter and Analog-to-Digital converters.</p> <p>To have the practical knowledge of forming a microcomputer system, to have the skills of designing an interface circuit, to have the methods of designing a program to control the interface circuit.</p>		
Main Chapters and Teaching Hours	<p>1. Teaching</p> <p style="padding-left: 20px;">1.1 The architecture of 8086</p> <p style="padding-left: 20px;">1.2 The instruction set of 8086</p> <p style="padding-left: 20px;">1.3 The assembly language programming</p> <p style="padding-left: 20px;">1.4 Interrupts</p> <p style="padding-left: 20px;">1.5 I/O interface circuits</p> <p>2. Experiments</p> <p style="padding-left: 20px;">2.1 Programmable Peripheral Interface experiment</p> <p style="padding-left: 20px;">2.2 Digital-to-Analog Experiment</p> <p style="padding-left: 20px;">2.3 Analog-to-Digital Experiment</p>		
Teach Method	The course is given in the form of class lectures, students also need to do three experiments.		
Test and Examination	1. Final Exam 70% 2. Experiments 30%		
Pre-request Course	Analogue and Digital Circuits		
References	[1] Barry B. Brey The Intel Microprocessors,8086/8088,80186,80286,80386,80486,Pentium, and Pentium Pro Processor Architecture, Programming, and Interfacing, 5th Edition, 2001		

Course Introduction

Code	033520	Teaching Hours	36
Course	Control System for Electrical Drive		
Key Words	Electrical; Motor; Apparent Power		
Purpose and Role of the Course	<p>Conception of ac motor, fundamentals of power, principle and equivalent circuit of the ac motor, DC/DC and DC/AC Switching Converters and harmonic, control technology of SPWM、 SVPWM and vector control for ac motor,</p> <p>Introduce the topics of induction motor, power electronics, and control technology for AC Motor. The emphasis is on grasp of principle of induction motor and its control technology .</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Fundamentals: <ol style="list-style-type: none"> 1.1 Conception of Electrical 1.2 Conception of Magnetism 1.3 Conception of Circuits 1.4 Conception of Mechanics 2. Active, Reactive, and Apparent Power <ol style="list-style-type: none"> 2.1 Introduction 2.2 Instantaneous 2.3 Active Power 2.4 Reactive Power 3. Induction Motor <ol style="list-style-type: none"> 3.1 Introduction 3.2 Principle of the Transformers 3.3 Equivalent Circuit of the Transformers 3.4 Principle of the Three-Phase motor 3.5 Principle of the Signal-Phase motor 3.6 Equivalent Circuit of the induction motor 4. Power Electronics <ol style="list-style-type: none"> 4.1 DC/DC Switching Converters 4.2 DC/AC Switching Converters 4.3 Harmonic of Power Electronics 5. The Control Technology of SPWM and SVPWM for AC Motor <ol style="list-style-type: none"> 5.1 Principle of SPWM 5.2 Principle of SVPWM 6. The Vector Control for AC Motor <ol style="list-style-type: none"> 6.1 Principle of Vector Control 6.2 Transform of Coordinate 6.3 Vector Control for AC Motor 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		

Test and Examination	1. Homework 40% 2. Final exam (open book) 60%
Pre-request Course	Knowledge of basic circuit analysis
References	[1] Electrical Machines, Drives, and Power Systems. Theodore Wildi Sixth edition 2006

Course Introduction

Code	033521	Teaching Hours	32
Course	The modern control strategies applied to Electro-hydraulic servo systems		
Key Words	modern control strategies, Electro-hydraulic, servo systems		
Purpose and Role of the Course	<p>This lecture should be useful to students who are at a level attained after two basic college courses in classical and modern control and electrohydraulic control systems. It introduces various kinds of modern control strategies applied to electro-hydraulic servo control system to improve the performance of the controlled system.</p> <p>Through this course students will mainly study modern control strategies applied to electrohydraulic servo control systems, which from classical PID tuning control to optimal control, adaptive control, robust control, preview and predictive control, and the design of their controllers and performance analysis of the closed loop systems.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1, Development of modern control strategies; 2, PID control applied to E-H servo systems 3, Optimal control applied to E-H servo systems 4, Preview and predictive control applied to E-H servo systems 5, Robust control applied to E-H servo systems 6, Adaptive control applied to E-H servo systems 7, Some topics on problems of modern control applied to electrohydraulic control systems. 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	1、 Assignments: 60% 2、 Final Exam: 40%		
Pre-request Course	Electro-hydraulic Servo Control Systems, Modern control strategies		
References	Script by lecturer		

Course Introduction

Code	033599	Teaching Hours	40
Course	Robust Control		
Key Words	H_∞ optimal control; Robust stability analysis; Loop transformation		
Purpose and Role of the Course	<p>Systems that can tolerate plant variability and uncertainty are called robust. The aim of this course is to present a theory of feedback system analysis, design and synthesis that is able to optimize the performance and robustness of control systems. This course is a natural extension to traditional optimal control theory. Since there always exist plant modeling errors and unknown disturbances in the industrial control problems, it is of theoretical and practical importance to learn this course. The aim of this course is to present a theory of feedback system analysis, design and synthesis that is able to optimize the performance and robustness of control systems.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Introduction (5hrs)</p> <ul style="list-style-type: none"> 1.1 Goals and origins of H_∞ optimal control 1.2 Optimizing the command response 1.3 Optimal disturbance attenuation 1.4 A robust stability problem <p>Chapter 2 Multivariable Frequency Response Design (7hrs)</p> <ul style="list-style-type: none"> 2.1 Introduction 2.2 Singular values 2.3 Singular values and the sensitivity operator 2.4 Robust stability analysis 2.5 Performance analysis and enhancement <p>Chapter 3 Signals and Systems (7hrs)</p> <ul style="list-style-type: none"> 3.1 Signals 3.2 Systems 3.3 The size of a system 3.4 The small gain theorem 3.5 Loop transformation 3.6 Robust stability revisited 3.7 The bounded real lemma <p>Chapter 4 Linear Fractional Transformations (5hrs)</p> <ul style="list-style-type: none"> 4.1 Introduction 4.2 LFTs in controller synthesis <p>Chapter 5 Full-Information H_∞ Controller Synthesis (6hrs)</p> <ul style="list-style-type: none"> 5.1 Introduction 5.2 The finite-horizon case 5.3 The infinite-horizon case <p>Chapter 6 The H_∞ Filter (5hrs)</p> <ul style="list-style-type: none"> 6.1 Introduction 6.2 Finite-horizon results 		

	<p>6.3 Infinite-horizon results</p> <p>Chapter 7 The H_∞ Generalized Regulator Problem (5hrs)</p> <p>7.1 Introduction</p> <p>7.2 Finite-horizon results</p> <p>7.3 Infinite-horizon results</p>
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	Do exercises and numerical simulations 100%
Pre-request Course	Linear algebra and matrix theory; Classical control theory; Linear systems theory; Optimal control.
References	<p>[1] Green M., Limebeer D. J. N., <i>Linear Robust Control</i>, Englewood Cliffs, New Jersey, U.S.A.: Prentice-Hall, 1995.</p> <p>[2] Zhou Kemin, Doyle J. C., Glover K., <i>Robust and Optimal Control</i>, Englewood Cliffs, New Jersey, U.S.A.: Prentice-Hall, 1996.</p>

Course Introduction

Code	033801	Teaching Hours	16
Course	Guidance and Control Systems Hardware-in-the-loop Simulation Experiments for Vehicle		
Key Words	Control system; Hardware-in-the-loop; vehicle		
Purpose and Role of the Course	<p>The course has close relation with these courses including principle of guidance or flight control, which is a succedent course. By these experiments, let students understand further basic control principle on vehicle. Through showing experiments and doing equipments, let students learn guidance and control systems hardware-in-the-loop simulation experiment for vehicle so that it lays a foundation for students to develop weapon equipment.</p> <ol style="list-style-type: none"> 1. Comprehend deeply theoretic knowledge about control and guidance for vehicle; 2. Let students learn guidance and control systems hardware-in-the-loop simulation experiment method for vehicle. 		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Show experiment equipments, demonstrate some experiments 2. Control system hardware-in-the-loop simulation experiment for vehicle 3. Attitude control loop hardware-in-the-loop simulation experiment for vehicle 4. Tracking infrared target experiment 		
Teach Method	Demonstrate experiments, Do experiments		
Test and Examination	Five grades: excellent, good, middling, pass, fail Submit experiment report		
Pre-request Course	Principle of Guidance, or Flight Control		
References	[1] The experiment instruction book		

Course Introduction

Code		Teaching Hours	32
Course	Practical Machine Learning		
Key Words	Neural Network; ROC Analysis; Clustering		
Purpose and Role of the Course	<p>Machine learning course is one of the most important units in the world top class CS/STATS departments such as MIT, Stanford, UC Berkeley, CMU, Cambridge and so on. Inductive learning and statistical learning has experienced rapid development in the past decade. Machine learning also make one of the most successful Artificial Intelligence branch by its solid mathematical foundation. Numerous applications have been employed by top-peer companies in IT industries such as Google, Microsoft, Yahoo! and so on. Several new frontier research fields had been emerged by employing machine learning model and statistical data analysis methods, that includes: bioinformatics, computational neuroscience, computational cognitive science and agent-based computational finance.</p> <p>The prerequisites are light; some prior exposure to basic probability and to linear algebra will suffice. We aim to use machine learning models to solve data-intensive real-world problems. Through this course, to give students a broad understanding of concepts in machine learning and statistics as applied across a range of application domains. It will also give students first hand experience in specific algorithms from statistical learning, Bayesian model, decision tree, dimension reduction, graphical models, and more. We will also teach student the practical application of using Matlab to solve the problems. This unit provides first hand experience about the problem of analyzing complex real world datasets, like those provided by biology, web, engineering, and many other domains.</p> <p>Students will be exposed to the most recent approaches based on statistical methods, optimization theory, and to state of the art algorithms. They will also experience real examples of data analysis, based on actual case studies. Students will access this unit with a basic knowledge of probability and will acquire working knowledge of practical data analysis, in real world situations. They will be able to start from a set of data and deliver patterns and other relevant relations detected in it and assessments about their statistical significance. They will learn general concepts about machine learning that are valid in many domains: algorithmic and statistical principles to be used in different domains. They will also acquire first hand experience in specific algorithms from statistical learning to probabilistic graphical models. They will see how a real world data analysis task is performed, by practicing with real data and Matlab. After successfully completing this unit, the students will be able to: Identify and discuss open questions in machine learning and data mining. Propose machine learning solutions to practical problems. Provide detailed coverage of at least one advanced topic in machine learning and data mining. Have a good understanding of inductive learning philosophy and mathematical details. Apply data mining techniques to large, real-world datasets. Use Matlab or other programming languages to implement designed machine learning models.</p>		

<p style="text-align: center;">Main Chapters and Teaching Hours</p>	<p>The main contents of this course are as follows. The final list is open to further changes based on the actual lecturing situations.</p> <ol style="list-style-type: none"> 1. Introduction and Philosophy of Learning 2. Classification and Regression 3. Discrete Bayesian Classifiers 4. Spam filter and Abnormal Detection 5. Clustering 6. Feature Selection 7. ROC Analysis 8. Text Mining 9. Machine Learning and Information Retrieval 10. Hidden Markov models 11. Neural Network 12. Computational approaches to cognitive science 13. Expectation Maximization 14. Reinforcement Learning 						
<p style="text-align: center;">Teach Method</p>							
<p style="text-align: center;">Test and Examination</p>	<p>Your grade will be computed based upon your class participation, instructor’s recommendations, home works and final exam or project. The weighting on these factors as follows:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 70%;">Classroom participation</td> <td style="text-align: right;">20%</td> </tr> <tr> <td>Homework</td> <td style="text-align: right;">40%</td> </tr> <tr> <td>Final Exam or Project</td> <td style="text-align: right;">40%</td> </tr> </table> <p>Students will be required to complete homework assignments. These must be turned in on time to receive credit. There will also be a final project. A project report will be required and projects will also be presented in an end-of-term poster session. The homeworks will count for 40% of the grade and the project will count for 40% of the grade.</p> <p>The final project counts for roughly 40% of your grade. We will use the same guidelines as the other classes; please read them. The main idea is to have you apply a concept from the class in your own research, or explore it further through experimentation. The evaluation of the project will be based on the following three deliverables:</p> <p>Submit one paragraph describing your project plan or ideas. The idea is to have you start working on the project. Feel free to come to discuss project ideas with classmates, to send emails to the lecturers.</p> <p>You will present a poster about your project. Submit your project write-up before the final deadline.</p>	Classroom participation	20%	Homework	40%	Final Exam or Project	40%
Classroom participation	20%						
Homework	40%						
Final Exam or Project	40%						
<p style="text-align: center;">Pre-request Course</p>	<p>None</p>						

References	<p>The lectures will use the lecturing notes (short descriptions of particular problems) and teaching materials (PPT) mainly. We recommend students to read the following text books as well.</p> <p>Hastie, Tibshirani and Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction, 2nd Edition, Springer 2008.</p> <p>Witten and Frank, Data Mining: Practical Machine Learning Tools and Techniques, 2nd Edition Morgan Kaufmann 2005.</p> <p>Christopher Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.</p> <p>Christopher Bishop, Pattern Recognition and Machine Learning, Springer 2006</p>
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Course Introduction

Code	033523	Teaching Hours	32
Course	Service Computing		
Key Words	Service Computing; Cloud manufacturing; Internet of Things		
Purpose and Role of the Course	<p>The aim of this course is by giving the special lectures or seminar of typical advanced computing technologies or models, including service computing, Internet of Things, distributed computing (such as parallel computing, grid computing), intelligent computing, cloud computing, to enable the graduate students to have background knowledge about the basic idea, concept, advances, and innovative applications of current advanced computing technologies. Then through the case study, course discussion, and course work, to make the students to master the related basis theory, methodology, key technologies.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Introduction (2 Teaching Hours) Chapter 2 Distributed Computing, including parallel computing, P2P computing, grid computing, etc. (4 Teaching Hours) Chapter 3 Intelligent computing (4 Teaching Hours) Chapter 4 Service Computing (6 Teaching Hours) Chapter 5 Cloud Computing (6 Teaching Hours) Chapter 6 Other advanced computing technologies including utility computing, greed computing, quantum computing, etc. (4 Teaching Hours) Chapter 7 Typical innovation application, such as cloud manufacturing and internet of things (6 Teaching Hours)</p>		
Teach Method	<p>The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.</p>		
Test and Examination	<p>The students are required to submit a research report at the end of this course.</p>		
Pre-request Course	<p>None</p>		
References	<p></p>		

Course Catalogue for International Postgraduates

(School of Jet Propulsion)

编号 No.	英文课程名称 Course Title	中文课程名称 Course Title	学时 Hours	学分 Credits	开课季节 Semester	任课教师 Lecturer
043302	Computational Fluid Dynamics	计算流体力学	32	2	Spring/ Fall	Li Xiaodong
043406	Advanced Heat and Mass Transfer	高等传热传质学	48	3	Spring/ Fall	Liu Youhong
041515	Combustion Technology and Application	燃烧技术及应用	32	2	Spring/ Fall	Liu Yuying
043528	Strength of Engineering Materials	工程材料强度理论	34	2	Spring/ Fall	Qi Hongyu
043533	FORTRAN Programming Language	FORTRAN 编程语言	32	2	Spring/ Fall	Xiaodong Li
043535	Flow measurement techniques	流动测试技术	48	3	Spring	Ma Hongwei
043536	Gas Dynamics	气体动力学	48	3	Spring	SHAN Peng
043813	Continuum Mechanics and Theory of Materials	连续介质力学和材料理论	40	3	Spring	SHI Duoqi
043407	Advanced Combustion	高等燃烧学	48	3	Fall	Huang Yong
043550	Robust Control	鲁棒控制	48	3	Fall	Qin Daoliang
043545	Fundamentals of Acoustics	声学原理	48	3	Spring	Li Xiaodong; Gao Junhui
043546	Advanced Combustion Diagnostics	先进燃烧测试技术	32	2	Spring	Wang Fang; Gan Zhiwen
043547	Aviation fuels	航空燃料学	32	2	Spring	Yang Xiaoyi
043548	Engineering Thermodynamics	工程热力学	32	2	Spring	Li Haiwang
043549	Science and Technology of Renewable Energy	新能源理论与技术	32	2	Spring	Yang Xiaoyi
043404	Fatigue and Fracture of Material and Structure	疲劳与断裂力学	48	3	Fall	Yang Xiaoguang
043301	Viscous Fluid Mechanics	粘性流体力学	48	3	Fall	Lu Lipeng
043544	Heat and Mass Transfer	传热传质学	48	3	Fall	Xu Guoqiang; Chen Longfei

Course Introduction

Code	043302	Teaching Hours	32
Course	Computational Fluid Dynamics		
Key Words	modeling fluid problems; computational fluid dynamics; aerodynamics combining		
Purpose and Role of the Course	<p>Primary mathematical equations of fluid (liquid and air) flow and approximation approaches of those equations. The basic thoughts and numerical methods of modeling fluid problems, such as finite difference, finite volume, finite element methods and so on, as well as the analysis of their numerical properties. High resolution method for Euler equation; Navier-Stokes equations and some turbulence models used frequently.</p> <p>Introduce the significance of computational fluid dynamics (CFD) in research of aerodynamics combining with theoretical analysis and experiments as well as its wide application to various engineering problems. The emphasis is on the basic thoughts and numerical methods in CFD, and the applications to realistic engineering problems.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction, flow models. 2. Equations of fluid mechanics. 3. Finite Difference Method. 4. Finite Volume Method. 5. Finite Element Method. 6. Time-stepping techniques. 7. Properties of numerical methods. 8. Operator-splitting / Navier-Stokes equations. 9. High-resolution methods / Euler equations. 10. Some new techniques in CFD 		
Teach Method	The course is given mostly in the form of class lectures, and some discussions on specific topics are also arranged in the class. Moreover, students are expected to grasp the contents through doing the homework assignments.		
Test and Examination	<ol style="list-style-type: none"> 1. Class participation, discussion and assignment 40% 2. Final exam (open book) 60% 		
Pre-request Course	Knowledge of aerodynamics, viscous fluid mechanics and numerical analysis, Fortran Language (or C/C+ language)		

References	<p>[1] J.H. Ferziger and M. Peric, Computational Methods for Fluid Dynamics. Springer, 1996.</p> <p>[2] C. Hirsch, Numerical Computation of Internal and External Flows. Vol. I and II. John Wiley & Sons, Chichester, 1990.</p> <p>[3] P. Wesseling, Principles of Computational Fluid Dynamics. Springer, 2001.</p> <p>[4] C. Cuvelier, A. Segal and A. A. van Steenhoven, Finite Element Methods and Navier-Stokes Equations. Kluwer, 1986.</p> <p>[5] S. Turek, Efficient Solvers for Incompressible Flow Problems: An Algorithmic and Computational Approach, LNCSE 6, Springer, 1999.</p> <p>[6] R. Löhner, Applied CFD Techniques: An Introduction Based on Finite Element Methods. John Wiley & Sons, 2001.</p> <p>[7] J. Donea and A. Huerta, Finite Element Methods for Flow Problems. John Wiley & Sons, 2003.</p> <p>[8] J. D. Anderson, Computational Fluid Dynamics: The Basics with Applications. McGraw-Hill, New York, 1995.</p>
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Course Introduction

Code	043406	Teaching Hours	48
Course	Advanced Heat and Mass Transfer		
Key Words	heat and mass transfer; radiation exchange; external flow		
Purpose and Role of the Course	This course is a very important professional basic course for the students for master degree. Its main purpose is both to deepen the knowledge of the heat and mass transfer learned on the undergraduate period and to establish the fundamentals of heat and mass transfer dissertation.		
Main Chapters and Teaching Hours	Chapter 01 Introduction Chapter 02 Introduction to conduction Chapter 03 One dimensional, steady-state conduction Chapter 04 Two dimensional, steady-state conduction Chapter 05 Transient conduction Chapter 06 Introduction to convection Chapter 07 External flow Chapter 08 Internal flow Chapter 12 Radiation: processes and properties Chapter 13 Radiation exchange between surfaces Chapter 14 Mass transfer Final examination		2 hours 4 hours 6 hours 4 hours 4 hours 6 hours 4 hours 4 hours 4 hours 4 hours 4 hours 4 hours 2 hours
Teach Method	Teaching is the main way and self learning is the assistant way。 The emphasis is on the training student's abilities to analysis and to solve practical problems.		
Test and Examination	Open book in the examination.		
Pre-request Course	Heat and mass transfer Engineering thermo-physics		
References	[1] Frank P. Incropera, David P. Dewitt, Theodore L. Bergman and Arienne S. Lavine. Fundamentals of heat and mass transfer. 6th edition, John Wiley & Sons, Inc., 2007. [2] Robert Siegel, John R. Howell. Thermal radiation heat transfer. 4th edition, Taylor&Francis, 2002 [3] Frank M. White. Heat and mass transfer. Addison-Wesley Publishing Company, 1988. 2002		

Course Introduction

Code	041515	Teaching Hours	32
Course	Combustion Technology and Application		
Key Words	combustion technologies; pollution combustion technology; combustion pollution control system		
Purpose and Role of the Course	<p>This course elaborates on the fundamentals principles of combustion technologies and related burners, nozzles, or combustor of gaseous fuels, liquid fuels and solid fuels on the basis of the combustion theory knowledge. The new developed low-NO_x combustion technology is also included. We have aimed this course for graduate students.</p> <p>Introduce the related combustion technologies of there kinds of fossil fuels, and also the low pollution combustion technology. The emphasis is to lay foundation to the ability of applying the related combustion technology to engineering problems, such as industry burner design, gas turbine combustor design, development of combustion pollution control system, etc.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction 2. Combustion technology of gaseous fuels 3. Combustion technology of liquid fuels 4. Combustion technology of solid fuels 5. Low NO_x Combustion technology and application 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing literature review.		
Test and Examination	Final exam (open book) : Prescribed topic's literature review and presentation, 100%		
Pre-request Course	Knowledge of basic combustion theory, fluid mechanics, heat transfer and thermodynamics		
References	<p>[1] Gary L. Borman, Kenneth W. Ragland, Combustion Engineering, McGraw-Hill Press, 1998</p> <p>[2] Stephen R. Turns, An Introduction to combustion-concepts and applications, 2nd ed., McGraw-Hill Press, 2000</p>		

Course Introduction

Code	043528	Teaching Hours	34
Course	Strength of Engineering Materials		
Key Words	mechanics analysis; fracture of solids; fiber reinforced plastics		
Purpose and Role of the Course	<p>Based on the macro and micro mechanics analysis, the strength theory of main engineering materials such as metals, polymers, ceramics and FRP composites are introduced. This course can serve for graduate students in the field of mechanics, materials science and engineering, aeronautics.</p> <p>The main contents are: fracture of solids, dislocation and strength theory of crystals, energy balance in fracture, fracture mechanics method, fracture toughness, brittle and ductile fracture, materials strength at elevated temperatures, fatigue, strength of polymer and ceramics, strength of fiber reinforced plastics, fracture control design of materials.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Failure of solid <ol style="list-style-type: none"> 1.1 materials strength 1.2 mechanism of failure 1.3 theory of strength 2. Dislocation and strength of crystals <ol style="list-style-type: none"> 2.1 the theory of shear strength 2.2 dislocation density 2.3 continuous of dislocation theory 3. Energy balance in fracture <ol style="list-style-type: none"> 3.1 energy balance 3.2 fracture toughness 3.3 Griffith 4. Fracture mechanics method <ol style="list-style-type: none"> 4.1 stress intensity factor 4.2 stress field of crack tips 4.3 crack opening displacement 5. Fracture toughness and its measurement <ol style="list-style-type: none"> 5.1 fracture toughness 5.2 dynamic fracture toughness 5.3 measurement of K_{Ic} 6. Brittle and ductile fracture of metals <ol style="list-style-type: none"> 6.1 brittle and ductile fracture 6.2 ductile-to-brittle transition behavior 7. Materials strength at elevated temperature <ol style="list-style-type: none"> 7.1 stress rupture 7.2 creep curve 7.3 creep-fatigue interaction 8. Fatigue <ol style="list-style-type: none"> 8.1 S-N curve 		

	8.2 fatigue strength 8.3 fatigue at elevated temperature 9. Strength of polymers and ceramics 9.1 viscoelastic properties of polymers 9.2 damage and fracture of polymers 9.3 strength of ceramics 10. Strength of fiber reinforced plastics 10.1 properties of FRP 10.2 orthotropic materials 10.3 strength of FRP 11. Fracture control design of materials 11.1 reliability of FRP 11.2 optimization of materials
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	1. Homework 30% 2. Final exam (open book) 70%
Pre-request Course	Knowledge of basic materials science and mechanics
References	[1]Chen Jianqiao. Strength of engineering materilas. Huazhong University of Science and Technology Press. Wuhan, 2008. [2] Jaroslav M. Strength and fracture of glass and ceramics . Amsterdam ; Elsevier, 1992. [3] Ferdinand L. Singer, Andrew Pytel. Strength of materials .New York : Harper & Row, 1980.

Course Introduction

Code	043533	Teaching Hours	32
Course	FORTRAN Programming Language		
Key Words	Modules; Subroutines; FORTRAN		
Purpose and Role of the Course	<p>FORTRAN Programming Design is a high-level computer programming language course. Through the data types, operations, sentence structure and basic program design methods of learning, the course will enable students to master a high-level programming language, understand the basic concepts and methods of program design and commonly used algorithms, and then learn to use FORTRAN to solve the general applications for the post-professional-related courses of study and application of procedures design to lay the foundation.</p> <p>The mission of this course is to combine the general numerical and non-numerical simulation to introduce to students the basic knowledge of computer program design, to enable students to master the basic contents of FORTRAN and the basic methods of program design and programming skills, understand the general idea of program design and way of thinking and basic capacity in the practical problems for the further learning and the application of computer.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Preliminary 2. Decision 3. Repetition 4. Input and Output 5. Functions and Subroutines 6. Arrays 7. Character 8. Modules and Interface Block 9. Pointer and Recursion 10. Files 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	Class participation, discussion and assignment 40% Final exam (open book) 60%		
Pre-request Course	Knowledge of Computer Culture and Higher Mathematics		
References	<p>[1] Weilin Zhang, FORTRAN 90 Programming Design, Anhui University Press, 2001.</p> <p>[2] Ming Xu, Tutorial of FORTRAN Power Station 4.0, Tsinghua Press, 2002.</p> <p>[3] Haoqiang Tan, FORTRAN 77 Programming, Tsinghua Press, 1999.</p> <p>[4] Patrick G. McKeown, Structured programming using FORTRAN 77, Harcourt Brace Jovanovich, 1985</p>		

Course Introduction

Code	043535	Teaching Hours	48
Course	Flow measurement techniques		
Key Words	Flow; measurement; techniques		
Course Description	This course will introduce basic measurement principles, measurement methods and data processing of flow pressure, temperature and velocity, giving some typical measurement results and comments on each technique.		
Course Objective	<p>Upon introducing students the principles, methods, techniques and traits for interpreting a variety of techniques of flow measurement, students will:</p> <ol style="list-style-type: none"> 1 understand the principles and the methods of the flow measurement techniques. 2 learn how to select proper techniques to finish measurements and experiments. 3 obtain the ability to develop the flow measurement techniques. 		
Main Chapters and Teaching Hours	<p>1 Introduction</p> <p>§1.1 Why we have to measure?</p> <p>§1.2 Background of flow measurement techniques</p> <p>Basic Requirements: Background of flow measurement techniques.</p> <p>Duration: 2 Hours</p> <p>2 Measurements of static pressure</p> <p>§2.1 principle</p> <p>§2.2 measurement of static pressure on a wall</p> <p>§2.3 static pressure probe</p> <p>§2.4 pressure sensitive paints</p> <p>§2.5 typical measurement results</p> <p>Basic Requirements: basic measurement principles, methods and data processing.</p> <p>Duration: 2 Hours</p> <p>3 Measurements of total pressure</p> <p>§3.1 principle</p> <p>§3.2 total pressure probe</p> <p>§3.3 boundary layer probe</p> <p>§3.4 pitot probe</p> <p>§3.5 combined probe</p> <p>Basic Requirements: basic measurement principles, methods and data processing.</p> <p>Duration: 2 Hours</p> <p>4 Multi-hole pressure probe</p> <p>§4.1 principle</p> <p>§4.2 data reduction method</p> <p>§4.3 probe type</p> <p>§4.4 calibration</p> <p>§4.5 calibration wind tunnel</p> <p>Basic Requirements: basic measurement principles, methods and data processing.</p>		

Duration: 2 Hours

5 Measuring errors of pressure probes

§5.1 Reynolds number

§5.2 Mach number

§5.3 pressure gradient and velocity gradient

§5.4 wall proximity

§5.5 blockage

§5.6 turbulence

§5.7 correction methods

Basic Requirements: basic measurement principles, methods and data processing.

Duration: 2 Hours

6 Hot Wire Anemometer

§6.1 principle

§6.2 data reduction method

§6.3 probe type

§6.4 calibration

§6.5 measurement program

§6.6 measuring errors

§6.7 typical measurement results

Basic Requirements: basic measurement principles, methods and data processing.

Duration: 6 Hours

7 Laser Doppler Anemometer

§7.1 principle

§7.2 data reduction method

§7.3 probe type

§7.4 seeding method

§7.5 measurement program

§7.6 measuring errors

§7.7 typical measurement results

Basic Requirements: basic measurement principles, methods and data processing.

Duration: 6 Hours

8 Particle Imaging Velocimeter

§8.1 principle

§8.2 data reduction method

§8.3 hardware

§8.4 seeding method

§8.5 measurement program

§8.6 measuring errors

§8.7 typical measurement results

Basic Requirements: basic measurement principles, methods and data processing.

Duration: 6 Hours

9 Unsteady pressure measurements

§9.1 principle

	<p>§9.2 data reduction method</p> <p>§9.3 probe type</p> <p>§9.4 calibration</p> <p>§9.5 typical measurement results</p> <p>Basic Requirements: basic measurement principles, methods and data processing.</p> <p>Duration: 2 Hours</p> <p>10 Flow temperature measurements</p> <p>§10.1 principle</p> <p>§10.2 data reduction method</p> <p>§10.3 probe type</p> <p>§10.4 calibration</p> <p>§10.5 typical measurement results</p> <p>Basic Requirements: basic measurement principles, methods and data processing.</p> <p>Duration: 6 Hours</p> <p>11 Flow visualization</p> <p>§11.1 principles</p> <p>§11.2 techniques</p> <p>§11.3 typical measurement results</p> <p>Basic Requirements: basic measurement principles, methods and data processing.</p> <p>Duration: 4 Hours</p> <p>12 Data acquisition system</p> <p>§12.1 principles</p> <p>§12.2 hardware</p> <p>§12.3 software</p> <p>Basic Requirements: basic measurement principles, methods and data processing.</p> <p>Duration: 2 Hours</p> <p>13 Student lectures</p> <p>Basic Requirements: basic measurement principles, methods and data processing.</p> <p>Duration: 6 Hours</p>
Teach Method	This course introduces flow measurement techniques by the use of multimedia teaching methods.
Test and Examination	One thesis including both MS WORD and PPT version is required to introduce a kind of measurement technique and Students will present their thesis in the class. Comprehensive assessment will be given by homework and class presentation
Pre-request Course	Fluid mechanics, thermodynamics, basic measurement techniques

References	<p>[1] 1 A.V. Smolakov and V.M. Tkachenko ; translated by S. Chomet ; edited by P. Bradshaw. The measurement of turbulent fluctuations : an introduction of hot-wire anemometry and related transducers /, Springer-Verlag, 1983.</p> <p>[2] 2 Richard J. Goldstein, Fluid mechanics measurements /, Hemisphere Pub. Corp., c1983.</p> <p>[3] 3 R.W. Miller, Flow measurement engineering handbook /, McGraw-Hill, c1983.</p> <p>[4] 4 R.A. Bajura, M.L. Billet, Fluid Measurements and Instrumentation Forum, 1986 / American Society of Mechanical Engineers, c1986.</p> <p>[5] 5 M. Padmanabhan, F.T. Dodge, T.R. Heidrick, Measuring and metering of unsteady flows /, ASME, c1986.</p> <p>[6] 6 E.P. Rood, C.J. Blechinger, Fluid measurement and instrumentation forum, 1990 : presented at the 1990 spring meeting of the Fluids Engineering Division, held in conjunction with the 1990 forum of the Canadian Society of Mechanical Engineers, University of Toronto, Toronto, Ontario, Canada, June 4-7, 1990 /, ASME, c1990.</p> <p>[7] 7 Zaichao Liang, Ching-Jen Chen, Shutang Cai, Flow modeling and turbulence measurements /, Hemisphere Pub., c1992.</p> <p>[8] 8 Jim E. Hardy...[et al.], Flow measurement methods and applications, Wiley c1999.</p> <p>[9] 9 R.J. Adrian ... [et al.] (eds.), Laser techniques applied to fluid mechanics : selected papers from the 9th international symposium, Lisbon, Portugal, July 13-16, 1998 /, Springer-Verlag, 2000.</p> <p>10 D.W. Spitzer, Flow measurement : practical guides for measurement and control /, ISA, c2001.</p>
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Course Introduction

Code	043536	Teaching Hours	48
Course	Gas Dynamics		
Key Words	Computational Fluid Dynamics; turbomachinery design; combustion		
Purpose and Role of the Course	<p>This class is intended for the 4th year undergraduate students and the graduate students. Students who wish he engages in the research fields of the internal flow field computational simulation, of turbomachinery design, of air-breathing engine components design, and so on, should take this class. It is the discipline fundamental class for those aerothermodynamic specialities, such as viscosity fluid flow, Computational Fluid Dynamics (CFD), turbomachinery design, combustion and combustor. The primary contents are : vector analysis and field theory; kinematic analysis of multi-dimensional flow fields; basic equations in both integral form and differential form for viscousless compressible multi-dimensional fluid flow, including Crocco's equation; entropy equation; acoustic speed equation; the resolving methods of the above equations including velocity potential function equation, stream function equation, small disturbance linearization theory, ideal two-dimensional steady supersonic flow's characteristic theory. Finally it deals with also basic equations of the above type in the relative coordinates, including some physical ideas and some important turbomachine equations.</p> <p>1 Understand the principles of Euler equations, especially that of its variety forms for internal flow field research and design.</p> <p>2 Learn three branches of conventional resolving methods for Euler equations.</p> <p>3 Know the principles of both the flow fields' engineering simulation and the flow fields' engineering design, using multi-dimensional Euler equations.</p>		
Main Chapters and Teaching Hours	<p>1. The Review of Compressible Fluid Dynamics (4 hrs.) To be familiar with engineering thermodynamics. To be familiar with compressible fluid dynamics or to say one-dimensional gas dynamics.</p> <p>2 The Vector Analysis and other Basic Mathematic knowledges to Deal with Three-Dimensional Gas Dynamics (6 hrs.) To be familiar with Vector operations and their physical meanings.</p> <p>3 Fluid Flow Kinematics (10 hrs.) To be familiar with total derivative, fluid acceleration and so on in both Cartesian and cylinder coordinates.</p> <p>4 The establishment of Euler equations with some variety forms. (10 hrs.) To be familiar with the physical meaning of each equation and every item.</p> <p>5 Velocity Potential Function Equation and Stream Function Equation (6 hrs.) To be familiar with this still vigour solving method.</p> <p>6 Small Disturbance Linearization Theory (6 hrs.) To be familiar with this useful and developing method.</p> <p>7 Method of Characteristics (6 hrs.) To be familiar with this general method for the hyperbolic equations.</p>		
Teach Method	Lecturing; Reading given books; Home exercises; Examination only 1 time with a opened test paper.		

Test and Examination	<p>1. During lecturing time, require some discussions and recitations, 30%</p> <p>2. Examination</p>
Pre-request Course	<p>[1]. James E. A. John, Gas Dynamics, Second Edition, Allyn and Bacon, Inc., Massachusetts 02159, 1984.</p> <p>[2]. Peng Shan, Fundamentals of Three-Dimensional Gasdynamics (In Chinese 多维气体动力学基础), First Edition, Press of Beijing University of Aeronautics and Astronautics, Beijing, August, 2004.</p> <p>[3]. Michel A. Saad, Compressible Fluid Flow, Prentice-Hall, Inc., Englewood Cliffs, New Jersey 07632, 1985.</p>
References	

Course Introduction

Code	043813	Teaching Hours	40
Course	Continuum Mechanics and Theory of Materials		
Key Words	Continuum mechanics; deformation gradient; viscoelasticity		
Purpose and Role of the Course	<p>The object of mechanics is to investigate the motions of material bodies under the influence of forces. Continuum mechanics is based on the assumption that matter is continuously distributed in space. Kinematics, balance relations of mechanics, general theory of mechanical material behavior are presented.</p> <p>Introduce the topics of deformation gradient, strain and strain rate tensors, stress tensors. The mechanical behaviors of solid materials and different constitutive relations, for example, elasticity, viscoelasticity, plasticity and viscoplasticity would be emphasized to students.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction: Probability <ol style="list-style-type: none"> 1.1 Development of continuum mechanics 1.2 Solid, Fluid to Rational Mechanics 2. Kinematics <ol style="list-style-type: none"> 2.1 Material Bodies 2.2 Material and Spatial Representation 2.3 Deformation Gradient 2.4 Strain Tensors 2.5 Strain Rate Tensors 2.6 Strain Rate in Convective Coordinates 3. Balance Relations of Mechancis <ol style="list-style-type: none"> 3.1 Preliminary Remarks 3.2 Balance of Mass in Global Form and Local Form 3.3 Stress Tensors 3.4 Stress Tensors in Convective Coordinates 4. General Theory of Mechanical Material Behavior <ol style="list-style-type: none"> 4.1 General Principles 4.2 Constitutive Relations 4.3 Properties of Material Symmetry 4.4 Kinematic Conditions of Internal Constraint 4.5 Formulation of Material Models 5. Elasticity <ol style="list-style-type: none"> 5.1 Elasticity and Hyperelasticity 5.2 Isotropic Elastic Bodies 5.3 Anisotropic Hyperelastic Solids 6. Viscoelasticity <ol style="list-style-type: none"> 6.1 Representation by means of functions 6.2 Representation by means of internal state variables 7. Plasticity 		

	<p>7.1 Rate-Independent Functions</p> <p>7.2 Representation by means of internal state variables</p> <p>7.3 Elastoplasticity</p> <p>8. Viscoplasticity</p> <p>8.1 Preliminary Remarks</p> <p>8.2 Viscoplasticity with elastic domain</p> <p>8.3 Plasticity as a limit case of viscoplasticity</p> <p>8.4 A Concept for general Viscoplasticity</p> <p>9. Constitutive Models in Thermomechanics</p> <p>9.1 Thermomechanical consistency</p> <p>9.2 Thermoelasticity</p> <p>9.3 Thermo-visco-elasticity</p> <p>9.4 Thermo-visco-plasticity with elastic domain</p> <p>9.5 General Thermo-visco-plasticity</p> <p>9.6 Anisotropic Material Properties</p>
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	1. Homework 30% 2. Final exam (open book) 70%
Pre-request Course	Knowledge of basic matrix analysis, and tensor analysis
References	<p>[1] A. Papoulis, Probability, Random Variables, and Stochastic Processes, McGraw-Hill Press, 3rd Ed, 1991</p> <p>[1] Peter Haupt, 《Continuum Mechanics and Theory of Materials》, Springer-Verlag, 2000.</p> <p>[3] J.-L,Chaboche. 《Mechanics of Solid Mateirals》, Cambridge University Press,2000.</p>

Course Introduction

Code	043407	Teaching Hours	48
Course	Advanced Combustion		
Key Words	Combustion; thermodynamics; diffusion flame		
Brief Description of the Course	<p>Combustion is a complex phenomenon involving chemistry, fluid dynamics, thermodynamics and heat transfer. Combustion has a very wide range of application in energy and power engineering, such as aeroengines, rocket engines, gas turbine engines, internal engines, industrial furnaces, anti-fire techniques, and pollutant emissions.</p> <p>This course will be given in English. All the contents in the course will be developed gradually on the two bases of reaction and fluid dynamics. The key points will be the combustion fundamentals in gas turbine combustors. Only after the study of this course, the students will be allowed to study other courses concerning combustion process, such as gas turbine combustors, the design of combustors, computational combustion flows, emission control, and combustion diagnostics.</p> <p>This course is an obligatory course for all the graduate students in thermal energy engineering. The prerequisite courses include college chemistry, the introduction to aviation engines, fluid mechanics, gas dynamics, thermodynamics and heat transfer.</p>		
Course Objective	<p>Combustion involves chemistry, fluid dynamics, thermodynamics and heat transfer. Combustion has a very wide range of application in energy and power engineering, such as aeroengines, rocket engines, gas turbine engines, internal engines, industrial furnaces, anti-fire techniques, and pollutant emissions.</p> <p>All the contents will be developed gradually on the two bases of reaction and fluid dynamics. The key points will be the combustion fundamentals in gas turbine combustors. Only after the study of this course, students will be allowed to study other courses such as gas turbine combustors, the design of combustors, computational combustion flows, emission control, and combustion diagnostics.</p> <p>This course is an obligatory course for all the graduate students in thermal energy engineering. The prerequisite courses include college chemistry, the introduction to aviation engines, fluid mechanics, gas dynamics, thermodynamics and heat transfer.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Introduction</p> <p>§1.1 Motivations</p> <p>§1.2 Combustion in aeroengines</p> <p>§1.3 The measurement of research level</p> <p>Duration: 2 Hours</p> <p>Chapter 2 Control equations for combustion flows</p>		

§2.1 Species in mixtures

§2.2 Concentration and reaction rate

§1.3 Transport properties

§1.4 Conservation equations

§1.5 Simplification for the 2D reactive boundary layer on a plate

§1.6 Stefan's flow

§1.7 Nondimensional criterions

Basic Requirements: Master the concepts and physical meanings of concentration, reaction rates, transport coefficients, and Stefan's flow.

Duration: 6 Hours

Chapter 3 Combustion thermodynamics and kinetics

§3.1 Thermodynamics of combustion

§3.2 Chemical kinetics of combustion

Basic Requirements: Master the concepts and physical meanings of standard enthalpy, sensible enthalpy, total enthalpy, heating value, stoichiometric air, fuel/air ratio, equivalence ratio, the ratio of excess air, adiabatic flame temperature, flame dissociation, chemical equilibrium, equilibrium constant, elementary and global reaction, the law of mass action, reaction mechanism, reaction order, steady-state approximation, activation energy, Arrhenius Law. Master the typical values of the above parameters.

Duration: 6 Hours

Chapter 4 Diffusion flames of gaseous fuel

§4.1 Free jets and their flames

§4.2 Confined jets

§4.3 Swirl jets.

Basic Requirements: Master the concepts and physical meanings of flame front, laminar and turbulent diffusion flame lengths, stable and lifted diffusion flames, features of free jets, confined jets, swirl number, critical swirl number for intense swirl, effects of swirl on flame length.

Duration: 6 Hours

Chapter 5 Laminar flames of premixed fuel

§5.1 Combustion modes

§5.2 Flame speed

§5.3 Factors affecting flame speed

§5.4 Flame speed measurements

Basic Requirements: Master the concepts and physical meanings of detonation, deflagration,

combustion wave, laminar flame speed, prominent factors affecting flame speed, typical methods to measure flame speed, typical values for flame speed.

Duration: 6 Hours

Chapter 6 Turbulent flames

§6.1 General description

§6.2 Review of turbulence

§6.3 Kolmogorov assumptions

§6.4 Features of turbulent flames and modelling

Basic Requirements: understand the basic logic about how to consider the effects of turbulence to flame speed.

Duration: 8 Hours

Chapter 7 Ignition and extinction

§7.1 Thermal spontaneous ignition

§7.2 Forced ignition

§7.3 Flame extinction

Basic Requirements: Master the concepts and physical meanings of critical ignition and extinction condition, ignition delay, minimum ignition energy, the typical plot between heat flux and temperature, difference between ignition and extinction, quenching distance.

Duration: 4 Hours

Chapter 8 Liquid fuel combustion

§8.1 Experimental observations

§8.2 Droplet evaporation

§8.3 Droplet combustion

§8.4 Spray combustion

§8.5 Spray parameters

§8.6 Spray formation

Basic Requirements: Master the concepts and physical meanings of features of liquid fuel combustion, transfer number, d^2 law, evaporation constant and its typical values, features of droplet flame location, cumulative and differential dispersion for a spray, Sauter Mean Diameter, MMD, Weber number and its critical value, Ohnesorg number,

Duration: 4 Hours

Chapter 9 Flameholding

§9.1 Flammability

	<p>§9.2 Flameholding at low velocity</p> <p>§9.3 Flameholding at high velocity</p> <p>Basic Requirements: Master the concepts and physical meanings of lean and rich limits and their typical value, the effects of pressure, temperature and velocity on flammability, principle of flameholding for a Bunsen flame, blow-off process of a Bunsen flame at different equivalence ratio, typical method to hold a flame at high velocity, well stirred reactor model, recirculation ignition model.</p> <p>Duration: 4 Hours</p> <p>Chapetr 10 Combustion emissions</p> <p>§10.1 Pollutants and their hazards</p> <p>§10.2 Mechanisms for pollutant formations</p> <p>§10.3 Methods to control emissions</p> <p>Basic Requirements: Master the concepts and physical meanings of CO, UHC, NO_x, smoke, and their primary mechanism of formation.</p> <p>Duration: 2 Hours</p>
Teach Method	Class teaching with designated references, homework and discussion problems.
Test and Examination	Closed test in the class.
Prerequisite	Chemistry, Introduction to aviation, fluid mechanics, Gas dynamics, Engineering thermodynamics, Heat transfer.
Textbooks and References	<p>Huang Yong et al., Combustion and combustor, Beihang University press , 2009.</p> <p>Stephen R. Turns, An Introduction to Combustion, McGRAW-HILL International Editions, 2000.</p> <p>I.Glassman, R. A. Yetter, Combustion, Elsevier, 2008.</p>

Course Introduction

Code	043550	Teaching Hours	48
Course	Robust Control		
Key Words	Robust control; semi-definite programming; LMITool		
Brief Description of the Course	<p>Robust control plays an important role in the advancement of automatic control. This course will give control engineering-involved students a general description of development in control science and describe the background why and how robust control arises. Despite many classical textbooks and distinct frameworks to introduce robust control, this course will focus on convex optimization-based robust control. Hence students in this course will not only master robust control techniques but also learn about some basic semi-definite programming (SDP) concepts. Typical SDP problems and off-the-shelf software kits will be first presented. Then robust control system analysis and synthesis with/without accounting for uncertainty will be smoothly introduced. In addition, robust filtering and estimation problem will also be discussed in the SDP framework. Finally, this course will be concluded by some tutorial applications and frontier introductions.</p>		
Course Objective	<p>Robust control has been successfully applied in the aerospace sector (e.g., European telecommunication satellites). Every student in aerospace-related fields should know about benefits and weakness of robust control. This course is specifically prepared for control engineering-oriented postgraduates. Through this course, students should have a general understanding of control development history and know about why and how robust control emerges. In addition, students ought to identify common SDP problems and can be proficient at using off-the-shelf software kits to solve them. Moreover, for robust controller and filter design problems frequently encountered in aerospace engineering, students should know how to use ad-hoc tools to obtain an optimized solution. Finally, students in this course should have their judgments on the prospective progress in robust control and gain the flexibility to apply some ideas in robust control to their own research problems.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Historical Review of Control §1.1 History of Control Development §1.2 Origins of Robust Control Basic Requirements: overview and general understanding of control field and how and why robust control arises Duration: 4 Hours</p> <p>Chapter 2 Mathematical Preliminaries §2.1 Linear Matrix Inequality and Related Numerical Problems §2.2 Ellipsoid Algorithm and Interior Point Algorithm §2.3 Schur Complement and Order Reduction of Matrix Inequalities</p>		

§2.4 Semidefinite Term Removal and Matrix Variable Removal

§2.5 Strict and Nonstrict LMIs and S-procedure

Basic Requirements: identification of linear matrix inequalities, three frequently encountered LMI problems, common numerical algorithms for LMI problems, Schur complement, matrix variable removal, and S-procedure.

Duration: 10 Hours

Chapter 3 Robust Control Software

§3.1 Robust Control Toolbox

§3.2 LMITOOL

§3.3 CVX Toolbox

Basic Requirements: solve common LMI problems using these off-the-shelf software kits

Duration: 6 Hours

Chapter 4 Analysis of System Performance

§4.1 Supremum and Infimum

§4.2 Continuous-time System Gain Indices

§4.3 Continuous-time System H_2 and H_∞ performance

§4.4 Discrete-time System Gain Indices

Basic Requirements: concepts of supremum and infimum and their difference from maximum and minimum, common system performance gains, physical meanings and usage of H_2 and H_∞ performance, and SDP formulation of these system performance indices.

Duration: 8 Hours

Chapter 5 Synthesis of Control Systems

§5.1 H_∞ Control

§5.2 H_2 Control

§5.3 Mixed H_2/H_∞ Control

Basic Requirements: synthesize state-feedback and dynamic output feedback controller parameters in terms of H_2 and H_∞ performance criteria and their SDP formulations.

Duration: 6 Hours

Chapter 6 Analysis and Synthesis of Uncertain Systems

§6.1 Uncertainty Models

§6.2 Robust Stability Analysis

§6.3 Robust Performance Analysis

§6.4 Robust H_2/H_∞ Control

Basic Requirements: common characterizations of uncertainty models, robust stability concepts,

	<p>robust performance analysis and controller synthesis based on H_2/H_∞ criteria.</p> <p>Duration: 6 Hours</p> <p>Chapter 7 Robust Filter Design</p> <p>§7.1 H_∞ Filter Design</p> <p>§7.2 H_2/H_∞ Filter Design</p> <p>Basic Requirements: robust filter design using H_2/H_∞ principles</p> <p>Duration: 4 Hours</p> <p>Chapter 8 Tutorial Applications</p> <p>§8.1 Multivariable PID Control</p> <p>§8.2 Robust H_∞ Filtering for Fault Diagnosis</p> <p>Basic Requirements: multivariable PID controller design and H_∞ Filtering for fault detection and isolation</p> <p>Duration: 2 Hours</p> <p>Chapter 9 Frontier in Robust Control</p> <p>Basic Requirements: know about progress in robust control, its challenges, and future directions</p> <p>Duration: 2 Hours</p>
Teach Method	Lecture, seminar, tutorial & computer programming.
Test and Examination	Coursework, class performance & project report: 40%, 20%, 40%.
Prerequisite	Linear algebra and linear system theory
Textbooks and References	<p>Stephen Boyd, Laurent El Ghaoui, E. Feron, V. Balakrishnan, Linear Matrix Inequalities in System and Control Theory, SIAM, 1994.</p> <p>Stephen Boyd, Lieven Vandenberghe, Convex Optimization, Cambridge University Press, 2004.</p> <p>Luigi Fortuna, Mattia Frasca, Optimal and Robust Control: Advanced Topics with MATLAB, CRC Press, 2012.</p> <p>Kemin Zhou, John Doyle, Keith Glover, Robust and Optimal Control, Prentice Hall, 1995.</p> <p>Kemin Zhou, John C. Doyle, Essentials of Robust Control, Prentice Hall, 1997.</p> <p>Dawei Gu, Petko H. Petkov, Mihail M. Konstantinov, Robust Control Design with MATLAB, Springer, 2013.</p> <p>Geir E. Dullerud, Fernando G. Paganini, A Course in Robust Control Theory: A Convex Approach, Springer, 2005.</p>

Course Introduction

Code	043545	Teaching Hours	48
Course	Fundamentals of Acoustics		
Key Words	Vibration and wave; fundamental acoustics; noise insulation		
Brief Description of the Course	This course provides modern and comprehensive classes in acoustic field, including the fundamentals of acoustics, sound measuring instrumentation, criteria and regulations for noise control, nonlinear acoustics, engineering application, introduction of aeroacoustics and computational aeroacoustics.		
Course Objective	The fundamentals of acoustics is an elective course for graduate students with energy and power engineering major in School of energy and power engineering, international school of Beihang University. The objective of this course is to make the students acquire the basic knowledge in fundamental acoustics, basic principles and methods in industrial and environmental noise control, and the basic problems and methods in acoustics. The teaching methods include lectures, experiments, and other links. This course is a foundation of the follow-up courses and related research for the postgraduate students.		
Main Chapters and Teaching Hours	<p>Chapter 1 Introduction</p> <p>§1.1 History of acoustics</p> <p>§1.2 Status and characteristics of acoustics</p> <p>Basic Requirements: Nothing specific</p> <p>Duration: 1 Hours</p> <p>Chapter 2 Basic properties of sound wave</p> <p>The basic sound absorption principle of porous materials and resonance, principle and application of sound insulation technology;</p> <p>§2.1 Fundamental concepts I : Sound pressure, frequency, wave length, phase</p> <p>§2.2 Fundamental concepts II : Sound energy, sound power, sound intensity</p> <p>§2.3 Homogeneous wave equation</p> <p>§2.4 Propagation, reflection and refraction</p> <p>§2.5 Mechanism of sound generation</p> <p>Basic Requirements: Advanced mathematics</p> <p>Duration: 7 Hours</p> <p>Chapter 3 Particle vibration and elastomer vibration</p> <p>§3.1 Vibrating particles</p> <p>§3.2 General governing equations of vibrating particles</p> <p>§3.3 Vibrating strings</p> <p>§3.4 Vibrating membrane</p> <p>Basic Requirements: Advanced mathematics</p> <p>Duration: 5 Hours</p>		

Chapter 4 Acoustic measurement and analysis methods

§4.1 Sound measuring instrumentation

§4.2 Acoustic measurement and analysis methods

§4.3 Introduction of aircraft noise measurements

Basic Requirements: Advanced mathematics, Signal processing

Duration: 3 Hours

Chapter 5 Evaluation methods and standards for noise

§5.1 Evaluation methods for noise

§5.2 Standards for noise

§5.3 Environmental noise

§5.4 Traffic noise

§5.5 Urban environmental noise

§5.6 Aircraft noise airworthiness

Basic Requirements: Basic concepts of acoustics

Duration: 2 Hours

Chapter 6 Sound insulation

§6.1 Principles of sound insulation

§6.2 Measurement and evaluation

§6.3 Application

Basic Requirements: Basic concepts of acoustics

Duration: 4 Hours

Chapter 7 Muffler

§7.1 Basic concepts

§7.2 Performance assessment

§7.3 Structure and characteristics

§7.4 Design methods

§7.5 Application

§7.6 Summary of noise control

Basic Requirements: Basic concepts of acoustics

Duration: 6 Hours

Chapter 8 Duct acoustics

§8.1 Sound waves in a finite duct with constant cross section

§8.2 Sound waves in a finite duct with arbitrary cross-sectional shape

§8.3 The effects of viscous damping on sound propagation in a duct

§8.4 Theory of waveguides

§8.5 Lined ducts

Basic Requirements: Basic concepts of acoustics, Advanced mathematics

Duration: 6 Hours

	<p>Chapter 9 Spherical waves §9.1 Solution of wave equation §9.2 Sound radiation by compact bodies §9.3 Sound intensity and sound power of pulsating sphere §9.4 Sound scattering by sphere with hard surfaces Basic Requirements: Basic concepts of acoustics, Advanced mathematics Duration: 4 Hours</p> <p>Chapter 10 Special phenomena in sound propagation §10.1 Reflection and refraction §10.2 The Doppler effect §10.3 Absorption of sound §10.4 Properties and applications of ultrasonic wave Basic Requirements: Basic concepts of acoustics, Advanced mathematics Duration: 2 Hours</p> <p>Chapter 11 Nonlinear Acoustics §11.1 Solution of one-dimensional nonlinear hydrodynamic equation §11.2 Nonlinearity of pressure-density relation and the parameter of nonlinearity §11.3 Wave distortions §11.4 Interaction between waves with limited amplitude §11.5 Propagation of waves with limited amplitude in viscous medium Basic Requirements: Basic concepts of acoustics, Advanced mathematics Duration: 4 Hours</p> <p>Chapter 12 Introduction of aeroacoustics §12.1 Development history of aeroacoustics §12.2 Lighthill equation §12.3 FW-H equation §12.4 Introduction of computational aeroacoustics Basic Requirements: Basic concepts of acoustics, Advanced mathematics, Fluid Dynamics Duration: 4 Hours</p>
Teach Method	Lectures, Experimental measurements, laboratory visit, stage discussion class are also arranged. This course focuses on training students to analyze and solve problem independently.
Test and Examination	Homework and projects presentation and defense
Prerequisite	Advanced mathematics Fluid Dynamics
Textbooks and References	Du Gonghuan, Zhu Zhemin, Gong Xiufen, Fundamental Acoustics, Shanghai Science and Technology Press, 1981 Ma Dayou, Basic Theory of modern Acoustics, Science Press, 2004.

	<p>Zhen Changju, Hong Zonghui, Wang Xian, Zhang Li, Environmental Noise Control Engineering, Higher Education Press, 1991.</p> <p>Sun Xiaofeng, Zhou Sheng, Aeroacoustics, National Defense Industry Press, 1994</p> <p>Ingard, K.U. and Morse, P.M., Theoretical Acoustics, McGraw-Hill Book Company, 1968.</p> <p>Dowling, A.P., Ffowcs Williams, J.E., Sound and Sources of Sound, Ellis Horwood Limited, 1983.</p>
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Course Introduction

Code	043546	Teaching Hours	32
Course	Advanced Combustion Diagnostic		
Key Words	Combustion; diagnostics		
Brief Description of the Course	<p>This course provides a pedagogical overview of the current state-of-the-art in the development of diagnostics methods for the solution of fundamental and applied combustion problems. Students should learn the following content: the tasks and requirements of combustion diagnostics; the methods to study the characteristics of fossil fuels and products of combustion; the theories and practices on measuring the properties of intermediate production and temperature of combustion; formation and diagnostics of sprays in combustion; diagnostic and control of combustion pollutant; perspectives of combustion diagnostics.</p>		
Course Objective	<p>Combustion is the major source of energy for human being. Thus, it is extremely importance to improve combustion efficiency and minimize combustion-generated pollution for our sustainable development future. This course concerns with the fundamental understanding of combustion diagnostics which is needed for applying combustion devices and processes. These knowledge was originated in the collaboration of scientists representing many fields of expertise. By this course, students will find how to improve the understanding of modern diagnostic methods applied to combustion processes, systems, and problems. The information presented here will be a valuable aid in their laboratories, researches, and in the solution of practical problems..</p>		
Main Chapters and Teaching Hours	<p>Chapter 1. An overview of combustion diagnostics §1.1 Diagnostics in combustion: task and requirements §1.2 Invasive techniques §1.3 Noninvasive techniques Basic Requirements: This chapter introduces a brief overview of combustion diagnostics. It requires the basic principles, basic methods of diagnostics in combustion and flames. Duration: 4 Hours</p> <p>Chapter 2. Analytic method of combustion characteristics of fossil fuels and products §2.1 Combustion characteristics of fossil fuel by thermal analysis methods §2.2 GC/MS for combustion Basic Requirements: The students should know the basic theory of thermal analysis methods and gas chromatography/mass spectrometry (GC/MS). Duration: 4 Hours</p> <p>Chapter3. Diagnostics of intermediate production and temperature of combustion §3.1 Gas Potentiometry</p>		

	<p>§3.2 Spontaneous Raman scattering diagnostics</p> <p>§3.3 Coherent Anti-Stokes Raman Scattering Spectroscopy</p> <p>§3.4 Laser-Induced Fluorescence</p> <p>§3.5 Ultrafast Fluorescence Anisotropy</p> <p>Basic Requirements: The students should know the basic principles and method of thermocouple. The basic knowledge of intermediate production in combustion is also required.</p> <p>Duration: 6 Hours</p> <p>Chapter 4. Formation and diagnostics of sprays in combustion</p> <p>§4.1 Motivation for spray combustion measurements</p> <p>§4.2 Laser Doppler Anemometry</p> <p>§4.3 Phase Doppler Anemometry</p> <p>§4.4 Malvin laser particle size analyzer</p> <p>§4.4 Other instruments for spray combustion</p> <p>Basic Requirements: This chapter presents an overview of conventional methods used for spray analysis. The basic understand of spray and atomization is necessary.</p> <p>Duration: 6 Hours</p> <p>Chapter 5. Diagnostic and control of combustion pollutant</p> <p>§5.1 Carbon monoxide</p> <p>§5.2 CO₂ greenhouse gas formation and capture</p> <p>§5.3 Soot and soot diagnostics by Laser-Induced Incandescence</p> <p>§5.4 Polycyclic aromatic hydrocarbons and combustion</p> <p>§5.5 NO_x formation, control and reduction techniques</p> <p>Basic Requirements: It demands the basic knowledge of pollutants such as NO_x, CO, OH and CO₂.</p> <p>Duration: 6 Hours</p> <p>Chapter 6. Perspectives</p> <p>§6.1 Diagnostics for detailed kinetic modeling</p> <p>§6.2 Diagnostic challenges for gas turbine combustor model validation</p> <p>§6.3 Sensor requirements for combustion control</p> <p>§6.4 Diagnostic requirements for emission control</p> <p>§6.4 Continuing developments</p> <p>Basic Requirements: This chapter concentrates on some of these unsolved questions and on directions for future research. The basic knowledge of kinetic modeling and controller is required.</p> <p>Duration: 6 Hours</p>
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Teach Method	The teacher's explanation is the primary method to study this course; the special topic discussion and self-study are the auxiliary means to study this course.
Test and Examination	Presentation and final report
Prerequisite	Aerodynamics; Combustion; Engineering Thermodynamics
Textbooks and References	Handbook of combustion, Volume 2: Combustion Diagnostics and Pollutants. Edited by Maximilian Lackner, Franz Winter, and Avinash K. Agarwal. WILEY-VCH VerlagGmbH&Co. KGaA, Weinheim, 2010. Applied combustion diagnostics. Eited by Katharina Kohse-Hoinghaus& Jay B. Jeffries. New York: Taylor & Francis, 2002. Combustion measurements. Edited by Norman Chigier. New York : Hemisphere Pub. Corp., 1991

Course Introduction

Code	043547	Teaching Hours	32
Course	Aviation fuels		
Key Words	Alternative; aviation fuel; Certification		
Brief Description of the Course	<p>The alternative aviation fuel is a required course to graduates in BUAA. The lectures introduce the notable landmarks in the progress of aviation fuel and safety of aviation fuel in aero-engine. The course contains 5 chapters including basic introduction of aviation fuel, chemical-physical properties, blending of aviation fuel, spray properties, combustion and emission, fit-for-purpose and certification.</p>		
Course Objective	<p>The objective of this course is to understand the frontier of alternative aviation fuels development and the basic knowledge of related with alternative aviation fuels. Principles of this course enable students to know physical and chemical properties of aviation fuel, and combustion properties and the fit for purpose for the aero-engine. Accordingly, the certification process of aviation fuel inspires students to explore for new aircraft engine design. The students will obtain the abilities of testing and simulation chemical-physical properties spray properties, and combustion performance of aviation fuel.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Introduction of Aviation Fuel §1.1 Development of Aviation fuel §1.2 Classification of alternative aviation fuel §1.3 Whole life cycle assessment</p> <p>Basic Requirements: aviation fuel development with the development of aviation engine, classification of alternative aviation fuel based on feedstock or processing, the feedstock including coal, biomass, algae, saline tolerance plant, et al. and whole life cycle assessment of carbon and energy efficiency for aviation fuel.</p> <p>Duration: 6 Hours</p> <p>Chapter 2 Aviation fuel production §2.1 Traditional aviation fuel §2.2 FT alternative aviation fuel §2.3 HRJ alternative aviation fuel §2.4 P&LRJ alternative aviation fuel</p> <p>Basic Requirements: the processing of aviation fuel including traditional aviation fuel, FT alternative aviation fuel derived from coal, nature gas, et al, HRJ derived from algae, saline tolerance and vegetable oil, P&LRJ derived from wood, straw, and sewage sludge.</p>		

	<p>Duration: 6 Hours</p> <p>Chapter 3 Physical-chemical properties</p> <p>§3.1 Components in aviation fuel</p> <p>§3.2 Physical & chemical property testing</p> <p>§3.3 Component and physical & chemical property simulation</p> <p>Basic Requirements: the component and its properties of aviation fuel, the instrument and testing method of fuel components and properties including viscosity, density, HHV, distillation, freezing point, vapor pressure et al, simulation model based on component.</p> <p>Duration: 6 Hours</p> <p>Chapter 4 Fit-for-purpose of alternative fuels</p> <p>§4.1 Fit-for-purpose of alternative fuels</p> <p>§4.2 Basics Combustion performance of alternative aviation fuel</p> <p>§4.3 Aviation fuel additives</p> <p>Basic Requirements: the theory and method of blending alternative aviation fuel with kerosene, fit-for-purpose of aviation fuels, combustion performance of alternative aviation fuel including flammability limits and ignition energy, relationship of composition, properties, and combustion performance.</p> <p>Duration: 6 Hours</p> <p>Chapter 5 Certification of alternative aviation fuel</p> <p>§5.1 Standards development of alternative aviation fuel</p> <p>§5.2 ASTM D7566 & ASTM D4054</p> <p>§5.3 Certification process of alternative aviation fuel</p> <p>Basic Requirements: introduction of two types of general standards including ASTM D7566 & ASTM D4054, the safety of alternative aviation fuel in aero-engine, the certification process of alternative aviation fuel.</p> <p>Duration: 6 Hours</p>
Teach Method	Teaching, Tutorial, Experiment, Special topic discussions
Test and Examination	Class learning, Homework and Final report: 40%, 20%, 40% respectively.
Prerequisite	Engineering Thermodynamics, Gas dynamics, Combustion
Textbooks and	Arthur H. Lefebvre, Dilip R. Ballal, Gas turbine combustion: alternative fuels and emissions, CRC

References	<p>Press, 2010.</p> <p>Fuel properties--effect on aircraft and infrastructure, Aviation Rulemaking Advisory Committee, 2007.</p> <p>Alain A. Vertes, Biomass to biofuels: strategies for global industries, Wiley, 2010.</p> <p>Shihai Xu, Character and utilization of liquid fuel, SINOPEC Press, 2010.</p> <p>Baoren Wang, Analysis of oil, High Education Press, 2007.</p> <p>Jesse Russell, Aviation Fuel, Demand Ltd. 2013.</p>
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Course Introduction

Code	043548	Teaching Hours	32
Course	Engineering Thermodynamics		
Key Words	Thermodynamics; Quasi-equilibrium process; reversibility process		
Brief Description of the Course	<p>This course will introduce the basic concept of thermodynamics, the first law of thermodynamics, and the second law of thermodynamics; the method about how to analyze and calculate the various processes and cycles about thermodynamic will be studied also.</p>		
Course Objective	<p>This course is an important subject fundamental course in the School of Energy and Power Engineering, which aims to make students understand the fundamental laws and principles in the subject of Engineering Thermodynamics, and learn how to apply the theories to real engineering applications. Through the courses, the students are expected to meeting the following requirements: the grasp of the fundamental laws and principles in Engineering Thermodynamics, such as the first Law and the second Law, and the capability of analyzing and computing thermodynamic processes and different types of cycles, like Otto or diesel cycles. Pre-required course is Physics. This course serves as pre-required course for Engineering Fluid Dynamics, Engine Principles.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Introduction §1.1 How to exploit and utilize energy, and the developments of engineering thermodynamics and heat engine; §1.2 The object and problem-solving techniques of engineering thermodynamics. Basic Requirements : understand the developments of engineering thermodynamics and heat engine; know well the object and problem-solving techniques of Engineering thermodynamics. Duration: 2 Hours</p> <p>Chapter 2 Basic concepts and Definitions §2.1 Thermodynamics system and state §2.2 Parameters under normal condition §2.3 thermodynamics process and cycle §2.4 Work and energy, volume work, §2.5 Quasi-equilibrium process, reversibility process. Basic Requirements: know well the concepts of thermodynamics, e.g. thermodynamics system, status parameters, work and energy, volume work. The important concepts are temperature, quasi-equilibrium process, reversibility process, and so on. Duration: 5 Hours</p> <p>Chapter 3 The first law of thermodynamics</p>		

	<p>§3.1 The first law of thermodynamics</p> <p>§3.2 Thermodynamic energy, total energy, enthalpy,</p> <p>§3.3 Energy equation for close and open systems,</p> <p>§3.4 Expansion and compression work.</p> <p>Basic Requirements: understand how to build the energy equation for close and open systems. Masterly analyze and calculate the work of various thermal components using energy equations.</p> <p>Duration: 4 Hours</p> <p>Chapter 4 Properties and behavior of gas and vapor</p> <p>§4.1 The definition of specific heat</p> <p>§4.2 Ideal-Gas Equation of State, specific heat of Ideal-Gas</p> <p>§4.3 Thermal energy, calculate enthalpy and entropy</p> <p>§4.4 Real-gas Equation of State</p> <p>§4.5 The pressure-specific volume diagram, vapor process under constant pressure</p> <p>§4.6 The definition and calculation of status parameters for water and vapor</p> <p>Basic Requirements: the calculation of specific heat of Ideal-Gas, thermal energy, calculate enthalpy and entropy. Understand the Real-gas Equation of State and the pressure-specific volume diagram. Know well how to calculate the status parameters of vapor using pressure-temperature diagram.</p> <p>Duration: 6 Hours</p> <p>Chapter 5 The basic thermodynamic process of gas and vapor</p> <p>§5.1 Constant-state parameter process of Ideal-Gas</p> <p>§5.2 Polytrophic process</p> <p>§5.3 Constant-state parameter process of vapor</p> <p>Basic Requirements: know well how to calculate volume work and technology work in the processes of Constant-Volume, Constant-pressure, Constant-temperature, Constant-entropy and polytropic for Ideal-Gas. Understand how to descript different process in the pressure-specific volume diagram and the Temperature-Entropy diagram.</p> <p>Duration: 3 Hours</p> <p>Chapter 6 The second law of thermodynamics (8 class hours)</p> <p>§6.1 The Carnot Cycle and the Carnot law</p> <p>§6.2 The second law of thermodynamics</p> <p>§6.3 Entropy</p> <p>§6.4 The principle of entropy increase</p> <p>§6.5 The entropy flux</p> <p>§6.6 The entropy generation</p>
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	<p>§6.7 The entropy function</p> <p>§6.8 The entropy equations for open system</p> <p>§6.9 Loss in work potential.</p> <p>Basic Requirements: understand the substance of the second law of thermodynamics, the aim of study of the second law of thermodynamics. Know well entropy, the principle of entropy increase, the entropy equation of close and open systems.</p> <p>Duration: 8 Hours</p> <p>Chapter 7 Thermodynamic cycle of gas</p> <p>§7.1 The ideal cycle of piston type internal combustion engine</p> <p>§7.2 The ideal cycle of gas turbine</p> <p>§7.3 The ideal cycle of jet engine.</p> <p>Basic Requirements: understand the characteristics of different cycles; know well the calculated method of work and thermal efficiency for different cycles.</p> <p>Duration: 4Hours</p>
Teach Method	Teaching and discussions through seminars; interactive method
Test and Examination	Homework (>60 questions) and final report (100 point)
Prerequisite	Advance mathematics (I, II), Physics
Textbooks and References	Yunus A. Cengel and Michael A. Boles, Thermodynamics: An Engineering Approach, McGraw-Hill Higher Education, 2014.

Course Introduction

Code	043549	Teaching Hours	32
Course	Science and Technology of Renewable Energy		
Key Words	Sustainable; Solar Energy; Wind Energy; Biomass Energy; Fuel Cell		
Brief Description of the Course	<p>This course is an optional course in School of Energy and Power Engineering, which aim to improve the development and utilization of new energy and renewable energy. Alternative fuels for aviation is an emerging multi-disciplinary, cross-edge science, which indicates the characteristics in the field of renewable energy research and development in Beihang University. This course is including: domestic and international energy situation and the development of new energy technologies; solar energy resources, solar thermal utilization, solar photovoltaic and solar chemistry; Biomass conversion principle and technology, biomass liquefaction and gasification, Fit for purpose of alternative aviation fuels; wind energy utilization and development, wind turbine energy conversion principle; fuel cell, and hybrid technology.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Energy and Sustainable Development (4 hours)</p> <p>1.1 Energy species and distribution</p> <p>1.2 Energy Evaluation Method</p> <p>1.3 Theory of Sustainable Development</p> <p>1.4 low-carbon economy</p> <p>Chapter 2 solar technology (8 hours)</p> <p>2.1 Sun and the solar spectrum</p> <p>2.2 Solar thermal conversion technology</p> <p>2.3 Solar photovoltaic technologies</p> <p>2.4 solar photochemical conversion technology</p> <p>Chapter 3 biomass and alternative fuels (8 hours)</p> <p>3.1 Biomass feedstock</p> <p>3.2 Pathway for Alternative aviation fuels</p> <p>3.3 Basic physical and chemical properties and combustion properties of alternative fuels</p> <p>3.4 Fit for purpose of Alternative aviation fuels</p> <p>Chapter 4 Wind Energy Technology (4 hours)</p> <p>4.1 Wind Energy Resources</p> <p>4.2 Wind turbine principle</p> <p>4.3 The characteristics of wind turbine</p> <p>Chapter 5 fuel cell technology</p> <p>5.1 Fuel cell development and working principle</p> <p>5.2 Fuel cell types, characteristics and application</p> <p>5.3 Fuel cell hybrid power</p>		
Teach Method	Teaching and experiment		
Test and Examination	Presentation and final report		

Course Introduction

Code	043404	Teaching Hours	48
Course	Fatigue and Fracture of Material and Structure		
Key Words	fatigue fracture; Crack initiation; Crack closure		
Brief Description of the Course	<p>It will give the classic theory and knowledge of fatigue fracture of metal, besides, with rapid development and aero and astro industry, the knowledge concerning fatigue and fracture has being updated. The new theories, new method, new experimental techniques have largely enhanced the understanding the fatigue failure of products, especially for new material and manufacture process. So, it will deal with not only the basic knowledge, such as stress-based fatigue theory, strain-based fatigue theory and crack-growth-based theory, but also fatigue of single crystal superalloy, ceramic-matrix composite etc. The course is tightly associated with engineering application, especially in the field aero engine and aircraft, meanwhile utilizing current research results.</p>		
Course Objective	<p>The course is for graduate students majoring in MSE, ME or A&A, who are interesting to learn the knowledge, concept and methodology about fatigue and fracture of material and structure, etc. or there is a need in their research work.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Introduction: Fatigue Phenomenon in the Material and Structure</p> <p>§1.1 Fatigue phenomenon</p> <p>§1.2 Different phases of the fatigue life</p> <p>§1.3 Fatigue Crack initiation</p> <p>§1.4 Fatigue Crack growth</p> <p>Basic Requirements: Understanding the engineering background of fatigue and fracture, the definitions of the items concerning the fatigue, crack initiation and propagation.</p> <p>Duration: 2 Hours</p> <p>Chapter 2 Fatigue Damage Mechanism</p> <p>§2.1 Crystallographic aspects</p> <p>§2.2 Crack initiation at inclusions</p> <p>§2.3 Small cracks, crack growth barriers, thresholds</p> <p>§2.4 Sub-Crack growth and striations</p> <p>§2.5 Characteristic features of fatigue failures</p> <p>Basic Requirements: concept of fatigue damage, damage mechanism understood as crack evolution from initiation to fracture at the meso and grain level, microstructure effects on fatigue damage, PSB, understanding the whole period of fatigue damage from micro to macro structure.</p> <p>Duration: 2 Hours</p> <p>Chapter 3 Deformation Behaviors under Cyclic Loading</p>		

	<p>§3.1 Behaviors under monotonic tensile loadings</p> <p>§3.2 Behaviors under Cyclic loadings</p> <p>Basic Requirement: Cyclic loading parameters, Cyclic hardening/Softening, Ratcheting, Mean stress relax, Bauchinger Effect, Cyclic stress-strain curve</p> <p>Duration: 4 Hours</p> <p>Chapter 4. Stress-Based Fatigue Life Prediction</p> <p>§4.1 HCF: S-N life Curve</p> <p>§4.2 Goodman Graph: Mean stress effect</p> <p>§4.3 Surface treatment</p> <p>§4.4 Type of loading, tension, bending, torsion</p> <p>§4.5 Combined loading</p> <p>Basic Requirements: Definition of HCF, Stress Fatigue HCF limit, Haigh Graph, Goodman Hypothesis, Various surface treatments and their effects on HCF</p> <p>Duration: 4 Hours</p> <p>Chapter 5. Strain-Based Fatigue Life Prediction</p> <p>§5.1 Low-cycle fatigue -N life Curve</p> <p>§5.2 Transition fatigue life</p> <p>§5.3 The factors influencing the LCF</p> <p>Basic Requirements: Definition of LCF, Manson-Coffin Model, Strain Fatigue</p> <p>Duration: 4 Hours</p> <p>Chapter 6. Fatigue Crack Growth. Analysis and Predictions</p> <p>§6.1 Introduction</p> <p>§6.2 Description of fatigue crack growth properties</p> <p>§6.3 Fatigue crack growth regions</p> <p>§6.4 Crack closure</p> <p>§6.5 Prediction of fatigue crack growth</p> <p>Basic Requirements: Stress Intensity Factor, Crack Closure Effect, Paris Equation</p> <p>Duration: 4 Hours</p> <p>Chapter 7. Stress Concentration</p> <p>§7.1 Definition of Kt</p> <p>§7.2 Analytical calculations on stress concentrations</p> <p>§7.3 Effect of the notch geometry on Kt</p> <p>§7.4 Some additional aspects of stress concentrations</p>
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	<p>§7.5 Methods for the determination of stress concentrations</p> <p>Basic Requirements : Concept of Stress Concentration, Stress Concentration Factor Calculation, Neuber Rule.</p> <p>Duration: 2 Hours</p> <p>Chapter 8 Residual Stress</p> <p>§8.1 Introduction</p> <p>§8.2 Different sources of residual stresses</p> <p>§8.3 Measurements or calculations of residual stresses</p> <p>§8.4 Effects of residual stress on fatigue</p> <p>Basic Requirements: Various Sources of Residual Stress, Their Effects on Fatigue, Residual Stress Relax during Service</p> <p>Duration: 2 Hours</p> <p>Chapter 9 The Fatigue Strength of Notched Specimens</p> <p>§9.1 Introduction</p> <p>§9.2 The fatigue limit of notched specimens at $S_m = 0$.</p> <p>§9.3 The fatigue limit of notched specimens for $S_m > 0$.</p> <p>§9.4 Significance of the surface finish.</p> <p>§9.5 The S-N curves of notched specimens</p> <p>Basic Requirements : Notched Fatigue, K_t Effect on Fatigue, Stress Gradient Effects on Fatigue, Grain Effect on Fatigue</p> <p>Duration: 2 Hours</p> <p>Chapter 10 Fatigue under Variable-Amplitude Loading</p> <p>§10.1 Introduction</p> <p>§10.2 The Miner rule</p> <p>§10.3 Strain history prediction model</p> <p>§10.4 Predictions based on service-simulation fatigue tests</p> <p>§10.5 Discussion of fatigue life predictions for VA loading</p> <p>§10.6 Crack growth under VA-stress histories</p> <p>§10.7 Crack growth prediction models for VA loading</p> <p>§10.8 Evaluation of prediction methods for fatigue crack growth under VA-load histories</p> <p>Basic Requirements: Loading Spectrum, Sequence Effect on Fatigue, Rain-Flow Counting, Miner Linear Damage Accumulation.</p> <p>Duration: 2 Hours</p>
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	<p>Chapter 11 Fatigue and Scatter</p> <p>§11.1 Introduction</p> <p>§11.2 Sources of scatter</p> <p>§11.3 Description of scatter</p> <p>§11.4 Some practical aspects of scatter</p> <p>§11.5 Major topics of the present chapter</p> <p>Basic Requirements: Fatigue Scatter and natural meanings, Scatter Modeling of Fatigue life, Worst fatigue Properties, P-S-N Curve.</p> <p>Duration: 2 Hours</p> <p>Chapter 12 High-Temperature Fatigue</p> <p>§12.1 Introduction</p> <p>§12.2 Two examples of high-temperature fatigue</p> <p>§12.3 Fatigue properties at high temperatures</p> <p>Basic Requirements : Understanding the effects of high temperature, Creep, Creep-Fatigue Interaction, Thermomechanical Fatigue, Thermal Fatigue, Thermal Shocking Fatigue. Application for Hot Parts of Aeroengine</p> <p>Duration: 2 Hours</p>
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	<p>1. Homework 20%</p> <p>2. Final exam or Project work (open book) 80%</p>
Prerequisite	Knowledge of Mechanics of Material and Elasticity Mechanics
Textbooks and References	<p>[1] Ralph I. Srephens, etc., Metal Fatigue in Engineering, Second Edition, Wiley Inter-Science Publication, 2001.</p> <p>[2] S. Suresh, Fatigue of Material, Second Edition, Cambridge University Press, 1998</p>

Course Introduction

Code	043301	Teaching Hours	48
Course	Viscous Fluid Dynamics		
Key Words	boundary layer; flow instability; turbulence theory		
Brief Description of the Course	<p>The course will introduce main basic principles of viscous flow. Based on the basic laws the course will give more knowledge and explanation of the boundary layer, flow instability and transition, turbulence theory and engineering models, flow in ducts. Additionally some introduction of recent progress in the field will be given in seminar.</p>		
Course Objective	<p>This course is a degree course for graduate students in air power, thermal engineering and other related specialties. Through this course, students will master viscous fluid dynamics especially basic turbulence theory, mathematical models usually used in turbulent engineering calculations, and then have a solid foundation for engineering calculations and scientific research in fluid flow</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Introduction</p> <p style="padding-left: 20px;">§1.1 Course feature, viscosity concept, and development of viscous flow</p> <p style="padding-left: 20px;">§1.2 Tensor notation, tensor defined, tensor algebra</p> <p>Basic Requirements: the objective of this course, the knowledge of tensor</p> <p>Duration: 4 hours</p> <p>Chapter 2 Basic Equations of Viscous Fluid Dynamics</p> <p style="padding-left: 20px;">§2.1 Kinematical equations, constitutive equations</p> <p style="padding-left: 20px;">§2.2 Dynamical equations, N-S equation, N-S equations in uniform rotating coordinate system,</p> <p style="padding-left: 20px;">§2.3 The mathematical model of viscous flow, dissipation and vortex motion</p> <p style="padding-left: 20px;">§2.4 Dimensional analysis.</p> <p style="padding-left: 20px;">§2.5 Difficulties to solve N-S equations, exact solutions of laminar flows</p> <p>Basic Requirements: The basics of the equations and their physics of viscous flow, the analysis laminar solutions of N-S Equations</p> <p>Duration: 12 hours</p> <p>Chapter 3 Laminar Boundary Layer</p> <p style="padding-left: 20px;">§3.1 Prandtl boundary layer equations,</p> <p style="padding-left: 20px;">§3.2 Integration method, similar flow differential method,</p> <p style="padding-left: 20px;">§3.3 boundary layer separation</p> <p>Basic Requirements: Boundary layer definitions, solutions to the problems of boundary layer, importance of BL in engineering</p>		

	<p>Duration: 4 hours</p> <p>Chapter 4 Stability of Fluid Movement and Transition</p> <ul style="list-style-type: none"> §4.1 Basic concept §4.2 Small perturbation analysis §4.3 Introduction of chaos theory <p>Basic Requirements: Basic knowledge of stability and transition and the way of analysis and solutions</p> <p>Duration: 3 hours</p> <p>Chapter 5 Turbulence Theory and Engineering Models</p> <ul style="list-style-type: none"> §5.1 Basic characteristics of turbulence §5.2 Turbulence mathematical approach and equations §5.3 Analysis of turbulence §5.4 Turbulence models <p>Basic Requirements: All the equations of turbulent flow, correlation and spectrum moment, all the hypothesis of the turbulent flow, turbulence models</p> <p>Duration: 10 hours</p> <p>Chapter 6 Turbulent Boundary Layer</p> <ul style="list-style-type: none"> §6.1 Basic characteristics of turbulent boundary layer §6.2 Velocity distribution §6.3 Solution of equations §6.4 Turbulence model in boundary layer §6.5 Boundary layer coherent structure <p>Basic Requirements: All the concepts of Turbulent Boundary Layer, the method analyzing and solving the problems of turbulence in boundary layer</p> <p>Duration: 3 hours</p> <p>Chapter 7 Pipe Turbulence</p> <ul style="list-style-type: none"> §7.1 Inlet flow §7.2 Fully developed flow <p>Basic Requirements: the concepts of turbulent flow in pipe, the method analyzing and solving the problems of pipe flow</p> <p>Duration: 2 hours</p> <p>Chapter 8 Free Turbulence</p> <p>Basic Requirements: Physical model, mathematical model, analysis of planar jet</p>
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	<p>Duration: 2 hours</p> <p>Turbulence Frontier Lectures Large eddy simulation, RANS turbulence model, direct numerical simulation</p> <p>Duration: 6 hours</p> <p>Review and Examination</p> <p>Duration: 2 hours</p>
Teach Method	<p>This course considers classroom teaching as the main teaching method, supplemented by seminars. This course encourages teachers and students to communicate in the classroom after, and refer to the relevant references after class. This course arranges a certain amount of exercise. This course focuses on training students to analyze and solve problems independently.</p>
Test and Examination	<p>Written examination</p>
Prerequisite	<p>Gas Dynamics or Basic Fluid Mechanics, Engineering Mathematics</p>
Textbooks and References	<p>Chen Maozhang, Fundamentals of Viscous Fluid Dynamics, Higher Education Press.</p> <p>White F. M, Viscous Fluid Flow, McGraw-Hill.</p> <p>Chlichting H. S. , Boundary-Layer Theory, McGraw-Hill.</p> <p>Warsi Z.U. A. et al, Fluid Dynamics , CRC Press.</p> <p>Davidson P. A. et al, Turbulence, Oxford University, Press.</p>

Course Introduction

Code	043544	Teaching Hours	48
Course	Heat and Mass Transfer		
Key Words	heat transfer; Fin performances; Physical Mechanisms		
Brief Description of the Course	<p>In this course, we lay the foundation for much of the typical topics of heat transfer covered by a majority of textbooks. We do so by raising several questions: What is heat transfer? How is heat transferred? Why is it important? One objective is to develop an appreciation for the fundamental concepts and principles that underlie heat transfer processes. The second objective is to illustrate the manner in which knowledge of heat transfer may be used with the first law of thermodynamics (conservation of energy) to solve problems relevant to technology and society.</p>		
Course Objective	<p>From the study of thermodynamics, the students have learned that energy can be transferred by interactions of a system with its surroundings. These interactions are called work and heat. However, thermodynamics deals with the end states of the process during which an interaction occurs and provides no information concerning the nature of the interaction or the time rate at which it occurs. The objective of the course is to extend thermodynamic analysis through study of the modes of heat transfer and through development of relations to calculate heat transfer rates.</p> <p>Heat and Mass Transfer is an important basic and major course. It is the compulsory course for the departments of thermal engineering and Mechanical Engineering. The aim and task of this course is to provide the elementary theory and basic method for the advanced specialized subject. It is also the foundation to utilize the thermal energy effectively. Through the study of this course, the students should know well the elementary theory about the law of heat transfer, the basic ability to analyze the actual heat transfer problems, the basic method to calculate heat transfer rates, and other experimental techniques. The basic concept about mass transfer should be known as well.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Introduction</p> <p>§1.1 Introduction of heat transfer</p> <p>§1.2 The three modes of heat transfer</p> <p>Basic Requirements : Understand the characteristics of the three modes of heat transfer processes and be able to explain their principles in a microscopic way.</p> <p>Duration: 2 Hours</p> <p>Chapter 2 One dimensional steady state heat conduction</p> <p>§2.1 The heat transfer process</p> <p>§2.2 The conduction rate equation</p> <p>§2.3 The system of differential equations for conduction and boundary conditions</p> <p>§2.4 Thermal resistant</p> <p>§2.5 The plane wall</p>		

	<p>§2.6 The cylinder and sphere</p> <p>Basic Requirements: Understand the difference between transient heat transfer and steady state heat transfer; Understand the thermal resistance and the assumptions under which the concept of thermal resistance can be applied in a straightforward manner.</p> <p>Duration: 7 Hours</p> <p>Chapter 3 Extended surface heat transfer</p> <p>§3.1 A general conduction analysis</p> <p>§3.2 Fins of uniform cross-sectional area</p> <p>§3.3 Fin performances</p> <p>§3.4 Fins of Non-uniform cross-sectional area</p> <p>§3.5 Overall surface efficiency</p> <p>Basic Requirements: Justify the one-dimensional assumption made in the analysis of fins. Understand the difference between fin effectiveness and fin efficiency.</p> <p>Duration: 2 Hours</p> <p>Chapter 4 Unsteady state heat conduction</p> <p>§4.1 The lumped parameter method</p> <p>§4.2 Validity of the lumped parameter method</p> <p>§4.3 General lumped parameter analysis</p> <p>§4.4 The plane wall with convection</p> <p>§4.4 Finite-difference methods</p> <p>Basic Requirements: Be able to answer the following questions in an analytical way: What is lumped capacity analysis? When is it applicable? What is the physical significance of the Biot number?</p> <p>Duration: 4 Hours</p> <p>Chapter 5 Numerical analysis of steady state heat conduction</p> <p>§5.1 The method of separation of variables</p> <p>§5.2 The conduction shape factor and the dimensionless conduction heat rate</p> <p>§5.3 Finite-difference equations</p> <p>§5.4 Solving the finite-difference equations</p> <p>Basic Requirements: Understand for what kind of problems in multidimensional heat transfer are analytical solutions possible. Name some common analytical methods in steady state multidimensional heat transfer. Understand the limitations of analytical methods. Learn the definition of “shape factor” in two-dimensional heat transfer analysis.</p> <p>Duration: 4 Hours</p> <p>Chapter 6 Convection heat transfer</p> <p>§6.1 The Convection Boundary Layer</p>
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§6.2 Local and Average Convection Coefficients

§6.3 Laminar and Turbulent Flow

§6.4 The Boundary Layer Equations

§6.5 Boundary Layer Similarity

§6.6 Physical Interpretation of the Dimensionless Parameters

§6.7 Boundary Layer Analogies

§6.8 Internal Flow

§6.8 External Flow

Basic Requirements : For laminar free convection from a heated vertical surface, the local convection coefficient can be solved. Learn the procedure of determining the convective heat transfer coefficient for typical applications (refer to classroom examples)

Duration: 10 Hours

Chapter 7 Condensation and boiling

§7.1 Dimensionless Parameters in Boiling and Condensation

§7.2 Boiling Modes

§7.3 Pool Boiling

§7.4 Condensation: Physical Mechanisms

§7.5 Laminar Film Condensation on a Vertical Plate

Basic Requirements: Understand the mechanisms which are responsible for the very high heat transfer coefficients in nucleate boiling; Using concepts of thermodynamics, explain how condensation occurs. Understand the reason why higher heat transfer coefficient is generally associated with dropwise condensation than with film condensation.

Duration: 4 Hours

Chapter 8 Radiation heat transfer

§8.1 Fundamental Concepts

§8.2 Radiation Heat Fluxes and Intensity

§8.3 Blackbody Radiation

§8.4 Emission from Real Surface

§8.5 Kirchhoff's Law

§8.6 The Gray Surface

Basic Requirements: be able to answer the following questions in an analytical way: What is thermal radiation? How does it differ from other forms of electromagnetic radiation? What is a black body? Does a black body actually exist? Define the total and spectral black body emissive powers. How are they related to each other?

Duration: 10 Hours

Chapter 9 Mass transfer

	<p>§9.1 Physical Origins and Rate Equations</p> <p>§9.2 Heat and Mass Diffusion: Analogy</p> <p>§9.3 Diffusive Mass Transfer on a Surface</p> <p>Basic Requirements: be able to answer the following questions in an analytical way: How does mass transfer differ from bulk flow? Can mass transfer occur in a homogeneous medium? Give examples for (a) liquid-to-gas (b) solid-to-liquid, (c) solid-to-gas, and (d) gas-to-liquid mass transfer. What is the driving force for (a) heat transfer (b) electric current (c) fluid flow and (d) mass transfer? What is an impermeable surface in mass transfer? How is it expressed mathematically? To what does it correspond in heat transfer?</p> <p>Duration: 2 Hours</p> <p>Chapter 10 The introduction of heat exchangers</p> <p>§10.1 Heat Exchanger Types</p> <p>§10.2 The Overall Heat Transfer Coefficient</p> <p>§10.3 Heat Exchanger Analysis: Use of the Log Mean Temperature Difference</p> <p>§10.4 Heat Exchanger Analysis: The Effectiveness-NTU Method</p> <p>Basic Requirements: be able to answer the following questions in an analytical way: What are the heat transfer mechanisms involved during heat transfer from the hot fluid to the cold fluid? In heat exchange between air and water across a tube wall, it is proposed to use fins to enhance the overall heat transfer coefficient. Would you put the fins on the air side or on the water side? When is a heat exchanger classified as compact? How does a cross flow heat exchanger differ from a counter flow one? What is the role of baffles in a shell-and-tube heat exchanger? What is the implication about pressure drop?</p> <p>Duration: 3 Hours</p>
Teach Method	Teaching, Tutorial, Special topic discussions
Test and Examination	The examination is mandatory and close book. The final score is composed by the examination (60%), the special topic discussion (20%), and homework (20%)
Prerequisite	Advanced Engineering Mathematics (I)、 Advanced Engineering Mathematics (II)、 Engineering Physics(I)、 Engineering Thermodynamics
Textbooks and References	<p>Incropera F. P., DeWitt D. P., Fundamentals of Heat and Mass transfer, John Wiley & Sons, 2002.</p> <p>Holman J. P., Heat Transfer, 10th Edition, McGraw-Hill, New York,2002.</p> <p>Kaviany M. Principle of Heat transfer, John Wiley & Sons, New York ,2002.</p> <p>John H. Lienhard IV/John H. Lienhard V, A Heat Transfer Textbook, 3th Edition , Phlogiston, 2003.</p>

Course Catalogue for International Postgraduates

(School of Aeronautic Science and Engineering)

编号 No.	英文课程名称 Course Title	中文课程名称 Course Title	学时 Hours	学分 Credits	开课季节 Semester	任课教师 Lecturer
053102	Man-machine Systems and Flying Qualities	人机系统和飞行品质	32	2	Spring	Tan Wenqian
053103	Flight Performance Analysis	飞机性能分析	32	2	Spring	Wang yanyang
053104	Modern Control Theory	现代控制理论	48	3	Spring	Chaoyang Dong
053106	Helicopter Flight Performance Analysis	直升机飞行性能分析	48	3	Spring	Yihua Cao
053110	Advanced Dynamics of structures	高等结构动力学	48	3	Fall	Cheng Wei
053112	Theory of Composite Mechanics	复合材料力学	32	2	Fall	ZHANG Zheng
053113	Airframe Structural Analysis and Design	飞机结构分析与设计	32	2	Fall	Xiaoquan Cheng
053115	Flight Theory and Flight Safety	飞行原理与飞行安全	32	2	Spring	Wang Weijun
053119	Theory and Design of Aeroelasticity	气动弹性理论与设计	32	2	Spring	Wu Zhigang
053120	Aerodynamics	飞行器空气动力学	48	3	Spring	Zhang Hua
053121	Experimental Fluid Mechanics	实验流体力学	32	2	Spring	Guo Hui
053122	Computational Fluid Mechanics	计算流体力学	48	3	Fall	Lan Shi long
053123	Viscous Fluid Flow	粘性流体力学	36	2	Fall	Zhang jinbai
053124	Airframe Structural Analysis and Design	飞机结构分析与设计	32	2	Fall	Xiaoquan Cheng
053125	An Introduction to Complex Flows	复杂流动引论	36	2	Spring	Deng XueYing Ma BaoFeng
053127	Advanced Engineering Thermodynamics	高等工程热力学	32	2	Fall	Pang Liping
053135	Satellite Thermal Control	卫星热控制	48	3	Fall	Li Yunze
053136	Environment Simulation and Test	环境模拟与试验	48	3	Fall	Li Yunze
053138	Computational Solid Mechanics	计算固体力学	48	3	Fall	Xing Yufeng
053139	Aeronautical Engineering	航空工程实验	16	1	Spring	Huang Jun

	Experiment					
053140	Aviation environment physiology and protective	航空生理学与防护 装备	36	2	Fall	XIAO Huajun
053141	Flight Dynamics and control of aircraft	飞行动力学与控制	48	3	Fall	Qu Xiangju
053126	Hypersonic Aerodynamics	高超音速空气动力 学	36	2	Spring	Wang Chunxuan; Zou Hui

Course Introduction

Code	053102	Teaching Hours	32																				
Course	Man-machine Systems and Flying Qualities																						
Key Words	pilot control, flying qualities, flight dynamics																						
Purpose and Role of the Course	<p>It is compulsory course for the graduate students in flight mechanics and flight safety. This course is try to explain the basics of dynamic system of pilot-aircraft, including modeling of the human pilot and analysis of handling qualities of aircraft.</p> <p>We hope that the students can understand the concepts of Man-machine Systems. They should have the ability of using the pilot models to research flying qualities.</p>																						
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Chapter 1 Introduction</td> <td style="width: 20%; text-align: right;">2 periods</td> </tr> <tr> <td>Chapter 2 Considerations in modeling a human operator</td> <td style="text-align: right;">2 periods</td> </tr> <tr> <td>Chapter 3 Identification of pilot model in time domain</td> <td style="text-align: right;">4 periods</td> </tr> <tr> <td>Chapter 4 Identification of pilot model in frequency domain</td> <td style="text-align: right;">4 periods</td> </tr> <tr> <td>Chapter 5 Analytical techniques for pilot models</td> <td style="text-align: right;">4 periods</td> </tr> <tr> <td>Chapter 6 OCM model of human pilot</td> <td style="text-align: right;">4 periods</td> </tr> <tr> <td>Chapter 7 Structural pilot model</td> <td style="text-align: right;">4 periods</td> </tr> <tr> <td>Chapter 8 Flying qualities and pilot ratings</td> <td style="text-align: right;">4 periods</td> </tr> <tr> <td>Chapter 9 Longitudinal requirements of flying qualities</td> <td style="text-align: right;">8 periods</td> </tr> <tr> <td>Chapter 10 Lateral requirements of flying qualities</td> <td style="text-align: right;">6 periods</td> </tr> </table>			Chapter 1 Introduction	2 periods	Chapter 2 Considerations in modeling a human operator	2 periods	Chapter 3 Identification of pilot model in time domain	4 periods	Chapter 4 Identification of pilot model in frequency domain	4 periods	Chapter 5 Analytical techniques for pilot models	4 periods	Chapter 6 OCM model of human pilot	4 periods	Chapter 7 Structural pilot model	4 periods	Chapter 8 Flying qualities and pilot ratings	4 periods	Chapter 9 Longitudinal requirements of flying qualities	8 periods	Chapter 10 Lateral requirements of flying qualities	6 periods
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Teach Method	<ol style="list-style-type: none"> 1. gave lectures in classroom (32 hours). 2. simulation experiment in flight mechanics lab (16 hours). 3. exercise (Homework) after class 																						
Test and Examination	Homework and Project 50%, Final exam 50%																						
Pre-request Course	<p>Having taken the following courses is a must.</p> <p>1. Aerodynamics, 2. flight Mechanics, 3. Classical Control Theory</p>																						
References	<p>[1] Thomas B. Man-machine system :Information, control, and decision models of human performance, The MIT Press, 1981.</p> <p>[2] Bernard Etikn, Dynamics of Atmospheric Flight, John Wiley and sons, Inc.,1972.</p> <p>[3].Committee on the Effects of Aircraft-pilot Coupling on Flight Safety, Aviation Safety and pilot Control , National Academy press, Washington.D.C.1997.</p>																						

Course Introduction

Code	053103	Teaching Hours	32
Course	Flight Performance Analysis		
Key Words	Flight Performance; Equations of Motion; Range and Endurance		
Purpose and Role of the Course	<p>Flight Performance is the mainly part of flight dynamics. This course introduce Equations of Motion of Aircraft center of mass, the basic performance, the range and endurance, take-off and landing performance, and the maneuvering flight performance.</p> <p>Students understand engineering estimate methods of aircraft performance, and can calculate flight performance reference and make performance analysis in aircraft design and practices.</p>		
Main Chapters and Teaching Hours	<p>Contents</p> <p>Chapter 1: Introduction of the General Performance Problem</p> <p>Chapter 2: Equations of Motion</p> <p>Chapter 3: The Basic Conceptions, such as Stalling Speed, Maximum Velocity and Ceiling, Gliding Flight</p> <p>Chapter 4: Climbing Flight</p> <p>Chapter 5: Range and Endurance</p> <p>Chapter 6: Take-off and Landing</p> <p>Chapter 7: Maneuvering flight</p> <p>Chapter 8: Additional Topics, including constraint plot and Energy Methods</p>		
Teach Method	Teaches primarily, discusses for auxiliary		
Test and Examination	Examination		
Pre-request Course	Theoretical mechanics, aircraft aerodynamics		
References	Maido Saarlal. Aircraft Performance. Hoboken: Wiley,2007		

Course Introduction

Code	053104	Teaching Hours	48
Course	Modern Control Theory		
Key Words	Mathematical Description; Linear System Analysis; Optimal Control		
Purpose and Role of the Course	<p>Modern control theory, based on the state space method and the mathematical tools such as linear algebra and differential equation, plays an important role in control engineering and attracted more attentions in control community. This course will discuss primary theory on modern control theory, including mathematical description, solutions of linear dynamical systems, controllability and observability, stability analysis method, state feedback and state estimator, optimal control theory and applications. Moreover, this course will also illustrate how to solve practical problem utilizing the methodology of control theory above, and simulate them by Matlab and its toolbox Simulink, which is helpful for students to understand the basic theory and enhance their ability of solving problems.</p> <p>The course is an important basic specialty course. Its task is to make students master the basic concepts and analysis of modern control systems, the basic methods of system design. The students will also have the basic experimental skills. They will be able to use Matlab for system analysis and design. After learning this course, the students will be able to learn the other courses, such as Adaptive Control Theory, Intelligent Control Theory, Flight Control, etc.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction 1 Hours 2. Mathematical description 5 Hours 3. Solutions of linear dynamical systems 5 Hours 4. Controllability and observability 6 Hours 5. Stability analysis method 8 Hours 6. State feedback and state estimator 6 Hours 7. Optimal control theory 10 Hours 8. Some practical applications 6 Hours 9. Review and Summary 1 Hours 		
Teach Method	Teaching methods are composed of lecture in class and exercises/experiment after class. The former is executed by the teacher via multimedia teaching, while the students should finish the latter assigned by the teacher by themselves.		
Test and Examination	Homework 20%, Project 40%, Final exam (close book, open note) 40%		
Pre-request Course	Linear Algebra; Principle of Automatic Control		
References	<ol style="list-style-type: none"> 1. Jing Yuanwei, Zhou Yucheng, Jiang Nan. Modern Control Theory [M]. Metallurgical Industry Press, 2006 2. W.L. Brogan. Modern Control Theory [M]. Upper Saddle River: Prentice Hall, Third Edition, 1991 3. Zdzislaw Bubnicki. Modern Control Theory [M]. Springer, 2005 4. B.B. Jeffrey. Linear Optimal Control: H_2 and H_∞ methods [M]. Addison Wesley Longman, 1999 		

Course Introduction

Code	053106	Teaching Hours	48
Course	Helicopter Flight Performance Analysis		
Key Words	Helicopter; Performance; Aerodynamic Fundamental; Rotor Aerodynamics		
Purpose and Role of the Course	<p>Helicopter is widely used in defense construction and civil transportation courses. This course is aimed at introducing the construction types of helicopter and corresponding aerodynamic problems. This course can be used as the rotorcraft speciality and the related research course.</p> <p>This course is an important basic speciality course. Its task is to make students master the basic concepts of helicopter aerodynamic fundamental and flight mechanics. Also the course is aimed at cultivating the capability for analyzing and solving problems.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 The historical review of Rotorcraft</p> <p>Chapter 2 Reference Frames and Transformations</p> <p>Chapter 3 General Equations of Unsteady Motion</p> <p>Chapter 4 Momentum theory, element theory and vortex theory</p> <p>Chapter 5 Rotorcraft steady flight performance</p> <p>Chapter 6 Rotorcraft unsteady flight performance</p> <p>Chapter 7 Introduction to advanced Rotorcraft Aerodynamics</p>		<p>2 hours</p> <p>4 hours</p> <p>4 hours</p> <p>10 hours</p> <p>10 hours</p> <p>10 hours</p> <p>8 hours</p>
Teach Method	<p>All the contents will be taught in class, together with some case discussion. And the students are expected to complete the pre-reading contents and assignments after class. Finally, a course report is requested.</p> <p>To cultivate the capability for analyzing and solving problems through teaching and discussion in class; To master helicopter flight dynamics knowledge and philosophy thinking methods.</p>		
Test and Examination	Homework 20%, Final exam (close book, open note) 80%		
Pre-request Course	Fundamental of Aerodynamics, The Overall Design of Aircraft		
References	<p>[1] Raymond W. Prouty Helicopter Performance, Stability and Control, 1986</p> <p>[2] Wayne Johnson Helicopter Theory, Princeton University Press, Princeton, 1980</p> <p>[3] B. Etkin, Dynamics of Atmospheric Flight, 1972; 2nd Edition Aircraft Dynamics –Stability and Control, John Wiley & Sons, 1997.</p> <p>[4] J. Seddon Basic Helicopter Aerodynamics, Blackwell Scientific Publications Ltd, 1990.</p>		

Course Introduction

Code	053110	Teaching Hours	48																											
Course	Advanced Dynamics of structures																													
Key Words	Structural Dynamics, Solid Mechanics, Analytical Mechanics																													
Purpose and Role of the Course	<p>The motivation for this course is to help students acquire an understanding of the dynamic response of structures and of the analytical tools required for determining such response. This course attempts to develop an appreciation mathematical basis for proper understanding of an analytical concept, Through the concept of the Function Space we establish the link between matrices and the continuous domain. This course is designed to cover the essential features of modern variational method and to demonstrate how a number of basis mathematical concepts can be used to produce a unified theory of variational mechanics.</p> <p>Understand the fundamental concepts, mathematical basis of structural dynamics, Analytical mechanics, Variational principle and Structural control.</p>																													
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%;">1...</td> <td style="width: 85%;">Introduction</td> <td style="width: 10%; text-align: right;">2 hours</td> </tr> <tr> <td>2</td> <td>Mechanics description of structures</td> <td style="text-align: right;">4 hours</td> </tr> <tr> <td>3.</td> <td>Principles of analytical mechanics</td> <td style="text-align: right;">10 hours</td> </tr> <tr> <td>4.</td> <td>Function spaces</td> <td style="text-align: right;">6 hours</td> </tr> <tr> <td>5</td> <td>Variational principle</td> <td style="text-align: right;">6 hours</td> </tr> <tr> <td>6.</td> <td>Coupling and mode of structures</td> <td style="text-align: right;">10 hours</td> </tr> <tr> <td>7</td> <td>Structural control</td> <td style="text-align: right;">6 hours</td> </tr> <tr> <td>8</td> <td>Summarization</td> <td style="text-align: right;">1 hour</td> </tr> <tr> <td>9.</td> <td>Examination</td> <td style="text-align: right;">3 hours</td> </tr> </table>			1...	Introduction	2 hours	2	Mechanics description of structures	4 hours	3.	Principles of analytical mechanics	10 hours	4.	Function spaces	6 hours	5	Variational principle	6 hours	6.	Coupling and mode of structures	10 hours	7	Structural control	6 hours	8	Summarization	1 hour	9.	Examination	3 hours
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9.	Examination	3 hours																												
Teach Method	lectures (44 hours). exercise after class																													
Test and Examination	Homework 40%, Final exam 60%																													
Pre-request Course	Engineering mechanics, Vibration basis, theoretical mechanics material mechanics,. structural mechanics																													
References	<ol style="list-style-type: none"> 1. J. L. Humar, Dynamics of structures, Prentice-Hall, Inc. 1990. 2. Cornelius Lanczos, Linear Differential Operators, D. Van Nostrand Company, Ltd., 1961 3. H.H.E. Leipholz, M. Abdel-Rohman, Control of structures, Martinus Nijhoff Publishers, Dordrecht. 1986 <p>J.T. Oden , J.N. Reddy, Variational Methods in Theoretical Mechanics, Springer-Verlag Berlin Heidelberg ,New York, 1983</p>																													

Course Introduction

Code	053112	Teaching Hours	32
Course	Theory of Composite Mechanics		
Key Words	composite material, mechanics, laminates		
Purpose and Role of the Course	<p>The whole gamut of this course, from micromechanics and macromechanics through lamination theory and examples of plate bending, buckling, and vibration problems, is treated so that a fundamental knowledge of the broad scope of composite materials is provided.</p> <p>To introduce the students to the basic concepts and analysis of the mechanical behavior of composite materials.</p>		
Main Chapters and Teaching Hours	<p>(1) Introduction to composite materials.....4h</p> <p>(2) Macromechanical behavior of a lamina.....10h</p> <p>(3) Micromechanical behavior of a Lamina.....8h</p> <p>(4) Macromechanical behavior of a laminate.....6h</p> <p>Bending, buckling, and vibration of laminated plates.....8h</p>		
Teach Method	PPT, Inspiration, Discussion, Creativity		
Test and Examination	suitable for postgraduate students		
Pre-request Course	Mechanics of Materials		
References	Mechanics of Composite Materials(2 th Ed.), Robert M. Jones, 1999		

Course Introduction

Code	053113	Teaching Hours	32
Course	Aircraft Structural Analysis and Design		
Key Words	Airframe Structural Analysis; Airframe Structural Design; Analysis of load transmission		
Purpose and Role of the Course	<p>The objective of this course is to let students understand the basic concept of airframe structural analysis and design, the principles and methods of structural analysis, the characteristic of typical airframe structures, et al, and apprehend the fundament and methods of airframe structural design. Through this course, students should master load transmission analysis, the choice of airframe structural forms, structure layout and basic principles and methods of structure component design in the airframe structural design. They can get hold of the primary inconsistency and have the ability to analyze complex problems synthetically. The students can establish a well-knit base for their future airframe structural working by this course.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Introduction (2 hours)</p> <p style="padding-left: 20px;">1.1 The course of an aircraft project</p> <p style="padding-left: 20px;">1.2 Definition of aircraft structural design</p> <p>Chapter 2 Design for Manufacturing (2 hours)</p> <p style="padding-left: 20px;">2.1 The development of aircraft structural ideas</p> <p style="padding-left: 20px;">2.2 Design for manufacturing</p> <p>Chapter 3 Aircraft Loads (4 hours)</p> <p style="padding-left: 20px;">3.1 Load factors</p> <p style="padding-left: 20px;">3.2 Flight states of aircraft loads</p> <p style="padding-left: 20px;">3.3 Ultimate loads and limited loads</p> <p>Chapter 4 Wing Box Structural Analysis and Design (10 hours)</p> <p style="padding-left: 20px;">4.1 Wing structure applications and design requirements</p> <p style="padding-left: 20px;">4.2 Wing structures and their elements</p> <p style="padding-left: 20px;">4.3 Typical wing structural forms</p> <p style="padding-left: 20px;">4.4 Structural analysis principles</p> <p style="padding-left: 20px;">4.5 Straight wing structure</p> <p style="padding-left: 20px;">4.6 Swept wing structure</p> <p style="padding-left: 20px;">4.7 Triangle wing structure</p> <p style="padding-left: 20px;">4.8 Wing structural design</p> <p style="padding-left: 20px;">4.9 Stiffness design of wing structure</p> <p>Chapter 5 Fuselage Structural Analysis and Design (6 hours)</p> <p style="padding-left: 20px;">5.1 Fuselage structure applications and design requirements</p> <p style="padding-left: 20px;">5.2 Fuselage structures and their elements</p> <p style="padding-left: 20px;">5.3 Typical fuselage structural forms</p> <p style="padding-left: 20px;">5.4 Load transfer analysis</p> <p>Chapter 6 Land Gear Structural Analysis (4 hours)</p> <p style="padding-left: 20px;">6.1 Land Gear applications and design requirements</p> <p style="padding-left: 20px;">6.2 Land Gear structures and their elements</p> <p style="padding-left: 20px;">6.3 Typical Land Gear forms</p>		

	<p>Chapter 7 Composite Structures (4 hours)</p> <p>7.1 Applications of composite materials on aircraft structures</p> <p>7.2 Composite materials process</p> <p>7.3 Typical aircraft composite material structural forms</p>
Teach Method	Teaching methods are composed of lecture in class and exercises/experiment after class. The former is executed by the teacher via multimedia teaching, while the students should finish the latter assigned by themselves.
Test and Examination	Homework 10%; Course report 40%, Final Examination 50%
Pre-request Course	<ul style="list-style-type: none"> ■ Knowledge of Mechanics of Materials; Structural Mechanics; Mechanics of Applied Elasticity; Mechanica of Composite Materials; Flight Mechanics,et al.
References	<ul style="list-style-type: none"> ■ Michael, C. Y. Niu. Airframe Structural Design (Second Edition) [M]. Hong Kong Conmilit Press Ltd, 2006. ■ Michael, C. Y. Niu. Composite Airframe Structures [M]. Hong Kong Conmilit Press Ltd, 1992. ■ Li Zhengneng. Aircraft Structures. Beijing: Press of Beijing University of Aeronautics ang Astronautics, 2005.01 (in Chinese).

Course Introduction

Code	053115	Teaching Hours	32
Course	Flight Theory and Flight Safety		
Key Words	Flight Safety; Aerodynamics; Performance; Handling Qualities; Dangerous Winds;		
Purpose and Role of the Course	<p>From the First World War, flight safety has become the focus of concern, especially in the civil aviation. There are a number of factors that result in accidents, but lack of risk awareness is a major and basic cause. Awareness requires knowledge. Through learning of the flight theories, this course makes students understand how airflow, flight performance, handling qualities and airload problems affect flight safety. These flight theories of aircraft involve low-speed, transonic and supersonic aerodynamics, aircraft performance and handling qualities, air loads, contaminated wings and so on. After studying the course, students will be able to point out the high risks in various flight conditions, and find out problems in aerodynamics, handling qualities, performance, and air loads for fixed-wing aircraft.</p> <ol style="list-style-type: none"> 1. To understand the concept of flight safety 2. To understand a general overview of accident causes and accident preventions 3. To grasp the flying risks of a fixed-wing aircraft from aerodynamics point 4. To catch on the problems in performance and handling qualities for fixed-wing aircraft <p>To understand other affecting factors on flight safety.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Overview of flight safety 2 hours 2. Low-speed aerodynamics 4 hours 3. Transonic and supersonic aerodynamics 2 hours 4. Performance 6 hours 5. Handling qualities 6 hours 6. Air loads – fatigue and overloads 4 hours 7. Dangerous winds 2 hours 8. Contaminated wings and runways 4 hours 9. Other factors 2 hours 		
Teach Method	Prelection in classroom, Exercises (Homework) after class and Teaching seminar.		
Test and Examination	Homework and Project 50%, Course attendance 10%, Final exam 40%		
Pre-request Course	Aeronautics elements.		
References	Aage Roed. Flight Safety Aerodynamics (2 nd Edition)[M]. Airlife Publishing Ltd., 1997		

Course Introduction

Code	053119	Teaching Hours	32
Course	Theory and Design of Aeroelasticity		
Key Words	Aeroelasticity, vibration, unsteady aerodynamics, flutter		
Purpose and Role of the Course	<p>Aeroelasticity is a specialized subject of air vehicle design. It study the mechanical of air vehicle in air flow, and is a disciplinary subject based on structural mechanics, aerodynamics and vibration theory. The goal of the subject is to learn the basic concept of aeroelasticity, grasp the application of aeroelasticity in aircraft design, and prevention of valid aeroelastic phenomenon, and understand the mechanism, and enhance the stiffness in aircraft design.</p> <p>The main content include two parts: 1) static aeroelastic problem: divergence, load distribution, control reverse and control effectiveness. 2-D airfoil, and engineering analysis method of wings. 2) flutter. With the emphasis on the stability of elastic wing in air flow, including the basic concept of flutter, flutter analysis, and flutter prevention approaches in structural design.</p> <p>With study on this course, the students should have been promoted on three areas: the ability of solving engineering problems using learned knowledge, the comprehensive ability of solving problems using various disiplinary, ability of analyzing problems in aircraft design.</p> <p>Aeroelasticity is a specialized subject of air vehicle design. It is the study of the effect of aerodynamic forces on elastic bodies, and is a disciplinary subject based on structural mechanics, aerodynamics and vibration theory.</p> <p>(1) Phenomena and concepts of aeroelasticity (2) Analysis of aeroelastic stability (3) Prevention of valid aeroelastic phenomena Application of aeroelasticity in air vehicle design</p>		
Main Chapters and Teaching Hours	<p>1 Historical development (2h) 2 Vibration and aerodynamics (8h) structure mechanism, vibration of n-DOF system, unsteady aerodynamics of 2-D airfoil and lifting surface, equations of motion 3 Static aeroelastic problem (8h) divergence, load distribution, control reverse and control effectiveness, 2-D airfoil, and engineering analysis method of wings. 4 Dynamic aeroelastic problem (8h) flutter mechanism, flutter analysis, flutter prevention approaches, dynamic aeroelastic response, and the concept of aero-servo- elasticity. 5 Aeroservoelasticity: analysis and active control (4h) 6 Future directions (2h)</p>		
Teach Method	The course will be introduced with basic theories, examples and analysis approaches in engineering. In this course, lecture, example demonstration and practice will be arranged alternatively.		
Test and Examination	Homework & attendance 30%; Final Examination 70%		

Pre-request Course	None
References	None

Course Introduction

Code	053120	Teaching Hours	48
Course	Aerodynamics		
Key Words	Aircraft; Aerodynamics; Aerodynamic characteristics		
Purpose and Role of the Course	<p>Aircraft Aerodynamics is one of the important basic theories for airplane designing. The course is for postgraduate student. The course introduces the basic theory of airplane aerodynamics. The course includes following content: the aerodynamic characteristics of low speed airfoil, the aerodynamic characteristics of low speed wing, the aerodynamic characteristics of airfoil and wing in subsonic flow, the aerodynamic characteristics of airfoil and wing in supersonic and the transonic flow, the aerodynamic characteristics of slender body of revolution, the aerodynamic characteristics of wing-body-tailwing combination body.</p> <p>The course introduces the basic theory of Airplane Aerodynamics. The emphasis is on applications of Aerodynamics theory to analysis the aerodynamic characteristics of airfoil, wing, slender body and combination body, under low, subsonic, supersonic and transonic speed.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. The aerodynamic characteristics of low speed airfoil, 8 Hours 2. The aerodynamic characteristics of low speed wing, 8 Hours 3. The aerodynamic characteristics of airfoil and wing in subsonic flow, 8 Hours 4. The aerodynamic characteristics of airfoil and wing in supersonic and the transonic flow, 8 Hours 5. The aerodynamic characteristics of slender body of revolution, 8 Hours 6. The aerodynamic characteristics of wing-body-tailwing combination body, 8 Hours 		
Teach Method	The course is given in the form of class lectures, teaching in English with multimedia courseware.		
Test and Examination	Questions in Class 10%, Homework 20%, Final exam (open book) 70%		
Pre-request Course	University Mathematics, Engineering Mechanics or University physics, Fundamentals of Aerodynamics		
References	<ol style="list-style-type: none"> 1 John D. Anderson, Jr., Fundamentals of Aerodynamics. Third Edition, International Edition. Mechanical Engineering Series, New York: McGaw-Hill, 2001 2 John J. Bertin, Michael L. Smith. Aerodynamics for Engineers. Second Edition. Englewood Cliffs, New Jersey: PRINTICE HALL, 1989 		

Course Introduction

Code	053121	Teaching Hours	32
Course	Experimental Fluid Mechanics		
Key Words	Experiments, measurements, flow visualization		
Purpose and Role of the Course	<p>Experiment is one the important study method in fluid mechanics. the basic theory concerning experimental study , some important measuring techniques on flow parameters and its update developments ,some popular visualization techniques, as well as measurements on transitional and turbulent boundary layer, will be presented in this course,.</p> <p>For the students to grasp the basic theory and method on the experimental fluid mechanics, and enable them to have the basic idea on how to design an experimental study on a problem in fluid mechanics and which technical problems should be concerned.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1: Introduction of Experimental Fluid Mechanics</p> <p>Chapter 2: Dimensional analysis and similarity</p> <p>Chapter 3: hot-wire velocimetry</p> <p>Chapter 4: Laser-Doppler anemometry</p> <p>Chapter 5: Measurements of unsteady force/pressure</p> <p>Chapter 6: Flow visualization</p> <p>Chapter 7: Experiments on transitional and turbulent boundary-layer</p>		<p>1 hour</p> <p>5hours</p> <p>5 hours</p> <p>5 hours</p> <p>5 hours</p> <p>5 hours</p> <p>6 hours</p>
Teach Method	Teaching primarily, discussing for auxiliary		
Test and Examination	Homework, Attendance, Examination		
Pre-request Course	Fluid Mechanics, Aerodynamics		
References	<p>[1]Tropea C, Yarin AL, Foss JF. Springer handbook of experimental fluid mechanics [M]. Berlin : Springer, 2007</p> <p>[2]Goldstein RJ. Fluid mechanics measurements [M]. Washington, DC: Taylor & Francis, 1996.</p> <p>[3]Print MA, Boswirth L. Fluid Mechanics: A Laboratory Course [M]. London : Griffin, 1978</p>		

Course Introduction

Code	053122	Teaching Hours	48
Course	Computational Fluid Mechanics		
Key Words	Fluid mechanics, computational fluid dynamics		
Purpose and Role of the Course	<p>To develop an understanding of Computational Fluid Mechanics. The mathematical structure is the theory of linear algebra and the attendant eigenanalysis of linear systems. The course will focus on the development, analysis and use of numerical tools (as applied to stability, accuracy, and design methods based in linear theory) to develop a basic understanding of algorithms and methods of practical value (e.g. methods for the Euler and Navier-Stokes equations).</p> <p>To understand the theory of numerical tools and the features of the classical numerical methods for Euler and Navier-Stokes equations.</p>		
Main Chapters and Teaching Hours	<p>Lesson 1 Waves and Scalar Conservation Law (I) The characteristic form of the Euler equations; physical interpretation; simple waves, expansion waves, compression waves and shock waves, contact discontinuities. (References: B1.Chap. 3)</p> <p>Lesson 2 Waves and Scalar Conservation Law (II) Conservation form; entropy condition; waveform preservation, destruction, and creation. (References: B1.Chap. 4)</p> <p>Lesson 3 The Riemann problem The Riemann problem for the Euler equations and for the linear systems of equations; Roe's Approximate Riemann solver for the Euler equations; other Approximate Riemann solvers. (References: B1.Chap. 5)</p> <p>Lesson 4 Upwind and adaptive stencils The introduction to flux averaging\flux splitting\flux reconstruction\wave speed splitting; flux split form; wave speed split form. (References: B1.Chap. 13)</p> <p>Lesson 5 Linear stability and nonlinear stability Von Neumann analysis; modified equations; convergence; monotonicity preservation; Total variation diminishing; range diminishing; positivity; total variation bounded; essentially nonoscillatory. (References: B1.Chap. 15,16)</p> <p>Lesson 6 Basic methods for scalar conservation laws Lax-Friedrichs method; Lax-Wendroff method; Godunov's first-order upwind method; Roe's first-order upwind method; Harten's first-order upwind methods; Beam-Warming second-order upwind method; Fromm's method. (References: B1.Chap. 17)</p> <p>Lesson 7 Basic methods for the Euler equations (I) Lax-Friedrichs method; Lax-Wendroff method; Flux vector splitting methods (Steger-Warming\Van Leer\ Liou-Steffen). (References: B1.Chap. 18)</p>		

	<p>Lesson 8 Basic methods for the Euler equations (II) Reconstruction-Evolution methods (Godunov's \ Roe's \ Harten's). (References: B1.Chap. 18)</p> <p>Lesson 9 High Resolution methods----flux averaging (I) Van Leer's\ Sweby's (References: B1.Chap. 20)</p> <p>Lesson 10 High Resolution methods----flux averaging (II) Chakravarthy-Osher's\ Davis-Roe's\ Yee-Roe's (References: B1.Chap. 20)</p> <p>Lesson 11 High Resolution methods----solution averaging (III) Van Leer's(MUSCL)\ Anderson-Thomas-Van Leer's (References: B1.Chap. 23)</p> <p>Lesson 12 Temporal discretisation and methods for unsteady problem General multistep methods; predictor-corrector methods; Runge-Kutta methods. (References: B2.Chap. 6; B3.Chap.9; B4.Chap.6)</p> <p>Lesson 13 Boundary conditions (References: B1.Chap. 19; B4.Chap.8)</p> <p>Lesson 14 Solution of Linear equation system Direct methods; iterative methods; multigrid method; preconditioning techniques (References: B2.Chap. 5; B3.Chap.10; B4.Chap.9)</p> <p>Lesson 15 Numerical solutions of viscous laminar flow Density-based methods; pressure correction methods (References: B2.Chap. 7; B3.Chap.12)</p> <p>Lesson 16 Simulations of Turbulence (I) RANS models (References: B2.Chap. 9; B4.Chap.7; B5.Chap.20,21,22,23)</p> <p>Lesson 17 Simulations of Turbulence (II) LES; DNS (References: B2.Chap. 9; B4.Chap.7; B5.Chap.20,21,22,23)</p> <p>Lesson 18 Finite volume methods General discretisation; convective fluxes; viscous fluxes; unstructured grid. (References: B2.Chap. 4,8; B3.Chap.5,6; B4.Chap.4,5)</p>
Teach Method	<p>Lectures in classroom (40 hours). Presentations and discussions (8 hours). Exercise (Homework) after class.</p>
Test and Examination	50% Attendance and reaction in class; 30% Presentation; 20% Homework
Pre-request Course	Aerodynamics or Fluid Mechanics

References	B1. Computational Gasdynamics Culbert B, Laney (1998) B2. Computational methods for fluid dynamics Ferziger J.H., Peric M. (3ed, 2001) B3. Numerical Computation of Internal and External Flows Hirsch (2ed,2007) B4. Computational Fluid Dynamics - Principles and Applications J. Blazek (2001) B5. Computational Fluid Dynamics Vol.III Hoffmann (4ed,2000)
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Course Introduction

Code	053123	Teaching Hours	36
Course	Viscous Fluid Flow		
Key Words	Viscous flows, Similarity Principle , Boundary Layer		
Purpose and Role of the Course	<p>This course presents systematically the basic concepts and mechanisms of viscous flows under the foundation acquired from undergraduate courses on fluid mechanics and aerodynamics. Theoretical methodology for analyzing viscous flows will be emphasized throughout the course, in conjunction with the input of knowledge on the advancement of research activities in various aspects of Viscous flows. Its contents involve: introduction to viscous flows, Dynamical Similarity Principle and Theory of Scaling, Fundamental Characteristics of Viscous Flows, Theory of Low Reynolds Number Flows, Fundamentals of High Reynolds Number Flows·Boundary Layer Theory, Laminar Separated Flows</p> <p>This course presents systematically the basic concepts and mechanisms of viscous flows under the foundation acquired from undergraduate courses on fluid mechanics and aerodynamics. Theoretical methodology for analyzing viscous flows will be emphasized throughout the course, in conjunction with the input of knowledge on the advancement of research activities in various aspects of Viscous flows. The present course is prepared for graduate level as a partial fulfillment for students who are pursuing toward their masters' degree, and a selective course for doctoral program</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction (2 hrs) <ol style="list-style-type: none"> 1.1 Brief Description of Viscous Flows 1.2 Fundamentals of Thermodynamics 1.3 Kinematic Properties of Viscous Flows 1.4 Transport Properties of Viscous Flows 1.5 Boundary Conditions for Viscous Flows 2. Dynamical Similarity Principle and Theory of Scaling (8 hrs) <ol style="list-style-type: none"> 2.1 Mathematical Models for Fluid Mechanics 2.2 Fundamentals of Scaling Analysis 2.3 Dimensionless Forms of Model Equations for Fluid Dynamics 2.4 Theory of Dynamical Similarity 2.5 Degeneracy of Government Equations 3. Fundamental Characteristics of Viscous Flows (6 hrs) <ol style="list-style-type: none"> 3.1 Kinematic Properties of Fluid Flows 3.2 Kinematics of Vortex Flows 3.3 Variation of Vorticity in Inviscid Flows 3.4 Variation of Vorticity in Viscous Flows 3.5 Onset and Transport of Vorticity 4. Theory of Low Reynolds Number Flows (6 hrs) <ol style="list-style-type: none"> 4.1 Introduction 4.2 Stokes Flows 		

	<p>4.3 Oseen Flows</p> <p>4.4 Low Reynolds Number Flows over Bodies</p> <p>4.5 Applications of Incompressible Low Reynolds Number Flows</p> <p>4.6 Compressible Low Reynolds Number Flows</p> <p>4.7 Numerical Methods for Low Reynolds Number Flows</p> <p>5. Fundamentals of High Reynolds Number Flows·Boundary Layer Theory(8 hrs)</p> <p>5.1 Introduction</p> <p>5.2 Boundary Layer Equations</p> <p>5.3 Exact Solutions of Laminar Prandtl’s Boundary Layer Equations</p> <p>5.4 Self-Similarity Characteristics of Boundary Layer Flows</p> <p>5.5 Integral Forms of Boundary Layer Equations</p> <p>5.6 Boundary Layer Flow Control</p> <p>6. Laminar Separated Flows (8 hrs)</p> <p>6.1 Introduction</p> <p>6.2 Kinematic Analysis of Separated Flows</p> <p>6.3 Solutions of Two Dimensional Laminar Boundary Layer Flows</p> <p>6.4 Multistructures of Boundary Layer Separations</p> <p>6.5 Three Dimensional Boundary Layer Separations</p>
Teach Method	<p>1. Class lecturing will be the primary form for presenting the course, with 4 class hours per week.</p> <p>2. The students are requested to study systematically the respective content in the text of “Viscous Fluid Flows” by F.M. White a priory to every class hour. The students must arrange their plans for home studies in accordance with the content covered in this course. The lectures presented in the class will only be stressed on the physical concepts common to the flow phenomena and theoretical methodology.</p> <p>3. Students will be assigned to read literatures of related topics, hand-in the related term papers, and give presentations in the class.</p>
Test and Examination	Final exam (open book) 100%
Pre-request Course	Engineering Thermodynamics and Heat Transfer, Fluid Mechanics, and Fundamentals of Aerodynamics.
References	<p>1. F. M. White, “Viscous Fluid Flow”, McGraw-Hill, 1974 (1st ed.), or 1991 (2nd ed.).</p> <p>2. H. Schlichting, “Boundary Layer Theory”, any edition.</p> <p>3. A.D. Young, “Boundary Layers”, AIAA, 1989.</p>

Course Introduction

Code	053124	Teaching Hours	32														
Course	Flight Mechanics																
Key Words	Performance; Dynamic Stability; Control Response; Flight Control																
Purpose and Role of the Course	<p>This course is an important basic specialty course. Its task is to make students master the basic concepts of aerodynamic fundamental and flight mechanics. Also the course is aimed at cultivating the capability for analyzing and solving problems.</p> <p>Flight dynamics problems are the important problems in Flight Vehicle Design. This course is aimed at introducing the basic concepts and research methods in Aircraft Flight Dynamics and Control. This course can be used as the compulsive course in the disciplines of Flight Vehicle Design and Vehicle Employment Engineering. Also it is a valuable elective course for the other disciplines.</p>																
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Chapter 1 Introduction</td> <td style="width: 20%; text-align: right;">2 hours</td> </tr> <tr> <td>Chapter 2 Reference Frames and Transformations</td> <td style="text-align: right;">4 hours</td> </tr> <tr> <td>Chapter 3 General Equations of Unsteady Motion</td> <td style="text-align: right;">4 hours</td> </tr> <tr> <td>Chapter 4 Aircraft Performance</td> <td style="text-align: right;">8 hours</td> </tr> <tr> <td>Chapter 5 Aircraft Maneuvers</td> <td style="text-align: right;">4 hours</td> </tr> <tr> <td>Chapter 6 Aircraft Dynamic Stability and Control Response</td> <td style="text-align: right;">4 hours</td> </tr> <tr> <td>Chapter 7 Aircraft Flight Control</td> <td style="text-align: right;">6 hours</td> </tr> </table>			Chapter 1 Introduction	2 hours	Chapter 2 Reference Frames and Transformations	4 hours	Chapter 3 General Equations of Unsteady Motion	4 hours	Chapter 4 Aircraft Performance	8 hours	Chapter 5 Aircraft Maneuvers	4 hours	Chapter 6 Aircraft Dynamic Stability and Control Response	4 hours	Chapter 7 Aircraft Flight Control	6 hours
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Chapter 6 Aircraft Dynamic Stability and Control Response	4 hours																
Chapter 7 Aircraft Flight Control	6 hours																
Teach Method	<p>All the contents will be taught in class, together with some case discussion. And the students are expected to complete the pre-reading contents and assignments after class. Finally, a course report is requested.</p> <p>To cultivate the capability for analyzing and solving problems through teaching and discussion in class; To master aircraft flight dynamics knowledge and philosophy thinking methods.</p>																
Test and Examination	Homework 20%, Final exam (close book, open note) 80%																
Pre-request Course	Fundamental of Aerodynamics; Theoretical Mechanics; Automatic Control System																
References	<p>[1] Etkin, B., Dynamics of Atmospheric Flight, Wiley, New York, 1972</p> <p>[2] Charles E. Dole Flight Theory and Aerodynamics, John Wiley & Sons, 1981</p>																

Course Introduction

Code	053125	Teaching Hours	36																														
Course	Introduction to Complex Flows																																
Key Words	Flow Separation, Vortex Dynamics, Shock/Boundary Layer Interaction																																
Purpose and Role of the Course	<p>This course is primarily aimed at the complex flow in research and engineering fields, including flow separation and vortical flow in low speed flows, and shock/boundary layer interaction in high speed flows.</p> <p>Training students in research methodology and provide a valuable link between fundamental knowledge and research frontier</p>																																
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">1. Introduction</td> <td style="width: 20%; text-align: right;">2 hours</td> </tr> <tr> <td>2. Two dimensional flow separation</td> <td></td> </tr> <tr> <td> 2.1 Phenomenon of two dimensional separation</td> <td style="text-align: right;">2 hours</td> </tr> <tr> <td> 2.2 Flow pattern of two dimensional separation</td> <td style="text-align: right;">2 hours</td> </tr> <tr> <td> 2.3 Flow structure in separation region</td> <td style="text-align: right;">2 hours</td> </tr> <tr> <td>3. Three dimensional flow separation</td> <td></td> </tr> <tr> <td> 3.1 Phenomenon of three dimensional separation</td> <td style="text-align: right;">4 hours</td> </tr> <tr> <td> 3.2 Skin friction line and limited streamline</td> <td style="text-align: right;">2 hours</td> </tr> <tr> <td> 3.3 Open and close separation</td> <td style="text-align: right;">2 hours</td> </tr> <tr> <td> 3.4 Qualitative analysis method of flow separation</td> <td style="text-align: right;">4 hours</td> </tr> <tr> <td>4. Separated vortex flow</td> <td style="text-align: right;">8 hours</td> </tr> <tr> <td>5. Shock/boundary layer interaction</td> <td></td> </tr> <tr> <td> 5.1 2D shock/boundary layer interaction</td> <td style="text-align: right;">2 hours</td> </tr> <tr> <td> 5.2 3D shock/boundary layer interaction</td> <td style="text-align: right;">2 hours</td> </tr> <tr> <td> 5.3 unsteadiness in shock/boundary layer interaction</td> <td style="text-align: right;">2 hours</td> </tr> </table>			1. Introduction	2 hours	2. Two dimensional flow separation		2.1 Phenomenon of two dimensional separation	2 hours	2.2 Flow pattern of two dimensional separation	2 hours	2.3 Flow structure in separation region	2 hours	3. Three dimensional flow separation		3.1 Phenomenon of three dimensional separation	4 hours	3.2 Skin friction line and limited streamline	2 hours	3.3 Open and close separation	2 hours	3.4 Qualitative analysis method of flow separation	4 hours	4. Separated vortex flow	8 hours	5. Shock/boundary layer interaction		5.1 2D shock/boundary layer interaction	2 hours	5.2 3D shock/boundary layer interaction	2 hours	5.3 unsteadiness in shock/boundary layer interaction	2 hours
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5.2 3D shock/boundary layer interaction	2 hours																																
5.3 unsteadiness in shock/boundary layer interaction	2 hours																																
Teach Method	Chalk-and-talk lectures and group discussion																																
Test and Examination	Attendance 20%, Presentation 30%, and Final Report 50%																																
Pre-request Course	Aerodynamics, Fundamentals of Fluid Dynamics																																

References	<ol style="list-style-type: none"><li>1. Xia XueJian, and Deng, XueYing, Separation and Vortex Dynamics in Engineering, Beihang University Press, 1991 (in chinese)<li>2. Wu, J.Z., Ma, H.Y., and Zhou, M.D., Vorticity and Vortex Dynamics, Springer Press, 2006
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Course Introduction

Code	053127	Teaching Hours	32
Course	Advanced Engineering Thermodynamics		
Key Words	advanced engineering thermodynamics		
Purpose and Role of the Course	<p>The aim of this course is to provide a better understanding how using energy more reasonable.</p> <ol style="list-style-type: none"> 1. Review Fundamental Thermodynamic Principles for Improved Knowledge and Understanding. 2. Gain Experience with Professional Level Use of Physical Property Models & Chemical Reaction Equilibrium Calculations 3. Implement Thermodynamics in Some Complex Systems <p>After successfully completing this course, students should be able:</p> <p>To understand the fundamental concepts of chemical engineering thermodynamics and to explain these concepts to other chemical engineers. We will re-derive the essential conclusions of classical thermodynamics so that students will comprehend the breadth as well as the limitations of thermodynamics.</p> <p>To solve complex chemical engineering problems using thermodynamic concepts, data, and models.</p> <p>To use modern chemical engineering thermodynamic models and to understand their limitations. The connections between physical chemistry, chemical engineering thermodynamics, and chemical process design will be demonstrated.</p> <p>Introduce topics in thermodynamics which are not typically covered in undergraduate courses</p> <ul style="list-style-type: none"> • Relate these topics to mechanical engineering applications • Review published literature in a selected topic area • Provide problem solving experience using the computer 		
Main Chapters and Teaching Hours	<p>The course is constructed of six parts:</p> <p>Concepts and definitions; properties of a pure substance; work and heat; the first and the second law of thermodynamics; entropy; power and refrigeration cycles; thermodynamics of mixtures; thermodynamic relations; chemical relations; phase and chemical equilibrium</p> <p>REVIEW OF CLASSICAL THERMODYNAMICS</p> <ol style="list-style-type: none"> 1. Basic Laws of Thermodynamics (2 weeks) 2. Properties of Materials (2 weeks) 3. Phase Equilibrium (2 weeks) 4. Chemical Equilibrium (2 weeks) <p>ADVANCED TOPICS</p> <ol style="list-style-type: none"> 1. Complex phase behavior in novel materials (2 weeks) 2. Thermodynamics in biological process systems (2 weeks) 3. Energy conversion and environmental protection (2 weeks) <p>INTRODUCTION AND OVERVIEW: Introductory Concepts and Preliminaries; Properties of Pure Substances; Energy and the First Law of Thermodynamics, Energy Transfer by Heat, Work, and Mass; Second Law of thermodynamics, Entropy: A Measure of Disorder.</p> <p>THE TWO LAWS COMBINED: Review on some consequences of first Law, Limitations of first Law, Thermodynamic Temperature Scale, Practical Temperature Measurement. Clausius Clapeyron</p>		

	<p>Equation, Stefan's Law. Helmholtz and Gibbs Functions, Availability in Steady Flow, Irreversibility and Effectiveness, Combined First and Second Laws, Isothermal and Adiabatic Compressibility; Joule-Kelvin Coefficient Maxwell Equation, Vander wall's Gas Equation; Equilibrium among Phases of a Pure Substances.</p> <p>MULTI PHASE SVSTEMS: General considerations, Dalton & Amagat Model, Mixture of gases and vapors. Changes in Molal Properties upon Mixing, Gibbs entropy Equation and Gibbs -Duhem Equation.</p> <p>CHEMICALLY REACTIVE SYSTEMS: Thermodynamics of reactive Systems and Criterion of Equilibrium, Phase rule. Combustion Process, Enthalpy of formation; First Law Analysis of Reacting Systems; Second Law analysis of Reacting Systems, Equilibrium Constant and its temperature Dependence.</p> <p>THERMODYNAMIC OPTIMIZATION:_Exergy analysis of Vapor and Gas Power Cycles, Guideline for improving Thermodynamic Effectiveness; Exergy analysis of Simple Power Plant (Steam Plant) or Energy efficiency of Industrial Production Schemes (e.g. Helium Liquefaction System).</p> <p>HIGH-SPEED GAS FLOW: Irreversible Thermodynamics and Thermodynamics of High-Speed Gas Flow.</p>
Teach Method	<p>Teaching & Learning</p> <p>Opening examination practice in graduate student teaching of advance engineering thermodynamics</p> <p>Undergraduate thermodynamics will be reviewed by a series of lectures and home work presentations. Advanced topics will be introduced using regular lectures</p>
Test and Examination	<p><u>Grading Basis</u> (650 points) Quizzes (2) 200 Final Examination 300 Term Project 100 Homework 50 650</p> <p>REVIEW OF CLASSICAL THERMODYNAMICS</p> <p>4 homework sets -- 40 % of final grade</p> <p>4 class tests -- 20 % of final grade</p> <p>ADVANCED TOPICS</p> <p>1 term paper -- 40% of grades</p>
Pre-request Course	Fundamentals of Engineering Thermodynamics

References	<p>Advanced Engineering Thermodynamics, 2nd Edition by Adrian Bejan ... Advanced Thermodynamics Engineering</p> <ol style="list-style-type: none"> 1. Advanced Engineering Thermodynamics Adrian Bejan Wiley NY 2nd Ed. ISBN 0471148806. 2. Advanced Engineering Thermodynamics Benson R S Pergamon, Oxford 3. Methods of Thermodynamics, by Reiss H, Pub. Blaisdell N Y 4. CRC handbook of Thermal Engg Kreith; Frank CRC ISBN 084939581x 5. Analysis of Energy Efficiency of Industrial Processes Stepanov, Vladimir S. Springer Verlag 6. An introduction to statistical thermodynamics Terrel L Hill. 7. Fundamentals of classical Thermodynamics, Van Wylen, Sonntag, Borgnakke, John Wiley 8. 8. Thermodynamics, K E Wark, McGH. 9. Thermodynamics for Engrs, B. V. Karlekar, Prentice Hall 10. Cycles And Performance Estimation Hodge J. Butterworth London 11. Availability Analysis Moran M. J. Prentice Hall. 12. Technical Thermodynamics Bosnjakovic, Blacksher NY 13. Applied Thermodynamics Babits Gallen & Bacon, Boston
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Course Introduction

Code	053135	Teaching Hours	48
Course	Satellite Thermal Control		
Key Words	Satellite, Space heat transfer, Thermal control		
Purpose and Role of the Course	<p>This course covers the fundamental principles which involved in satellite's thermal control. The recently development of relegated subject such like heat transfer and advanced automation technologies will also be introduced in our lectures, and the contents are usually suitable for the M.S. students and Ph.D. students whose major are aerospace engineering. All potential students are warmly welcomed to select our course, but those who have no academic backgrounds in thermal science and control engineering are strongly suggest to take the relative courses like heat transfer, control theory before taking this course.</p> <p>The objective of this course is to provide the students a solid fundamental in space thermal engineering, which is necessary for the design and analysis of spacecraft structure and system. Students are expected to master the thermal analysis algorithms of spacecraft external heat flux and internal temperature distribution, as well as the effective passive thermal control methods and active thermal control approaches.</p>		
Main Chapters and Teaching Hours	<p>There are six units in this course, and they are organized as follows:</p> <ol style="list-style-type: none"> 1) Spacecrafts and their space environment, 2) Analysis of the spacecraft in-orbit external heat flux and internal temperature distribution, 3) Passive thermal control methods, 4) Active thermal control approach's, 5) Satellite's thermal test, 6) Development of advanced thermal control technologies. 		
Teach Method	<p>In this course, we adept thee patterns in our teaching and learning:</p> <ol style="list-style-type: none"> 1) Lectures, for fundamental concepts and principles; 2) Course projects (Reading + self-research), for detail knowledge and application; 3) Group discussion, to enhance the academic abilities in communication. 		
Test and Examination	None		
Pre-request Course	Heat transfer, Engineering thermodynamics, Control theory, Introduction to aerospace engineering.		
References	None		

Course Introduction

Code	053136	Teaching Hours	48
Course	Environment Simulation and Test		
Key Words	Environmental simulation, environmental test, aerospace system, vehicle system, electronic system.		
Purpose and Role of the Course	<p>Environmental simulation and test technologies are necessary the reliability test of mechanical systems and electronic systems, such like spacecrafts, aircrafts and land vehicles, heat exchangers and electronic apparatus. This course introduces the fundamental simulation principle of ground level climate environment, aircraft's plying environment and space environment which impact the spacecraft's in-orbit behaviors. The potential students for this course are the M.S. or Ph.D. students whose majors are aerospace engineering, vehicle engineering or electronic engineering, and they should have a solid academic background in heat transfer and engineering thermodynamics. The objective of this course is to provide the students a solid fundamental in environmental simulation technology, which is necessary for the reliability design and analysis of spacecrafts, aircrafts, land vehicles and general equipments. Students are expected to master the primary simulation principle involved in environmental test, as well as design procedures and analysis algorithm of the relative environmental simulation facilities.</p>		
Main Chapters and Teaching Hours	<p>There are six units in this course, and they are organized as follows:</p> <ol style="list-style-type: none"> 5) Environmental facts and environmental impacts, 6) Primary environmental simulation approaches, 7) Ground level environmental simulation for land vehicles and general equipments, 8) Aircraft environmental simulation and test, 5) Space environment and spacecraft environmental test, 6) Development of environmental simulation technologies. 		
Teach Method	<p>In this course, we adept thee patterns in our teaching and learning:</p> <ol style="list-style-type: none"> 4) Lectures, for fundamental concepts and principles; 5) Course projects (Reading + self-research), for detail knowledge and application; 6) Group discussion, to enhance the academic abilities in communication. 		
Test and Examination	None		
Pre-request Course	Heat transfer, Engineering thermodynamics, Control theory, Introduction to aerospace engineering.		
References	None		

Course Introduction

Code	053138	Teaching Hours	48																		
Course	Computational Solid Mechanics																				
Key Words	Solid Mechanics, Computational method																				
Purpose and Role of the Course	<p>The FEM, meshfree methods and boundary methods, as is well known, are the bridges from theories to applications. Based on the knowledge of material mechanics, theoretical mechanics and structural mechanics and structural dynamics, this course pertaining to these methods focuses primarily on the fundamental concepts, methods of establishing all kinds of elements and solution methods of static and dynamic equilibrium equations, including the newly developed Gauss elimination method, symplectic direction integration methods preserving structures. Understand the fundamental concepts, the basic foundations of numerical methods; Capable of implementing FEM, meshless method and boundary element method;</p>																				
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">1.Introduction</td> <td style="width: 30%;">2 hours</td> </tr> <tr> <td>2.Variational principle</td> <td>4 hours</td> </tr> <tr> <td>3.One dimensional FEM</td> <td>10 hours</td> </tr> <tr> <td>4.Two dimensional FEM</td> <td>10 hours</td> </tr> <tr> <td>5.Meshfree Method</td> <td>6 hours</td> </tr> <tr> <td>6.Boundary element methods</td> <td>6 hours</td> </tr> <tr> <td>7.Numerical methods</td> <td>6 hours</td> </tr> <tr> <td>8.Summarization</td> <td>1 hour</td> </tr> <tr> <td>9.Examination</td> <td>3 hours</td> </tr> </table>			1.Introduction	2 hours	2.Variational principle	4 hours	3.One dimensional FEM	10 hours	4.Two dimensional FEM	10 hours	5.Meshfree Method	6 hours	6.Boundary element methods	6 hours	7.Numerical methods	6 hours	8.Summarization	1 hour	9.Examination	3 hours
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9.Examination	3 hours																				
Teach Method	<p>1. lectures (44 hours). 2.exercise after class</p>																				
Test and Examination	<p>Homework 40%, Final exam 60%</p>																				
Pre-request Course	<p>Engineering mechanics structural dynamics.</p>																				
References	<p>1. K. Washizu, Variational Methods in Elasticity and Plasticity, Pergamon Press Ltd. 1968. 2. O.C.Zienkiewicz, The Finite Element Method, Third edition,McGraw-HILL Book Company(UK) Limited, 1977 3. CA Brebbia, JCF Telles and LC Wrobel, Boundary Element Techniques, Theory and Applications in Engineering. Pringer-Verlag Berlin Heidelberg NewYork Tokyo, 1984 4. KJ Bathe and EL Wilson, Numerical Methods in Finite Element Analysis, Prentice-Hall, Inc. Englishwood Cliffs, New Jersey, 1976</p>																				

Course Introduction

Code	053139	Teaching Hours	16
Course	Aeronautical Engineering Experiment		
Key Words	aeronautical engineering, glider model, design/build/fly test		
Purpose and Role of the Course	<p>It is an elective laboratorial course for foreign graduate students with Beihang University. The course objective is to make the students understand the engineering concept for the aircraft development and to foster the practical and innovative abilities of the students.</p> <p>Two segments compose the whole course. The first part is called theoretical lesson of 4 hours which includes description and arrangement of the course, experimental principles, power plant and model airplane design process. In The second part of 12 hours practice, student teams are immersed in a glider model design project, where they design, build, and fly the radio-controlled model glider.</p> <p>Each student is required to submit a Lab Report which includes title, abstract, introduction, description of experiment, results of experiment, analysis of results, conclusion and reference list.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Experiment Principle 2 hours Description of the course contents, arrangement, teaching method, grade assessment, and requirements of lab report. Fundamentals of aerodynamics, flight environment and flight control.</p> <p>Chapter 2 Power Plants and Model Airplane Design Process 2 hours Compositions and operational principles of piston engine and air-breath engines. Estimation of model airplane take-off gross weight, design of wing/fuselage/tails, positioning of center of gravity, layout and design of control surfaces.</p> <p>Chapter 3 Design Experiment of An Electric Glider Model 12hours Students will be divided into groups of 3-5 persons and carry out the following items under the guidance of assistant teachers.</p> <p>(1) design of an electric glider model, (2) part fabrication, component assembling, and the whole model airplane integration, (3) ground check and adjustment for the electric glider model, (4) flight test of the electric glider model.</p>		
Teach Method	Classroom teaching + Grouping experiments + Written lab report		
Test and Examination	<p>Each student is required to submit a Lab Report.</p> <p>Final grade: 70% from Lab Report, 30% from course attendance.</p> <p>No final exam.</p>		
Pre-request Course	None		
References	None		

Course Introduction

Code	053140	Teaching Hours	36
Course	Aviation environment physiology and protective equipment		
Key Words	Aviation physiology personal protective equipment altitude hypoxia		
Purpose and Role of the Course	<p>To introduce the overview of altitude environment, altitude physiology, personal protective equipment.</p> <p>Let the students to understand the theory and have a grasp of the principle of the aviation physiology, altitude environment and the personal protective equipment.</p>		
Main Chapters and Teaching Hours	<p>introduction 4h</p> <p>chapter one atmosphere</p> <p>chapter two the effects of aeronautical environment physics factors 3 h</p> <p>chapter three high altitude anoxia 3h</p> <p>chapter four positive pressure cabin and rapid decompression 3h</p> <p>chapter five aviation oxygen supply and protective equipment 4h</p> <p>chapter six practice of physiological experiments on aviation 4 h</p> <p>chapter seven temperature physiology of aviation 3h</p> <p>Chapter eight the protection of heat and cold in aviation 3h</p> <p>chapter nine the protection of aircraft noise 1h</p> <p>chapter ten the protection of radiation in aviation 1h</p> <p>chapter eleven aerodynamics effect and its protection for aerospace</p> <p>chapter twelve protective equipment for aerospace</p>		
Teach Method	To lecture with PPT. And to show some tests		
Test and Examination	Take a exam. or finish a report.		
Pre-request Course	Computer and projector		
References	Physiology of altitude oxygen equipment		

Course Introduction

Code	053141	Teaching Hours	48																						
Course	Flight Dynamics and control of aircraft																								
Key Words	Flight Dynamics, flight mechanics, flight control																								
Purpose and Role of the Course	<p>This course is primarily aimed at students in aircraft design, at the graduate level. It is compulsory course for the graduate students in flight mechanics and flight safety. The following contests is included in the course, equations of aircraft, stability of aircraft motion, SAS and CAS control design and simulation.</p> <p>We primarily hope that the students can understand the concepts of flight Dynamics. They should have the ability of analyzing aircraft stability, control design for improvement of flying quality of aircraft based on control theory, simulation for the aircraft control system using MATLAB .</p>																								
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 80%;">1. Introduction</td><td style="text-align: right;">2 hours</td></tr> <tr><td>2. Equilibrium States</td><td style="text-align: right;">4 hours</td></tr> <tr><td>3. Static Stability of airplane</td><td style="text-align: right;">4 hours</td></tr> <tr><td>4. Frames and Coordinate systems</td><td style="text-align: right;">4 hours</td></tr> <tr><td>5. 6-DOF motion equations</td><td style="text-align: right;">4 hours</td></tr> <tr><td>6. linearization model of motion equations</td><td style="text-align: right;">4 hours</td></tr> <tr><td>7. Stability derivatives</td><td style="text-align: right;">4 hours</td></tr> <tr><td>8. Longitudinal Dynamics</td><td style="text-align: right;">6 hours</td></tr> <tr><td>9. Lateral Dynamics</td><td style="text-align: right;">4 hours</td></tr> <tr><td>10. Longitudinal control</td><td style="text-align: right;">6 hours</td></tr> <tr><td>11. Lateral control</td><td style="text-align: right;">4 hours</td></tr> </table>			1. Introduction	2 hours	2. Equilibrium States	4 hours	3. Static Stability of airplane	4 hours	4. Frames and Coordinate systems	4 hours	5. 6-DOF motion equations	4 hours	6. linearization model of motion equations	4 hours	7. Stability derivatives	4 hours	8. Longitudinal Dynamics	6 hours	9. Lateral Dynamics	4 hours	10. Longitudinal control	6 hours	11. Lateral control	4 hours
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10. Longitudinal control	6 hours																								
11. Lateral control	4 hours																								
Teach Method	<p>gave lectures in classroom (32 hours).</p> <p>Project practice in flight mechanics lab (16 hours).</p> <p>exercise (Homework) after class</p>																								
Test and Examination	Homework and Project 50%, Final exam 50%																								
Pre-request Course	Having taken the following courses, Control Theory, aerodynamics																								
References	<p>1. B. Etkin, Aircraft Dynamics –Stability and Control, John Wiley & Sons, 1997.</p> <p>2. Brian L. Stevens, Aircraft control and simulation, 2nd, John Wiley & Sons, 2003</p>																								

Course Introduction

Code	053126	Teaching Hours	36
Course	Hypersonic Aerodynamics		
Key Words	Hypersonic Aerodynamics, inviscid flow, viscous flow		
Purpose and Role of the Course	<p>Hypersonic Aerodynamics is an important part of the entire flight spectrum, representing the segment at the extreme high velocity of this spectrum. This course is divided into three parts. Part 1 deals with inviscid hypersonic flow, emphasizing purely the fluid dynamic effects of the mach number becoming large. Part 2 deals with viscous hypersonic flow, emphasizing the purely fluid dynamic effects of including the transport phenomena of viscosity and thermal conduction at the same time that the mach number becomes large. Part 3 deals with the influence of high temperature on both inviscid and viscous flows through the various physical phenomena that dominate high-speed aerodynamics.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Hypersonic aerodynamic characteristics, 6 Hours 2. Inviscid hypersonic Flow, 12 Hours 3. Viscous hypersonic Flow, 10 Hours 4. High-temperature gas dynamics, 8 Hours 		
Teach Method	The course is given in the form of class lectures, teaching in English with multimedia courseware.		
Test and Examination	Questions in Class 10%, Homework 20%, Final exam (open book) 70%		
Pre-request Course			
References			

Course Catalogue for International Postgraduates

(School of Computer Science and Engineering)

编号 No.	英文课程名称 Course Title	中文课程名称 Course Title	学时 Hours	学分 Credits	开课季节 Semester	任课教师 Lecturer
063301	Software Engineering	软件工程	48	3	Fall	徐红
063302	Computer Networks	计算机网络	48	3	Fall	李欢
063303	Artificial Intelligence & Application	人工智能	32	2	Fall	百晓
063304	Computer Vision	计算机视觉	32	2	Spring	黄迪
063305	Data Mining	数据挖掘	32	2	Fall	张日崇
063308	Object Oriented Programming(Java)	面向对象程序设计 (Java)	48	3	Fall	李建欣 赵永望
063309	Digital Image and Video Processing	数字图像与视频处理	32	2	Fall	李波
063311	Data Structures	数据结构	48	3	Spring	张茂林
063312	Distributed Operating Systems	分布式操作系统	48	3	Spring	任爱华
063313	Computer Network Lab	计算机网络实验	48	3	Spring	张力军
063314	Operating Systems	操作系统	48	3	Spring	任爱华
063315	Scientific Thesis Writing	科技论文写作	16	1	Spring	黄迪

Course Introduction

Code	063301	Teaching Hours	48
Course	Software Engineering		
Key Words	software engineering; software process models; software project management		
Purpose and Role of the Course	<p>This is a course designed for international graduate students and/or Ph.D. candidates who study in School of Computer Science and Engineering, BeiHang University, especially for those whose specialty is Software Engineering or Computer Software and Theory. Students from School of Electronic and Information Engineering, School of Automation Science and Electrical Engineering or others may also find this course helpful.</p> <p>Software engineering is the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software. When students have taken this course, they will:</p> <ul style="list-style-type: none"> ■ Understand software processes and software process models, software project management, software quality management and software configuration management; ■ Know well the principles, methodologies and techniques used in project planning and scheduling, system modeling, verification and validation, and documentation standards; ■ Work as software engineering professionals in requirements engineering, software development, quality assurance and software evolution. 		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Software processes and project management (10 hours) 2. Requirements engineering, design development and system modeling (18 hours) 3. Quality assurance (12 hours) 4. Advanced topics in software engineering (8 hours) 		
Teach Method	<ol style="list-style-type: none"> 2. Lectures on main topics: software processes, project management, system modeling, quality assurance, etc. 3. Presentations and discussions on topics of general interest. 4. Practice and evaluation. 		
Test and Examination	Individual performance (45%) + team project (55%)		
Pre-request Course	Programming language Database Operating system (recommended)		
References	<ol style="list-style-type: none"> 1. Ian Sommerville, Software Engineering (9th Edition), Addison Wesley, 2010. 2. Roger Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill Science/Engineering/Math, 2009. 		

Course Introduction

Code	063302	Teaching Hours	48
Course	Computer Networks		
Key Words	Internet Protocols, Network Architecture and Algorithms		
Purpose and Role of the Course	<p>This course covers fundamental concepts and principles in the design and implementation of computer networks. Topics include: layered network architectures, applications, network programming interfaces (e.g., sockets), transport, congestion, routing, and data link protocols, local area networks, emerging high-speed networks. Examples will be drawn primarily from the Internet (e.g., TCP, UDP, and IP) protocol suite.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Computer Networks and the Internet <ol style="list-style-type: none"> 1.1 What is the Internet 1.2 The Network Edge 1.3 The Network Core 1.4 Delay, Loss, and Throughput in Packet-Switched Networks 1.5 Protocol Layers and Their Service Models 1.6 History of Computer Networking and Internet 2. Application Layer <ol style="list-style-type: none"> 2.1 Principles of Network Applications 2.2 The Web and HTTP 2.3 File Transfer :FTP 2.4 Electronic Mail in the Internet 2.5 DNS-The Internet Directory Service 2.6 Peer-to-Peer Applications 2.7 Socket Programming with TCP and UDP 3. Transport Layer <ol style="list-style-type: none"> 3.1 Introduction of Transport-Layer Services 3.2 Multiplexing and Demultiplexing 3.3 Connectionless Transport: UDP 3.4 Principles of Reliable Data Transfer 3.5 Connection-Oriented Transport: TCP 3.6 Principles of Congestion Control 3.7 TCP Congestion Control 4. Network Layer <ol style="list-style-type: none"> 4.1 Introduction 4.2 What's inside a router 4.3 The Internet Protocol (IP) 4.4 Routing Algorithms 4.5 Broadcast an Multicast Routing 5. Link Layer <ol style="list-style-type: none"> 5.1 Introduction 		

	<p>5.2 Error-Detection and Error-Correction Techniques</p> <p>5.3 Multiple Access Protocols</p> <p>5.4 Link-Layer Addressing</p> <p>5.5 Ethernet</p> <p>6. Wireless and Mobile Networks</p> <p>6.1 Introduction</p> <p>6.2 Wireless Links and Network Characteristics</p> <p>6.3 WiFi: 802.11</p> <p>6.4 Cellular Internet Access</p> <p>6.5 Mobility Management and Mobile IP</p>
Teach Method	The course is given in the form of class lectures, and students are expected to further master the contents through doing homework assignments, programming assignments and reading research papers.
Test and Examination	1. Homework 50% 2. Final exam (close + open book) 50%
Pre-request Course	Knowledge of OS, Basic Algorithms, Programming Languages
References	

Course Introduction

Code	063303	Teaching Hours	32																								
Course	Artificial Intelligence & Application																										
Key Words	artificial intelligence, machine learning, vision learning																										
Purpose and Role of the Course	This course is a post-graduate degree course of computer software and theory and computer application, it focuses on the basic principles and applications of Artificial Intelligence, Machine Learning and Computer Vision. Learning through this course, the students will understand how to apply the Machine Learning technology in actual systems, enhancing the systems the solution abilities and the intelligent levels.																										
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">Chapter 1.</td> <td style="width: 70%;">History and Challenge</td> <td style="width: 20%;">3 hours</td> </tr> <tr> <td>Chapter 2.</td> <td>Problems and Solutions, Brief Introduction</td> <td>4 hours</td> </tr> <tr> <td>Chapter 3.</td> <td>Machine Learning Introduction</td> <td>3 hours</td> </tr> <tr> <td>Chapter 4.</td> <td>Learning Methods</td> <td>6 hours</td> </tr> <tr> <td>Chapter 5.</td> <td>Introduction to Computer Vision</td> <td>4 hours</td> </tr> <tr> <td>Chapter 6.</td> <td>Vision Problems</td> <td>4 hours</td> </tr> <tr> <td>Chapter 7.</td> <td>Machine Learning Systems and Applications</td> <td>4 hours</td> </tr> <tr> <td>Chapter 8.</td> <td>Practices</td> <td>4 hours</td> </tr> </table>			Chapter 1.	History and Challenge	3 hours	Chapter 2.	Problems and Solutions, Brief Introduction	4 hours	Chapter 3.	Machine Learning Introduction	3 hours	Chapter 4.	Learning Methods	6 hours	Chapter 5.	Introduction to Computer Vision	4 hours	Chapter 6.	Vision Problems	4 hours	Chapter 7.	Machine Learning Systems and Applications	4 hours	Chapter 8.	Practices	4 hours
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Chapter 8.	Practices	4 hours																									
Teach Method	Principles and Methods in classroom, Classroom discussions, Exercises and Hands-on practice, English Courseware, Bilingual-Teaching.																										
Test and Examination	1. Homework 30% 2. Final Project and Exam 70%																										
Pre-request Course																											
References																											

Course Introduction

Code	063304	Teaching Hours	32
Course	Computer Vision		
Key Words	Image Filtering, Segmentation, Representation, Recognition; Video Tracking and Motion Analysis		
Purpose and Role of the Course	<p>The course of computer vision is designed for graduate students interested in vision, graphics, artificial intelligence, and machine learning. It offers a broad introduction to common vision problems, theories and algorithms. The course is also aimed at developing critical thinking and understanding when and how these algorithms can be applied to specific applications. The students will be able to acquire hands-on experience through implementing some popular approaches as assignments. Even students who do not intend to do research work in the domain of computer vision in the future will benefit from learning these algorithms and tools covered during this course, since these techniques are useful in many other areas.</p>		
Main Chapters and Teaching Hours	<p>Introduction (2 credit hours) Formation and Filtering (6 credit hours) Basis of Machine Learning (4 credit hours) Grouping and Fitting (4 credit hours) Recognition (6 Credit hours) Multiple Views and Motion (4 credit hours) Advanced Topics (2 credit hours) Project Presentation (4 credit hours)</p>		
Teach Method	<p>Fundamental concepts, important theories as well as their typical applications within the domain of computer vision and some other highly related topics, e.g. machining learning and pattern recognition, will be presented. Several classic and recent representative academic papers will be given out to the students as supplementary material for reading, and the assignments are mini projects aimed at implementing some of the main algorithms introduced in the class. Both the reading and coding work is desired to help the students improve their understanding to technical content and the ability of utilization in practice.</p>		
Test and Examination	<p>Instead of examination the course requires a self-chosen final project, to which at most two persons constitute a team. The project includes reading, programming, writing and presentation. Each team involving in the project has to implement the idea that is proposed after reading sufficient papers in the literature. Furthermore, it is responsible for introducing the work in a scientific way as well as writing it in a technical report. The test score not only depends on the innovation, correctness, and depth of the method and experimentation, but is related to the clarity, organization, language of the presentation and writing as well.</p>		
Pre-request Course	<p>Linear Algebra; Theory of Matrices; Digital Signal Processing (NOT Mandatory).</p>		
References	<p>Computer Vision: Algorithms and Applications, Richard Szeliski, Springer. Computer Vision: A Modern Approach (2nd Edition), David A. Forsyth, Jean Ponce, Prentice Hall. Algorithms for Image Processing and Computer Vision, J. R. Parker, Wiley.</p>		

Course Introduction

Code	063305	Teaching Hours	32
Course	Data Mining		
Key Words	Databases, data mining technology, Classification and Regression		
Purpose and Role of the Course	This class gives a basic exposition of the goals and methods of data mining, including concepts, principles, architectures, algorithms, implementations, and applications. The main topics include an overview of databases, and data mining technology, concept mining, association mining, classification and predication, clustering, Text Mining and Web Mining. The goal of this course is to make students grasp the basic techniques of Data Mining and be capable of solving practical problems.		
Main Chapters and Teaching Hours	Part 1 Introduction 2 hours Part 2 Data, Data Preparation, and Data Preprocessing 4 hours Part 3 Classification and Regression 6 hours Part 4 Association 4 hours Part 5 Clustering 4 hours Part 6 Text Mining 4 hours Part 7 Web Mining 4 hours Part 8 Seminar and Project Presentation 4 hours		
Teach Method	Lecture Case Study Paper Analysis Project Implementation		
Test and Examination	Survey Writing Practical Project Survey and Project Presentation Survey and Project Report		
Pre-request Course	Probability and Statistics, Program Design, Data Structure		
References	Data Mining: Concepts and Techniques, 3rd edition, J. Han, M. Kamber and J. Pei. Morgan Kaufmann, 2011 Data Mining: Practical Machine Learning Tools and Techniques with Java Implementations Ian H. Witten and Eibe Frank Morgan Kaufmann, 2011 Introduction to Data Mining P.-N. Tan, M. Steinbach, V. Kumar Addison-Wesley, 2005		

Course Introduction

Code	063308	Teaching Hours	48
Course	Object Oriented Programming (Java)		
Key Words	Programming; Object-oriented Design; Java Language		
Purpose and Role of the Course	<p>This course mainly focuses the principle of object oriented programming (OOP) and the famous OOP language —Java. It aims to let students understand the principal of OOP, and learn some basic concepts of Java programming language, such as Java essential language, I/O, network, database, security, and J2EE etc. This lesson will train students' ability to design the software with OOP and to develop small application with Java.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction(3 hours) 2. The principle of object oriented programming (OOP) (6 hours) 3. Java Language Basic(3 hours) 4. OOP concepts in Java(3 hours) 5. Java Essential Techniques(3 hours) 6. Java I/O & Exception(3 hours) 7. Java GUI-AWT/Swing(3 hours) 8. Java Web & Applet(3 hours) 9. Java Database(3 hours) 10. Java Security(3 hours) 11. Java Network(3 hours) 12. J2EE (3 hours) 13. XML/Web Services(3 hours) 14. Application Example (6 hours) 		
Teach Method	<p>The course is given in the form of class lectures, and students are required to finish some programming homework assignments and a final project with the knowledge learned during class.</p>		
Test and Examination	<p>1. Homework 30% 2. Final Project and Exam 70%</p>		
Pre-request Course	<p>Computer Foundation, and the C or other programming languages background is preferred.</p>		
References	<p>[1] Bruce Ecke, Thinking in Java, 4th Edition, 2007, China Machine Press [2] Horstmann Gay S, Gary Cornell Core Java, volume I: Fundamentals, Eighth Edition, Sun Enterprise, 2007</p>		

Introduction of Course

Code	063309	Teaching Hours	32 hours (12 hour homework including)
Course	Digital Image and Video Processing		
Key Words	Digital Image and Video, Frequency Domain, Spatial Domain, Processing		
Purpose and Role of the Course	To help oversea student learn some fundamental principals of digital image and video processing. When the course is finished, students should know how to process images and video clips to get demanded information and the mathematic models inside the processing. And when they meet such kind of applications, they can provide a suitable solution in both algorithm side and implementation side.		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction to Digital Image and Video Processing, 2 hours 2. Procedure and Tools for Digital Image and Video Processing, 2 hours 3. Digital Image Processing in Spatial Domain, 4 hours 4. Digital Image Processing in Frequency Domain, 4 hours 5. Digital Image Compressing, 4 hours 6. General Processing of Digital Video, 2hours 7. Digital Video Compressing, 1 hours 8. Application of Digital Image and Video Processing, 1 hours <p>The experiments and tests are not included in teaching hours.</p>		
Teach Method	Teaching in class, homework at home or labs		
Test and Examination	class project 100%.		
Pre-request Course	C Language Programming, Linear Algebra, Advanced Mathematics		
References	<p>Electronics Industry Publish, Rafael C. Gonzlez, Richard E. Woods , Digital Image Processing Second Edition</p> <p>THU Publish, A.Murat Tekalp, Digital Video Processing</p>		

Course Introduction

Code	063311	Teaching Hours	48
Course	Data Structures		
Key Words	Data representation, Data manipulation, Stacks, Queues, Trees, Graphs		
Purpose and Role of the Course	<p>Purpose: Computer components include CPU, Main memory, Hard Disk and others. When the programs need to be executed, Program and Data will be moved to main memory. The main memory is very rare and expensive resources in computer. For representing the data, we have to provide the more effective data structure. To develop a program for using the data structure, we need to develop the suitable high performance algorithm.</p> <p>Role: Lecture: ZHANG Maolin Title: Associate Professor School: School of Computer Science E-mail: zml@buaa.edu.cn Tel: 010-82317629</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Review of C++, 3 hours Chapter 2 Review of program performance, 3 hours Chapter 3 Formula-based and linked representations, 6 hours Chapter 4 Arrays and matrices, 3 hours Chapter 5 Stacks and applications, 3 hours Chapter 6 Queues and applications, 3 hours Chapter 7 Skip lists and hashing, 3 hours Chapter 8 Binary and other trees, 3 hours Chapter 9 Priority queues, heap sort, and Huffman codes, 3 hours Chapter 10 Tournament trees and bin parking, 3 hours Chapter 11 Search Trees, 3 hours Chapter 12 Graphs, 3 hours</p>		
Teach Method	<ol style="list-style-type: none"> 1. Teaching in classroom 2. Algorithms programs experiment 3. Assignments & examination 		
Test and Examination	<p>20% for assignments 20% for test 60% for final examination</p>		
Pre-request Course	<ol style="list-style-type: none"> 1. Operating system 2. C++ programming 		
References	<p>《Data Structures, Algorithms, and Application in C++》, 1998, Edition 1, Sartaj Sahni, Florida University Author's Home Page: www.cise.ufl.edu/~sahni/dsaac/</p>		

Course Introduction

Code	063312	Teaching Hours	48
Course	Distributed Operating System		
Key Words	Operating system, Networks, Distributed system, Distributed operating system		
Purpose and Role of the Course	<p>A distributed system, which is based on distributed computing and network technology, is connected by using multi-processors. Distributed operating system is the operating system which is configured on distributed computer systems, it is the basis for a distributed system, but also as the interface between the bare computer with the user</p> <p>The purpose of this course is to enable students to understand and master the basic concepts of distributed systems and distributed operating systems, basic principles, algorithms and implementation techniques.</p>		
Main Chapters and Teaching Hours	<p>1 Introduction to Distributed Systems (3hrs) 2 Communication in Distributed Systems (9hrs) 3 Synchronization in Distributed Systems (9hrs) 4 Processes and Processors in Distributed Systems (9hrs) 5 Distributed File Systems (9hrs) 6 Distributed Shared Memory (9hrs)</p>		
Teach Method	<p>The teacher will give lectures on chapter 1 through chapter 6 during the formal class hours. The case study is arranged for the student's independent study which requires their reading reports from the independent study.</p>		
Test and Examination	<p>Students reading reports and class discussions will be considered as their final exam results.</p>		
Pre-request Course	<p>Data Structures, Computer Architectures, Operating Systems</p>		
References	<p>1. Distributed operating systems, Andrew S. Tanenbaum, Prentice Hall,1995 2. Distributed Operating Systems: Concepts and Practice, Doreen L. Galli, Prentice Hall,2000 3. Distributed Systems: Concepts and Design (Fourth Edition), George Coulouris, 机械工业出版社, 2006</p>		

Course Introduction

Code	063313	Teaching Hours	48
Course	Computer Networks Lab		
Key Words	Computer Network, Protocol, Lab		
Purpose and Role of the Course	In this course, the experiments of computer networks are designed to help students to understand the principle of computer networks and to enhance their application capability about the computer networks.		
Main Chapters and Teaching Hours	Lab 1. Introduction (6 hours) Lab 2. Data Link Layer Protocol (6 hours) Lab 3. Network Layer Protocol (8 hours) Lab 4. Transport Layer Protocol (4 hours) Lab 5. Application Layer Protocol (4hours) Lab 6. analysis and application of routing information protocol (6 hours) Lab 7. analysis and application of open shortest path first protocol (8 hours) Lab 8. Comprehensive experiment (6 hours)		
Teach Method	The course is given in the form of class lectures and experiments in the computer network Lab.		
Test and Examination	1.Lab Session & Lab reports(30%) 2. Final exam(70%)		
Pre-request Course	Computer Networks		
References	[1] Andrew S. Tanenbaum, Computer Networks, Fourth Edition, Prentice Hall,2004 [2]James F. Kurose, Keith W. Ross, Computer Networking A Top-Down Approach Featuring the Internet, Fourth Edition, Addison-Wesley, 2006		

Course Introduction

Code	063314	Teaching Hours	48
Course	Operating System		
Key Words	Operating system, Distributed operating system, Computer Resource Management, Concurrent Programming, Unix/Linux Operating system, Windows Operating System		
Purpose and Role of the Course	<p>As distributed computer systems become more pervasive, there is a need for a course that teaches how their operating systems are designed and implemented. To fulfill that need this course establishes the foundation on operating system. In this course, the design principles on operating system will be introduced to lay the foundation for distributed operating system.</p> <p>This course is the prerequisite course of Distributed Operating Systems.</p>		
Main Chapters and Teaching Hours	<p>1 Introduction (3hrs) 2 Operating-system structures (3hrs) 3 Process Management (3hrs) 4 Threads (3hrs) 5 CPU Scheduling (3hrs) 6 Process synchronization (3hrs) 7 Deadlocks (3hrs) 8 Main Memory (6hrs) 9 Virtual Memory (6hrs) 10 File-system interface (3hrs) 11 File-system implementation (3hrs) 12 Mass-storage structure (3hrs) 13 I/O Systems (6hrs)</p>		
Teach Method	<p>The teacher will give lectures on chapter 1 through chapter 13 during the formal class hours. The case study is arranged for the student's independent study which requires their reading reports and presentations for the independent study.</p>		
Test and Examination	<p>Final exams will cover 60% of the total scores. Students reading reports and class discussions will be considered as 40% of the total scores.</p>		
Pre-request Course	Data Structures, Computer Architectures		
References	<p>[1] "Operating System Concepts with JAVA" (Seventh Edition) Abraham Silberschatz 等, John Wiley & Sons, Inc.,2005 [2] "Operating Systems: Design and Implementation" (Second Edition) A. S. Tanenbaum, A. S. Woodhull, Prentice Hall, 1997.9 [3] "Modern Operating Systems" (Second Edition), Andrew S. Tanenbaum, 机械工业出版社 2002 [4] "Operating Systems : Concurrent and Distributed Software Design", Jean Bacon and Tim Harris, 电子工业出版社, 2003,</p>		

Course Introduction

Code	063315	Teaching Hours	16
Course	Scientific Thesis Writing		
Key Words	Paper structure, method description, syntax analysis etc.		
Purpose and Role of the Course	This course aims to introduce the writing process as well as present the fundamentals of effective scientific paper writing. Instructions focus primarily on the methodology of writing and publishing scientific manuscripts but thesis writing will also be addressed. The course will be presented in two segments: i.e. the first part teaches students how to write effectively, concisely, and clearly and the second part takes them through the preparation of an actual scientific manuscript.		
Main Chapters and Teaching Hours	Course introduction (2 credit hours) Writing basics (4 credit hours) Title and abstract (2 credit hours) Introduction (2 credit hours) Methodology (2 credit hours) Analysis and discussion on experimental results, Conclusion and References (2 credit hours) Presentation (2 credit hours)		
Teach Method	Fundamental knowledge of scientific papers and important instructions on the writing style will be presented. Meanwhile, these critical concepts will also be illustrated by the example of well written papers. Furthermore, the students will practice on their own drafted manuscripts step by step from the beginning (title) to the end (reference), which is desired to help the students improve their understanding to the course content as well as the ability of utilization in practice.		
Test and Examination	Instead of examination, this course requires a final writing project. At the beginning of the course, each student will prepare a drafted paper which can be either an unfinished manuscript that is made by himself/herself or an imperfect version of a published one obtained from the authors elsewhere. Students will improve the drafted paper according to the instructions given in the courses, and finally make it as a ready version for possible submission. The test score will be given depending on the improvement achieved by comparing of the two versions and analyzing their differences.		
Pre-request Course	None		
References	How to Write & Publish a Scientific Paper: 5th Edition, Robert A. Day, Oryx Press.		

Course Catalogue for International Postgraduates

(School of Mechanical Engineering and Automation)

编号 No.	英文课程名称 Course Title	中文课程名称 Course Title	学时 Hours	学分 Credits	开课季节 Semester	任课教师 Lecturer
073102	Advanced Manufacturing Technology & Systems	先进制造技术与系统	32	2	Fall	Lihong Qiao
073107	The foundation of applied programming design	应用程序设计基础	34	2	Fall	GUO lianshui
073108	Principle of machining and machined surface integrity	切削加工原理及表面完整性	32	2	Fall	CHEN Wuyi
073118	CAD/CAM Technology	CAD/CAM 技术	32	2	Spring	MEI Zhongyi
073106	Modeling and Control of Dynamic Systems	建模与动态系统的控制	36	2	Fall	LIU Qiang
073127	Theory of Elasticity	弹性力学	48	3	Fall	Li Xiaoxing
073128	The Finite Element Method	有限元	48	3	Fall	ZHANG Yidu
073129	Modal Analysis: Theory and Practice	模态分析：理论与实践	48	3	Spring	ZHANG Yidu
073126	Mechanical Vibration	机械振动学	32	2	Spring	ZHANG Yidu
073141	Laser Processing	激光加工技术	32	2	Spring	Zhao Haiyun
073123	Robotics	机器人学	32	2	Spring	LIU Rong
073111	Elasticity and Plasticity	弹塑性力学	32	2	Fall	Li Xiaoxing
073132	Sheet Metal Forming Technology	板料成形技术	32	2	Fall	Li Xiaoxing
073115	Basis of Software Technique	软件技术基础	32	2	Fall	Yuan Peijiang
073104	Intelligent Optimization Computing	智能优化计算及其应用	32	2	Fall	QIAO Lihong
073157	Academic writing & Presentation	科技论文写作与学术交流	16	1	Spring	Guan Yingchun
073103	Geometrical Product Specification for Digital Manufacturing	数字化制造的产品几何定义规范	32	2	Fall	QIAO Lihong
073109	Modern Product Design Methodology	现代产品设计方法学	32	2	Fall	Wang Dangxiao
073125	Advanced Principle of Mechanics	高等机械原理	32	2	Fall	Guo Weidong
073130	Aircraft Digital Manufacturing Engineering	飞机数字化制造工程	32	2	Spring	Mei Zhongyi
073137	Pneumatic Hydraul servo System	气液压伺服系统	32	2	Spring	Ma Jungong

073140	Principle of Computed Tomography	计算机断层层析 成像原理	32	2	Spring	Fu Jian
073153	Sheet Forming Comprehensive Experiment	板料成形综合实 验	16	1	Spring	Wu Xiangdong
073154	Experiments on Computer Graphics	计算机图形学实 验	16	1	Fall	Chen Shaoqiang
073155	Basis of Software Technique (lab)	软件技术基础实 验	16	1	Fall	Yuan Peijiang

Course Introduction

Code	073102	Teaching Hours	32
Course	Advanced Manufacturing Technology and Systems		
Key Words	digital manufacturing; technologies and systems; design and manufacturing		
Brief Description of the Course	This is a project-based course. A comprehensive study of modern digital manufacturing technologies and systems. Topics include contemporary manufacturing concepts and systems, information modeling, manufacturing simulation, model based product definition, manufacturing process planning, and manufacturing execution systems.		
Main Chapters and Teaching Hours	Contemporary manufacturing concepts and systems 6H Information modeling 6H Model based definition 4H Manufacturing process planning 6H Manufacturing systems and simulation 10H		
Teach Method	Research-based learning: reading, discussion, and project.		
Test and Examination	Grading is based on assignments: 4 PPT submissions and 1 project-based assignment (with PPT illustration). Each PPT: 15% Project: 40%		
Pre-request Course	Knowledge of basic mechanical design, manufacturing technology and digital technology		
References	[1]ad Abouel Nasr and Ali K. Kamrani, Computer-Based Design and Manufacturing, Springer, 2007. [2]George Chryssolouris, Manufacturing Systems: Theory and Practice, Springer, 2006		

Course Introduction

Code	073107	Teaching Hours	34
Course	The foundation of applied programming design		
Key Words	program design technology; Iterative Refinement; data base		
Purpose and Role of the Course	<p>This course focuses on the program design technology and process, it exposes students to two fundamentally new ideas. First, it presents program design guidelines that show the students how to analyze a problem statement; Second, the course introduce the data structure, data base application and its interface to applied program. Program techniques and exercises are included.</p> <p>Introduce the topics of the method of applied programs design, an introduction to programming and computing. The emphasis is on program structure and data structure, data base application method and its interface to applied program.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction: Applied program design <ol style="list-style-type: none"> 1.1 Processing Simple Forms of Data 1.2 Numbers, Expressions, Simple Programs 1.3 Programs are Function Plus Variable Definitions 2. Data Structure <ol style="list-style-type: none"> 2.1 Variable Definitions 2.2 Conditional Expressions and Functions 2.3 Compound Data, Part 1: Structures 2.4 Structure Definitions 3. Development through Iterative Refinement <ol style="list-style-type: none"> 3.1 Data Analysis 3.2 Defining Data Classes and Refining Data Classes 3.3 Refining Functions and Programs 4. Data base <ol style="list-style-type: none"> 4.1 Concept of data base 4.2 Design of data base 4.3 Interface to applied program 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 40% 2. Final exam (open book) 60% 		
Pre-request Course	Knowledge of basic advanced program language, object-oriented method and data base technology		
References	<p>[1] Matthias Felleisen , Robert Bruce Findler, Matthew Flatt, Shriram Krishnamurthi , How to Design Programs: An Introduction to Programming and Computing, The MIT Press , Cambridge, Massachusetts, London, England,2002</p> <p>[2] Brian W. Kernighan / Dennis M. Ritchie, The C Programming Language (2nd Edition), Prentice Hall, 1989-03-01</p>		

Course Introduction

Code	073108	Teaching Hours	32
Course	Principle of machining and machined surface integrity		
Key Words	Machining; Surface Integrity; Lubricating effects		
Purpose and Role of the Course	<p>This is an elective course for the graduate students in the area of mechanical engineering and will provide the students with intensive understanding of metal cutting process and the machined surface quality..</p> <p>The course is designed for the students working on machining research to have an intensive understanding of the machining process, the formation of the machined surface and the surface integrity. The knowledge will also be important for the students in the area of CAM, CAPP, CNC and quality engineering.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction <ul style="list-style-type: none"> • 1.1 Definition and Classification of Machining • 1.2 The Importance of the Machining • 1.3 The Development of the Machining Technology • 1.4 Surface Integrity • 1.5 Arrangement of the Course 2. Cutting process <ul style="list-style-type: none"> • 2.1 Deformation in machining • 2.2 The chip/tool interface • 2.3 Material movement at condition of seizure • 2.4 Flow zone and built-up-edge • 2.5 Cutting with blunt tools 3. Cutting force and cutting temperature <ul style="list-style-type: none"> • 3.1 Forces and Stresses in Cutting • 3.2 Shear Angle Equations • 3.3 Plowing Force and "Size Effect" • 3.4 Measurement of cutting forces • 3.5 Heat Generation and Dissipation • 3.6 Temperature Field • 3.7 Temperature Measurement • 3.8 Temperature variation with cutting conditions • 3.9 The problems remain to be solved in force and temperature research 4. Mechanisms and processes of tool wear <ul style="list-style-type: none"> • 4.1 Tool Wear Mechanisms • 4.2 Wear Process and Pattern • 4.3 Tool Wear Experiments 5. Coolant and lubricant in cutting <ul style="list-style-type: none"> • 5.1 Cooling effects • 5.2 Lubricating effects • 5.3 Latest development to reduce cutting fluids pollution 6. Formation of the machined surface and surface alteration 		

	<ul style="list-style-type: none"> • 6.1 Force induced alteration • 6.2 Thermal stress induced alteration • 6.3 Recrystallizing, phase change and recasting • 6.4 Influence of surface alteration on the workpiece performance <p>7. Surface texture and micro-defects</p> <ul style="list-style-type: none"> • 7.1 Classification of Surface Texture • 7.2 The Indices of the Surface Roughness • 7.3 The Factors Influencing Surface Texture • 7.4 Micro-defects <p>8. Physical changes of the machined surface</p> <ul style="list-style-type: none"> • 8.1 Generation of Residual Stress • 8.2 The Factors Influencing Residual Stress • 8.3 The Measurement of Residual Stresses • 8.4 Technique to Improve Stress Distribution • 8.5 Surface Hardness Change • 8.6 The Factors to Influence Surface Hardness <p>9. Machinability of engineering materials</p> <ul style="list-style-type: none"> • 9.1 Introduction to machinability • 9.2 Machinability of steel • 9.3 Machinability of carbon fiber reinforced plastic (CFRP) • 9.4 Evaluation of machinability <p>10. Individual project to write a report. Sample topics are:</p> <ul style="list-style-type: none"> • 10.1 Machinability of aerospace materials • 10.2 Selection of tool materials and tool structure • 10.3 Optimization of machining condition • 10.4 Study of machining process (theoretical study, simulation software, border condition, experimental verification equipment, results)
Teach Method	Combination of classroom teaching, discussion, report writing.
Test and Examination	1. Report 30% 2. Final exam (open book) 70%
Pre-request Course	Knowledge of mechanics of materials, metal cutting principle in undergraduate leve
References	1. E. M. Trent, Metal Cutting, (3rd edition), Butterworth-Heinemann Ltd. 1991 2. B. Mills, A. H. Redford, Machinability of Engineering Materials, Applied Science Publisher, 1983.

Course Introduction

Code	073115	Teaching Hours	32
Course	Basis of Software Technique		
Key Words	data structure; linear list; stack and queue; binary tree;		
Purpose and Role of the Course	<p>It is the major core course for students to learn programming languages, procedural methods, and database system.</p> <p>The purpose of the course is to enable students to learn basic methods and procedures. The course focuses on training students' ability to use software technology to solve problems, and how to apply the theory and methods of software to solve actual problems.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction (2 hours) <ol style="list-style-type: none"> 1.1 Introduce the development and application of data structure course 1.2 The characteristics, learning objective and running environment of the course 1.3 Simple programming method 1.4 A brief introduction of data structure, storage structure, algorithm and its description 2. Linear list (6 hours) <ol style="list-style-type: none"> 2.1 Fundamental concepts 2.2 Storage structure 2.3 Basic operation of the linear list 2.4 Case study 3. The stack (4 hours) <ol style="list-style-type: none"> 3.1 Definition of stack 3.2 Basic operations of stack in detail 3.3 Application of the stack 4. The queue (4 hours) <ol style="list-style-type: none"> 4.1 Concept of the queue 4.2 Operations of a queue 4.3 Case study, program and algorithm 5. Tree and binary tree (4 hours) <ol style="list-style-type: none"> 5.1 Basic principles and properties of tree 5.2 The practical application of using tree and binary tree 5.3 Algorithm and application examples 6. The graph (4 hours) <ol style="list-style-type: none"> 6.1 The traversal of the graph 6.2 Storage method of graph 6.3 Shortest path problem and algorithm 7. Sorting method (4 hours) <ol style="list-style-type: none"> 7.1 Insertion sort, selection sort, bubble sort method 7.2 Sort algorithm 7.3 Several examples 8. Order file and index file (2 hours) <ol style="list-style-type: none"> 8.1 Concepts of file 8.2 Searching method 9. Summary and Review (2 hours) 		

Teach Method	All the contents will be taught in class, together with some case discussion. And the students are expected to complete the pre-reading contents and assignments after class. Finally, a course report is requested.
Test and Examination	Attendance 10%; Course report 40%, Final Examination 50%
Pre-request Course	<ul style="list-style-type: none"> ■ Knowledge of basic C programming language ■ Basic operations on Visual C++
References	<ul style="list-style-type: none"> ■ Reference books and reading materials: <ul style="list-style-type: none"> ✓ Clifford A. Shaffer. Data Structures and Algorithm Analysis in C++ (3rd edit.). 2013

Course Introduction

Code	073118	Teaching Hours	32
Course	CAD/CAM Technology		
Key Words	CAD/CAM; Curve and Surface; Modeling		
Brief Description of the Course	CAD/CAM technology is the basic course of CAD/CAM research direction. This course focuses on presenting a balanced mix on the theory and practice of the CAD/CAM concepts. The main object of the course is to learn the concept, method and application of CAD/CAM technology.		
Main Chapters and Teaching Hours	<p>Theory introduction:</p> <p>(1) CAD/CAM Introduction (1 hour)</p> <p>(2) Development of the Geometric Modeling System (2 hours)</p> <p>(3) Geometric Transformation (1 hour)</p> <p>(4) Parametric Representation of Curves (2 hours)</p> <p>(5) Surface Modeling (2 hours)</p> <p>(6) Engineering Drawings (2 hours)</p> <p>(7) Assembly Modeling (1 hours)</p> <p>(8) Finite Element Method (2 hours)</p> <p>(9) Data Exchange Standard (1 hours)</p> <p>(10) Computer Aided Manufacture (2 hours)</p> <p>Practice (in CATIA):</p> <p>(1) Part Design (3 hours)</p> <p>(2) Assembly Design (2 hours)</p> <p>(3) Drafting (2D Drawing) (2 hours)</p> <p>(4) Surface Design (2 hours)</p> <p>(5) Machining (CAM) (3 hours)</p> <p>(6) Finite Element Method (Structural Analysis) (2 hours)</p> <p>(7) Digital Mockup (DMU Kinematics) (2 hours)</p>		
Teach Method	Teaching methods will be presented mainly by teacher's introduction and learned by student themselves. Practices on CATIA will be needed.		
Test and Examination	Homework after class and final report		
Pre-request Course	Knowledge on basic matrix analysis and computer graphics.		
References	[1] Principles of CAD/CAM/CAE systems, 电子工业出版社, 2006		

Course Introduction

Code	073106	Teaching Hours	36
Course	Modeling and Control of Dynamic Systems		
Key Words	Modeling; Frequency analysis; Compensation		
Purpose and Role of the Course	<p>Modeling approaches, Time domain response, Frequency analysis and Compensation</p> <p>The course is a selective curriculum course. The course is designed for the graduate students to understand the modeling approaches, time domain response, frequency analysis and compensation of mechatronical dynamic systems such that they obtain the capability of modeling, analysis and design of control systems. The emphasis is on analytical modeling approaches, dynamic performance analysis and general control system design .</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Introduction to Dynamic Systems</p> <p style="padding-left: 20px;">1.1 Concepts of Modeling and control of Dynamic Systems 1.2 Objective and contents of the course</p> <p>Chapter 2 Mathematical Models of Systems</p> <p style="padding-left: 20px;">2.1 Introduction 2.2 Differential Equations of Physical Systems 2.3 Linear Approximations of Physical Systems 2.4 The Laplace Transform 2.5 The Transfer Function of Linear Systems 2.6 Block Diagram Models 2.7 Signal-Flow Graph Models 2.8 Computer Analysis of Control Systems 2.9 Design Examples 2.10 The Simulation of Systems Using Matlab 2.11 Sequential Design Example: Disk Drive Read System</p> <p>Chapter 3 Response of Dynamic Systems In Time Domain</p> <p style="padding-left: 20px;">3.1 Test Input Signal 3.2 Performance of a Second-Order System 3.3 Effects of a Third Pole and a Zero on the Second-Order System Response 3.4 The s-plane Root Location and the Transient Response 3.5 The Steady State Error 3.6 Performance Indices 3.7 The Concept of Stability</p>		

	<p>3.8 The Routh-Hurwitz Stability Criterion 3.9 The Relative Stability of Feedback Systems</p> <p>Chapter 4 Frequency Response of Dynamic Systems</p> <p>4.1 Frequency Response Plots 4.2 An Example of Drawing the Bode Diagram 4.3 Frequency Response Measurements 4.4 Performance Specification in the Frequency Domain 4.5 Log Magnitude and Phase Diagrams 4.6 The Nyquist Criterion 4.7 Relative Stability and the Nyquist Criterion 4.8 Time Domain Performance Criterion Specification in the Frequency Domain 4.9 System Bandwidth 4.10 PID Controllers in Frequency Domain</p> <p>Chapter 5 The Design of Control Systems</p> <p>5.1 Sequential Design Example: Disk Drive Read System 5.2 Motor Speed Control 5.3 Position Control</p>
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	1. Homework 40% 2. Final exam (open book) 60%
Pre-request Course	Knowledge of university mathematics, physics and dynamics
References	<p>[1] John Dorsey, Continuous and Discrete Control Systems—Modeling, Identification, Design, and Implementation, (Reprinted in China)</p> <p>[2] Gene F. Franklin etc., Digital Control of Dynamic Systems 动态系统的数字控制 (Third Edition), (Reprinted in China)清华大学出版社, 2001.</p> <p>[3] Eronini Umez-Eronini, System Dynamics and Control, PWS Publishing, 1999</p> <p>[4] Richatd C. Dorf, Robert H. Bishop. Modern Control System(Eighth Edition), (Reprinted in China), 高等教育出版社, 2001</p>

Course Introduction

Code	073127	Teaching Hours	48																																																																																							
Course	Theory of Elasticity																																																																																									
Key Words	Plane Problem; Elasticity; Saint-Venant's principle																																																																																									
Purpose and Role of the Course	<p>Theory of Elasticity is a branch of solid mechanics. Its basic task is to study displacement, deformation and stress distribution inside elastic body caused by action of external force or by change of temperature. It is fundament of the analysis of strength; rigidity and stability of engineering structure, but the analysis is not directly executed in this course. This course will provide a training to resolve engineering problems.</p> <p>Theory of Elasticity is a special foundation course of mechanical engineering field. The objective of this course is the training for students to master the systematic concepts and calculation methods about elasticity problems. It will benefit the research of the theory as well as practical engineering designs.</p>																																																																																									
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">Chapter 1</td> <td style="width: 80%;">Introduction</td> <td style="width: 10%; text-align: right;">(1 hrs.)</td> </tr> <tr> <td> 1.1</td> <td>Elasticity</td> <td></td> </tr> <tr> <td> 1.2</td> <td>Basic Hypothesis</td> <td></td> </tr> <tr> <td> 1.3</td> <td>Components of Stress</td> <td></td> </tr> <tr> <td> 1.4</td> <td>Components of Strain</td> <td></td> </tr> <tr> <td>Chapter 2</td> <td>Theory of Plane Problem</td> <td style="text-align: right;">(7 hrs.)</td> </tr> <tr> <td> 2.1</td> <td>Plane Stress and Plane Strain</td> <td></td> </tr> <tr> <td> 2.2</td> <td>Differential Equations of Equilibrium</td> <td></td> </tr> <tr> <td> 2.3</td> <td>Geometric Equations</td> <td></td> </tr> <tr> <td> 2.4</td> <td>physical Equations - Hook's Law</td> <td></td> </tr> <tr> <td> 2.5</td> <td>Boundary Conditions and Saint-Venant's principle</td> <td></td> </tr> <tr> <td> 2.6</td> <td>Displacement Method</td> <td></td> </tr> <tr> <td> 2.7</td> <td>Stress Method and Compatibility Equations</td> <td></td> </tr> <tr> <td> 2.8</td> <td>Stress Function. Inverse and Semi-Inverse Method</td> <td></td> </tr> <tr> <td>Chapter 3</td> <td>Plane Problems in Rectangular Coordinates</td> <td style="text-align: right;">(8 hrs.)</td> </tr> <tr> <td> 3.1</td> <td>Solution by Polynomials</td> <td></td> </tr> <tr> <td> 3.2</td> <td>Pure Bending of a beam</td> <td></td> </tr> <tr> <td> 3.3</td> <td>Bending of a Cantilever Beam Loaded at the End</td> <td></td> </tr> <tr> <td> 3.4</td> <td>Bending of a Beam by Uniform Load</td> <td></td> </tr> <tr> <td> 3.5</td> <td>Wedge under Gravity and Hydrostatic Pressure</td> <td></td> </tr> <tr> <td> 3.6</td> <td>Solution by Series</td> <td></td> </tr> <tr> <td>Chapter 4</td> <td>Plane Problems in Polar Coordinates</td> <td style="text-align: right;">(8 hrs.)</td> </tr> <tr> <td> 4.1</td> <td>General Equations in Polar Coordinates</td> <td></td> </tr> <tr> <td> 4.2</td> <td>Stress Distribution Symmetrical about an Axis and Displacements</td> <td></td> </tr> <tr> <td> 4.3</td> <td>Strain Components in Polar Coordinates</td> <td></td> </tr> <tr> <td> 4.4</td> <td>Uniform Pressure Acting on a Cylinder</td> <td></td> </tr> <tr> <td> 4.5</td> <td>Plate with a Small Hole, Stress Concentration</td> <td></td> </tr> <tr> <td> 4.6</td> <td>Wedge Loaded at the vertex or along the faces</td> <td></td> </tr> <tr> <td> 4.7</td> <td>Semi-Infinite Plate</td> <td></td> </tr> </table>			Chapter 1	Introduction	(1 hrs.)	1.1	Elasticity		1.2	Basic Hypothesis		1.3	Components of Stress		1.4	Components of Strain		Chapter 2	Theory of Plane Problem	(7 hrs.)	2.1	Plane Stress and Plane Strain		2.2	Differential Equations of Equilibrium		2.3	Geometric Equations		2.4	physical Equations - Hook's Law		2.5	Boundary Conditions and Saint-Venant's principle		2.6	Displacement Method		2.7	Stress Method and Compatibility Equations		2.8	Stress Function. Inverse and Semi-Inverse Method		Chapter 3	Plane Problems in Rectangular Coordinates	(8 hrs.)	3.1	Solution by Polynomials		3.2	Pure Bending of a beam		3.3	Bending of a Cantilever Beam Loaded at the End		3.4	Bending of a Beam by Uniform Load		3.5	Wedge under Gravity and Hydrostatic Pressure		3.6	Solution by Series		Chapter 4	Plane Problems in Polar Coordinates	(8 hrs.)	4.1	General Equations in Polar Coordinates		4.2	Stress Distribution Symmetrical about an Axis and Displacements		4.3	Strain Components in Polar Coordinates		4.4	Uniform Pressure Acting on a Cylinder		4.5	Plate with a Small Hole, Stress Concentration		4.6	Wedge Loaded at the vertex or along the faces		4.7	Semi-Infinite Plate	
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	<p>Chapter 5 Finite-difference Method (4 hrs.)</p> <p>5.1 Derivation of Finite-difference Equations</p> <p>5.2 Methods of Successive Approximation</p> <p>5.3 Relaxation Method</p> <p>5.4 Triangular and Hexagonal Nets</p> <p>5.5 Block and Group Relaxation</p> <p>5.6 Points Near the Boundary</p> <p>Chapter 6 Elementary Problems in Three-dimensions (10 hrs.)</p> <p>6.1 Introduction</p> <p>6.2 Principal Stress</p> <p>6.3 Stress at a Point</p> <p>6.4 Maximum Stress</p> <p>6.5 Strain at a Point</p> <p>6.6 Uniform Stress</p> <p>6.7 Stretching of a Prismatic Bar by a Its Own Weight</p> <p>6.8 Twist of Circular Shafts of Constant Cross Section</p> <p>6.9 Pure Bending of Prismatic Bars</p> <p>6.10 Pure Bending of Plates</p> <p>Chapter 7 Torsion and Bending of Bars (6 hrs.)</p> <p>7.1 Torsion of Straight Bars</p> <p>7.2 Torsion of Elliptic Cross Section Bars</p> <p>7.3 Membrane Analogy</p> <p>7.4 Torsion of Rectangular Bars</p> <p>7.5 Additional Results</p> <p>7.6 Bending of Straight Bars</p> <p>7.7 Bending of Elliptic Cross Section Bars</p> <p>7.8 Bending of Rectangular Bars</p> <p>Chapter 8 Propagation of Waves in Elastic Solid Media (4 hrs.)</p> <p>8.1 Introduction</p> <p>8.2 Waves of Dilatation and Waves of Distortion in Isotropic Elastic Media</p> <p>8.3 Plan Waves</p> <p>8.4 Rayleigh Surface Waves</p> <p>8.5 Spherically Symmetric Waves in the Infinite Medium</p>				
Teach Method	Combination of lecture, discussion and self-study. Enlightening and summary explaining to emphasize on the difficult and key points. Numbers of exercises for training of capacity to analyze and resolve difficulties as well as to consolidate basic concepts				
Test and Examination	<table> <tr> <td>1. Exercises and representation of class</td> <td>30%</td> </tr> <tr> <td>2. Final exam</td> <td>70%</td> </tr> </table>	1. Exercises and representation of class	30%	2. Final exam	70%
1. Exercises and representation of class	30%				
2. Final exam	70%				
Pre-request Course	Mechanics of materials.				

References	<p>[1] L.D. Landau, E.M, translated from the Russian by J.B. Sykes and W.H. R. Lifshitz. Theory of elasticity, Butterworth Heinemann, 1999</p> <p>[2] 陆明万, 罗学富. 弹性理论基础. 清华大学出版社, 2001</p> <p>[3] 徐秉业, 王建学. 弹性力学. 清华大学出版社, 2007</p> <p>[4] S Timoshenko, J N Goodier. Theory of Elasticity. (Third Edition). 清华大学出版社, 2004</p>
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Course Introduction

Code	073128	Teaching Hours	48
Course	The Finite Element Method		
Key Words	1. The Finite Element Method; Interpolation Models; Isoparametric Elements		
Purpose and Role of the Course	<p>The finite element method is a numerical method which can be used for the accurate solution of complex engineering problems and it has been so well established that today it is considered to be one of the best methods for solving a wide variety of practical problems efficiently.</p> <p>The objective of this course is to introduce the various aspects of finite element method as applied to engineering problems in a systematic manner. After finishing the course a student will not only be able to understand the current literature of the finite element method but also be in a position to develop short computer programs for the solution of engineering problems.</p>		
Main Chapters and Teaching Hours	<p>2. Overview of Finite Element Method</p> <p style="margin-left: 20px;">2.1 Basic Concept</p> <p style="margin-left: 20px;">2.2 Historical Background</p> <p style="margin-left: 20px;">2.3 General Applicability of the Method</p> <p style="margin-left: 20px;">2.4 Engineering Applications of the Finite Element Method</p> <p style="margin-left: 20px;">2.5 General Description of the Finite Element Method</p> <p style="margin-left: 20px;">2.6 Comparison of Finite Element Method with Other Methods of Analysis</p> <p style="margin-left: 20px;">2.7 Finite Element Program Packages</p> <p>3. Discretization of the Domain</p> <p style="margin-left: 20px;">3.1 Introduction</p> <p style="margin-left: 20px;">3.2 Basic Element Shapes</p> <p style="margin-left: 20px;">3.3 Discretization Process</p> <p style="margin-left: 20px;">3.4 Node Numbering Scheme</p> <p style="margin-left: 20px;">3.5 Automatic Mesh Generation</p> <p>4. Interpolation Models</p> <p style="margin-left: 20px;">4.1 Introduction</p> <p style="margin-left: 20px;">4.2 Polynomial Form Of Interpolation Functions</p> <p style="margin-left: 20px;">4.3 Simplex, Complex And Multiplex Elements</p> <p style="margin-left: 20px;">4.4 Interpolation Polynomial In Terms Of Nodal Degrees Of Freedom</p> <p style="margin-left: 20px;">4.5 Selection Of The Order Of The Interpolation Polynomial</p> <p style="margin-left: 20px;">4.6 Convergence Requirements</p> <p style="margin-left: 20px;">4.7 Linear Interpolation Polynomials in Terms of Global Coordinates</p> <p style="margin-left: 20px;">4.8 Interpolation Polynomials for Vector Quantifies</p> <p style="margin-left: 20px;">4.9 Linear Interpolation Polynomials in Terms of Local Coordinate</p> <p>5. Higher Order and Isoparametric Elements</p> <p style="margin-left: 20px;">4.1 Introduction</p> <p style="margin-left: 20px;">4.2 Higher Order One-Dimensional Elements</p> <p style="margin-left: 20px;">4.3 Higher Order Elements in Terms of Natural Coordinates</p> <p style="margin-left: 20px;">4.4 Higher Order Elements in Terms of Classical Interpolation Polynomials</p> <p style="margin-left: 20px;">4.5 One-Dimensional Elements using Classical Interpolation Polynomials</p>		

	<p>4.6 Two-Dimensional Elements using Classical Interpolation Polynomials</p> <p>4.7 Continuity Conditions</p> <p>4.8 Comparative Study of Elements</p> <p>4.9 Isoparametric Elements</p> <p>4.10 Numerical Integration</p> <p>5. Derivation of Element Matrices and Vectors</p> <p>5.1 Introduction</p> <p>5.2 Direct Approach</p> <p>5.3 Variational Approach</p> <p>5.4 Solution Of Equilibrium Problems Using Variational (Rayleigh-Ritz) Method</p> <p>5.5 Solution Of Eigen value Problems Using Variational (Rayleigh-Ritz) Method</p> <p>5.6 Solution Of Propagation Problems Using Variational (Rayleigh-Ritz) Method</p> <p>5.7 Equivalence Of Finite Element And Variational (Rayleigh-Ritz) Methods</p> <p>5.8 Derivation Of Finite Element Equations Using Variational (Rayleigh-Ritz) Approach</p> <p>5.9 Weighted Residual Approach</p> <p>5.10 Solution Of Eigen value Problems Using Weighted Residual Method</p> <p>5.11 Solution Of Propagation Problems Using Weighted Residual Method</p> <p>5.12 Derivation Of Finite Element Equations Using Weighted Residual (Galerkin) Approach</p> <p>5.13 Derivation Of Finite Element Equations Using Weighted Residual (Least Squares) Approach</p> <p>6. Assembly of Element Matrices and Vectors and Derivation of System Equations</p> <p>6.1 Coordinate Transformation</p> <p>6.2 Assemblage of Element Equations</p> <p>6.3 Computer Implementation of the Assembly Procedure</p> <p>6.4 Incorporation of Boundary Conditions</p> <p>6.5 Incorporation of Boundary Conditions in the Computer Program Problems</p> <p>7. Numerical Solution of Finite Element Equations</p> <p>7.1 Introduction</p> <p>7.2 Solution of Equilibrium Problems</p> <p>7.3 Solution of Eigenvalue Problems</p> <p>7.4 Solution of Propagation Problems</p> <p>7.5 Parallel Processing in Finite Element Analysis</p>
Teach Method	The course is given in the form of class lectures
Test and Examination	1. Homework 30% 2. Final exam (open book) 70%
Pre-request Course	Knowledge of basic matrix analysis, mechanics
References	[1] Taylor, Robert L. , The Finite Element Method, Oxford : Butterworth-Heinemann, 2000

Course Introduction

Code	073129	Teaching Hours	48
Course	Modal Analysis: Theory and Practice		
Key Words	Modal Analysis; Mathematical Models; Response Function Measurement Techniques		
Purpose and Role of the Course	<p>Theoretical basis (single-degree-of-freedom system theory, multi-degree-of-freedom system, damping), Response function measurement techniques, Modal parameter extraction methods, Derivation of mathematical models and Modal analysis applications.</p> <p>Efforts are made throughout to ensure that the students understand the physics of the various stages as well as the mathematics in the modal analysis and test.</p>		
Main Chapters and Teaching Hours	<p>Overview</p> <ul style="list-style-type: none"> 1.1 introduction to Modal Analysis and Testing 1.2 Applications of Modal Analysis and Testing 1.3 Philosophy of Modal Analysis and Testing 1.4 Summary of Theory 1.5 Summary of Measurement Methods 1.6 Summary of Modal Analysis Processes <p>2. Theoretical Basis</p> <ul style="list-style-type: none"> 2.1 Single-degree-of Freedom System Theory 2.2 Presentation and Properties of FRF Data for SDOF System 2.3 Undamped Multi-Degree-of Freedom Systems 2.4 MDOF Systems with Proportional Damping, Structural Damping and Viscous Damping 2.5 Modal Analysis of Rotating Structures 2.6 Complex Modes 2.7 Characteristics and Presentation of MDOF FRF DATA <p>3. Response Function Measurement Techniques</p> <ul style="list-style-type: none"> 3.1 Testing Planning 3.2 Basic Measurement System 3.3 Structure Preparation 3.4 Excitation of the Structure 3.5 Transducers and Amplifiers 3.6 Analyzers 3.7 Digital Signal Processing 3.8 Calibration 3.9 Mass Cancellation 3.10 Rotational FRF Measurement 3.11 Multi-point Excitation Methods <p>4. Modal Parameter Extraction Methods</p> <ul style="list-style-type: none"> 4.1 Preliminary Checks of FRF Data 4.2 SDOF Modal Analysis Methods 4.3 MDOF Modal Analysis in the Frequency Domain 4.4 Global Modal Analysis Methods in the Frequency Domain 		

	<p>4.5 MDOF Modal Analysis in the Time Domain</p> <p>4.6 Modal Analysis of Non-Linear Structures</p> <p>5. Derivation of Mathematical Models</p> <p>5.1 Modal Models</p> <p>5.2 Refinement of Modal Models</p> <p>5.3 Display of Modal Model</p> <p>5.4 Response Models</p> <p>5.5 Spatial Models</p> <p>5.6 Mobility Skeletons and System Models</p> <p>6. Applications</p> <p>6.1 Comparison of and Correlation of Experiment and Prediction</p> <p>6.2 Adjustment or Updating of Models</p> <p>6.3 Coupled and Modified Structure Analysis</p> <p>6.4 Response Prediction and Force Determination</p> <p>6.5 Test Planning</p>
Teach Method	The course is given in the form of class lectures
Test and Examination	<p>1. Homework 30%</p> <p>2. Final exam (open book) 70%</p>
Pre-request Course	Knowledge of basic matrix analysis, Fourier transforms, Digital signal processing, mechanics
References	[1] D.J. Ewins , Modal Testing :Theory , Practice and Application, New York: Research Studies Press, 3rd Ed, 2000

Course Introduction

Code	073126	Teaching Hours	32
Course	Mechanical Vibration		
Key Words	Natural Frequency; Mode Shape; System Response		
Brief Description of the Course	The course objectives are to develop an understanding of typical vibration concepts and phenomenon, to develop means to control vibrations, to formulate industrial dynamic problems in terms of vibration models, to recognize standard vibration response to excitation and to illustrate vibration solutions to practical vibration problems		
Main Chapters and Teaching Hours	Chapter 1	Fundamentals of Vibration	2h
	Chapter 2	Vibration of Single-Degree of Freedom(SDOF) System	6h
	Chapter 3	Transient Vibration	4h
	Chapter 4	Vibration of Two-Degree of Freedom(2DOF) System	8h
	Chapter 5	Vibration of Multiple-Degree of Freedom(MDOF) System	4h
	Chapter 6	Elastic System Vibration	8h
Teach Method	Lecture in English, Reference Reading, Discussion and Experiment		
Test and Examination	Course Score= Final Report (80%) + Homeworks (20%)		
Pre-request Course	Knowledge of basic matrix analysis, mechanics		
References	[1] D. E. Newland, Mechanical Vibration Analysis and Computation, Dover Publications, 2005		

Course Introduction

Code	073141	Teaching Hours	32
Course	Laser Processing		
Key Words	Laser, Material, Material Processing		
Brief Description of the Course	<p>Light amplification by stimulated emission of radiation (laser) is a coherent and monochromatic source of electromagnetic radiation. As a result, laser finds diverse applications ranging from mere mundane to most sophisticated uses either for totally commercial or purely scientific purposes, and from life saving to life threatening causes. High power lasers can produce intense heating and perform various manufacturing operations or material processing. The present contribution provides an overview of the application of high power laser only for material processing in engineering applications. The manufacturing processes covered have been broadly divided into four major categories, namely, laser assisted forming, joining, machining and surface engineering. Besides discussing the scope and principle of these processes, each section enumerates a detailed update of literature, scientific issues and technological innovations.</p>		
Main Chapters and Teaching Hours	<p>0 Introduction (2Hrs) 1 Physics: Generation of Laser (4Hrs) 2 Facility: High Power Laser and Laser Processing System (4Hrs) 3 Metallurgy: Laser-matter Interaction in Material Processing (4Hrs) 4 Applications: 4.1 Laser Forming (4Hrs) 4.2 Laser Joining (4Hrs) 4.3 Laser Machining (2Hrs) 4.4 Laser Surface Engineering 4.5 Other Laser Material Processing methods (2Hrs) 5 Laser Safety (2Hrs) 6 Professional Visit (2Hrs)</p>		
Teach Method	class lecture (50%) + reference reading (35%) + group discussing (15%)		
Test and Examination	Open book exam		
Pre-request Course	Physics Heat Treatment of Material		
References	<p>[1] William M. Steen, Jyotirmoy, Mazumder, Laser Material Processing, Spring-Verlag, London, 4th Edition, 2010 [2] D.DuttaMajumdar, I. Manna, Lser Material Processing, Institute of Materials, Mineral and Mining and ASM International, Maney for the Institute and ASM Internaitonal, 2011</p>		

Course Introduction

Code	073123	Teaching Hours	32
Course	Robotics		
Key Words	Robot Mechanism; RobotKinematics; RobotDynamics		
Brief Description of the Course	<p>It is the major core course for students in the discipline of robotics or mechatronics, with the focus on introducing how to apply the fundamental theory and methods of robotics to model and control a robot. The goal of the course is to provide the prospective students a relatively thorough understanding of fundamental knowledge of robotics, including the history and current situation of robot, robot mechanism, spatial descriptions and transformations, kinematics modelling, inverse kinematics, dynamics modelling, and trajectory planning.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction (5 hours) <ol style="list-style-type: none"> 1.1 Definition of Robot 1.2 History 1.3 Research Topics of Robotics 1.4 Presentations and discussions 2. Robot Mechanism (5 hours) <ol style="list-style-type: none"> 2.1 Abstract 2.2 Mechanism of locomotive robot 2.3 Mechanism of robot manipulator 2.4 Schematic Diagram of Robot Mechanism 2.5 Presentations and discussions 3. Spatial Descriptions and Transformations (6 hours) <ol style="list-style-type: none"> 3.1 Mathematical Descriptions of Positions, Orientations and Frames 3.2 Coordinates Transformations 3.3 Homogeneous coordinates and homogeneous transformation 4. Kinematics Modelling (4 hours) <ol style="list-style-type: none"> 4.1 Definition of Kinematics 4.2 Forward Kinematics Equations 4.3 Denavit - Hartenberg (D-H) Method 4.4 Cases Study 5. Inverse Kinematics (4 hours) <ol style="list-style-type: none"> 5.1 Introduction 5.2 Geometric Method 5.3 Algebraic Method 5.4 Existence of solutions 6. Dynamics Modelling (4 hours) <ol style="list-style-type: none"> 6.1 Definition of Dynamics 6.2 Lagrange Dynamic Modeling Method 6.3 Case of Dynamic Modeling 7. Trajectory Planning (4 hours) <ol style="list-style-type: none"> 7.1 Introduction 		

	<p>7.2 Joint Space Schemes</p> <p>7.3 Cartesian Space Schemes</p> <p>7.4 Case Study</p>
Teach Method	All the contents will be taught in class, together with some case discussions. And the students are expected to complete the pre-reading contents and assignments after class. Finally, a course report is requested.
Test and Examination	Attendance 20%+homework and course report 80%.
Pre-request Course	Knowledge of basic geometry, matrix analysis, control theory
References	[1] John. J. Craig, Introduction to Robotics, Pearson Prentice Hall, 3rd Ed, 2005

Course Introduction

Code	073111	Teaching Hours	32																				
Course	Elasticity and Plasticity																						
Key Words	Stress analysis; plastic limit; metal forming																						
Purpose and Role of the Course	<p>Theory of elasticity and plasticity is a branch of solid mechanics; it is also the foundation of the mechanical engineering as well as analysis of metal forming, the theory of elastoplastic stability, the elastoplastic finite element method and the numerical simulation of metal forming. In this course the relation between stress, strain and displacement of solid will be investigated when the load and the boundary conditions change. The goal of study is that the student may master the basic concept of elastoplastic mechanics and the calculation methods of typical instances through the study, and this course will provide a training to resolve engineering problems.</p> <p>This course train students to master the systematic concepts and calculation methods about elasticity problems. It will benefit the study of the mechanics theory as well as mechanical engineering designs.</p>																						
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">1. Introduction of tensor</td> <td style="width: 20%; text-align: right;">2 hours</td> </tr> <tr> <td>2. Stress analysis</td> <td style="text-align: right;">4 hours</td> </tr> <tr> <td>3. Strain analysis</td> <td style="text-align: right;">4 hours</td> </tr> <tr> <td>4. Relation of Stress-Strain</td> <td style="text-align: right;">4 hours</td> </tr> <tr> <td>5. Solution of elastoplastic problems</td> <td style="text-align: right;">6 hours</td> </tr> <tr> <td>6. Thick wall cylinder</td> <td style="text-align: right;">6 hours</td> </tr> <tr> <td>7. Torsion of bar</td> <td style="text-align: right;">4 hours</td> </tr> <tr> <td>8. Solution of thin shell</td> <td style="text-align: right;">6 hours</td> </tr> <tr> <td>9. Analysis of plastic limit</td> <td style="text-align: right;">4 hours</td> </tr> <tr> <td>10. Mechanics of metal forming</td> <td style="text-align: right;">8 hours</td> </tr> </table>			1. Introduction of tensor	2 hours	2. Stress analysis	4 hours	3. Strain analysis	4 hours	4. Relation of Stress-Strain	4 hours	5. Solution of elastoplastic problems	6 hours	6. Thick wall cylinder	6 hours	7. Torsion of bar	4 hours	8. Solution of thin shell	6 hours	9. Analysis of plastic limit	4 hours	10. Mechanics of metal forming	8 hours
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10. Mechanics of metal forming	8 hours																						
Teach Method	Combination of lecture, discussion and self-study. Enlightening and summary explaining to emphasize on the difficult and key points. Numbers of exercises for training of capacity to analyze and resolve difficulties as well as to consolidate basic concepts.																						
Test and Examination	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">1. Exercises and representation of class</td> <td style="width: 20%; text-align: right;">30%</td> </tr> <tr> <td>2. Final exam</td> <td style="text-align: right;">70%</td> </tr> </table>			1. Exercises and representation of class	30%	2. Final exam	70%																
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2. Final exam	70%																						
Pre-request Course	Materials mechanics.																						
References	<p>[1] Yang Guitong, Theory of elasticity and plasticity, China Building Materials Industry Press 2005</p> <p>[2] H.F.Chen, A.F.Sarips. Elasticity and plasticity. China Architecture & Building Press, 2005</p> <p>[3] S Timoshenko, J N Goodier. Theory of Elasticity. McGRAW-HILL Book Company, Inc. 1951</p> <p>[4] 徐秉业等. 应用弹塑性力学. 清华大学出版社, 1995</p> <p>[5] 陈明祥. 弹塑性力学. 科学出版社, 2006</p>																						

Course Introduction

Code	073132	Teaching Hours	32																					
Course	Sheet Metal Forming Technology																							
Key Words	Stamping analysis; Cylindrical deep drawing; Material properties																							
Purpose and Role of the Course	<p>The principles of common sheet metal forming processes, such as bending, stamping and drawing of simple shapes, and the theoretical analysis based on engineering plasticity are detailed in this course. With the help of this course students may master the skills concerning design of sheet metal forming processes, include calculation methods, process parameters, equipments used, and so on. This engineering training help students to master the skills concerning design of sheet metal forming processes.</p>																							
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%;">1.</td> <td style="width: 85%;">Introduction</td> <td style="width: 10%; text-align: right;">2 hours</td> </tr> <tr> <td>2.</td> <td>Material properties</td> <td style="text-align: right;">8 hours</td> </tr> <tr> <td>3.</td> <td>Sheet deformation processes</td> <td style="text-align: right;">6 hours</td> </tr> <tr> <td>4.</td> <td>Stamping analysis</td> <td style="text-align: right;">6 hours</td> </tr> <tr> <td>5.</td> <td>Bending of sheet</td> <td style="text-align: right;">4 hours</td> </tr> <tr> <td>6.</td> <td>Cylindrical deep drawing</td> <td style="text-align: right;">8 hours</td> </tr> <tr> <td>7.</td> <td>Combined bending and tension of sheet</td> <td style="text-align: right;">8 hours</td> </tr> </table>			1.	Introduction	2 hours	2.	Material properties	8 hours	3.	Sheet deformation processes	6 hours	4.	Stamping analysis	6 hours	5.	Bending of sheet	4 hours	6.	Cylindrical deep drawing	8 hours	7.	Combined bending and tension of sheet	8 hours
1.	Introduction	2 hours																						
2.	Material properties	8 hours																						
3.	Sheet deformation processes	6 hours																						
4.	Stamping analysis	6 hours																						
5.	Bending of sheet	4 hours																						
6.	Cylindrical deep drawing	8 hours																						
7.	Combined bending and tension of sheet	8 hours																						
Teach Method	Combination of lecture, discussion and self-study. A lot of photos and videos of industrial workshop to help understanding real manufacturing processes. Large exercises for training of capacity to analyze and resolve engineering problems.																							
Test and Examination	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%;">1.</td> <td style="width: 85%;">Exercises and representation of class</td> <td style="width: 10%; text-align: right;">30%</td> </tr> <tr> <td>2.</td> <td>Final exam</td> <td style="text-align: right;">70%</td> </tr> </table>			1.	Exercises and representation of class	30%	2.	Final exam	70%															
1.	Exercises and representation of class	30%																						
2.	Final exam	70%																						
Pre-request Course	Elasticity and plasticity theory; Principle of mechanism																							
References	<p>[1] Z.Marciniak, J L Duncan, S J Hu. Mechanics of Sheet Metal Forming. Butterworth-Heinemann Press, 2002</p> <p>[2] R H Wagoner, J L Chenot. Metal forming analysis. Cambridge University Press, 2001</p> <p>[3] D F Eary. E A Reed. Techniques of Pressworking Sheet Metal. Prentice-Hall Press. 1974</p> <p>[4] S R Reid. Metal forming and impact mechanics. Pergamon Press, 1985</p> <p>[5] G. L John. 金属成形科学与实践. 化学工业出版社, 2006</p> <p>[6] 胡世光, 陈鹤峥. 板料冷压成形原理. 国防工业出版社, 1989</p> <p>[7] Electronic files prepared by teacher</p>																							

Course Introduction

Code	073115	Teaching Hours	32
Course	Basis of Software Technique (lab)		
Key Words	data structure; linear list; stack and queue; binary tree;		
Purpose and Role of the Course	<p>It is the major core course for students to learn programming languages, procedural methods, and database system.</p> <p>The purpose of the lab is to enable students to learn basic methods and procedures. The lab focuses on training students' ability to solve problems on computer, and how to apply the theory and methods of software to solve actual problems.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Visual C++ 6.0 (2 hours) <ol style="list-style-type: none"> 1.1 Introduce the Visual C++6.0 development environment 1.2 Program debugging method 2. Design procedure (2 hours) <ol style="list-style-type: none"> 2.1 A case of calculation 2.2 Design a simple score system 3. The linear list (2 hours) <ol style="list-style-type: none"> 3.1 Chain list structure in various operations 4. The stack (2 hours) <ol style="list-style-type: none"> 4.1 Design a program to solve the maze problem 5. The queue (2 hours) <ol style="list-style-type: none"> 5.1 Design a program to realize the bank's electronic line business 6. Tree and binary tree (2 hours) <ol style="list-style-type: none"> 6.1 Create a binary tree and realize the preorder traversal and the inorder traversal 7. The graph (2 hours) <ol style="list-style-type: none"> 7.1 Establish adjacency list of undirected graph 7.2 Realize the depth-first traversal and breadth-first traversal of graph 8. Sorting algorithm (2 hours) <ol style="list-style-type: none"> 8.1 Design a program that requires 		
Teach Method	All the labs will be taught in class, using Visual C++. And the students are expected to complete the labs and get results from the program. Finally, a programming design is requested.		
Test and Examination	Attendance 10%; labs 60%, Final programming design 30%		
Pre-request Course	<ul style="list-style-type: none"> ■ Knowledge of basic C programming language ■ Basic operations on Visual C++ 		
References	<ul style="list-style-type: none"> ■ Textbook: 唐发根.数据结构（第二版）.科学出版社.2004 ■ Reference books and reading materials: <ul style="list-style-type: none"> ✓ Clifford A.Shaffer. Data Structures and Algorithm Analysis in C++ (3rd edit.). 2013 		

Course Introduction

Code	073104	Teaching Hours	32
Course	Intelligent Optimization Computing		
Key Words	intelligent computing; optimization algorithms; artificial neural		
Brief Description of the Course	<p>The course is designed to provide the student with an understanding of the basic principles and models of some major intelligent optimization computing algorithms as well as their applications. The main content includes: simulated annealing, genetic algorithms, tabu search algorithm, various artificial neural networks, and applications of the above optimization computing algorithms.</p>		
Main Chapters and Teaching Hours	<p>Topic 1: Introduction 4H Topic 2: Simulated annealing 4H Topic 3: Genetic algorithm 4H Topic 4: Tabu search 4H Topic 5: Artificial neural networks and their applications 12H Topic 6: Application and practice of intelligent optimization computing 4H+32H (after class)</p>		
Teach Method	Lectures, in-class discussions, final project with demonstration		
Test and Examination	<p>Class discussion: 10% Final course project: 90%. In which, literature review 20%, other part 50% , and presentation and computation demo 30%.</p>		
Pre-request Course	Knowledge of advanced mathematics and computer science		
References	<p>[1] D.T. Pham and D. Karaboga , Intelligent Optimization Techniques , Springer , 2002. REFERENCES [2] Jacek M. Zurada, Introduction to Artificial Neural Systems, West Publishing Company, 1992.</p>		

Course Introduction

Code	073157	Teaching Hours	16
Course	Academic writing & Presentation		
Key Words	Academic writing, Critical Reading, Oral Presentation		
Purpose and Role of the Course	<p>The course seeks to help graduate student develop as a writer within the English-speaking academic community by raising awareness of, practicing, and reflecting upon the conventions of written texts. As well as an introduction to critical thinking and critique writing, the course will also develop your awareness of conventions of research-based academic writing, both regarding structural elements such as the introduction, literature review and conclusion, and also how to use the work of other authors appropriately in your work. The students will also have the chance to reflect on how these conventions influence the development of their own voices. We will also cover critical writing with a special focus on critiques, micro and macro-level argumentation for term papers. We will focus on the thesis writing process with a workshop on literature reviews. Finally, we will discuss some poster and oral presentation skills,</p> <p>This is an advanced course for graduate students for academic writing. Enrollment is limited to students writing a dissertation, thesis, or paper. Through analyzing models and individual writing practice, students learn strategies to improve their skills in writing and editing these extended academic research papers. Course topics include reporting research, critical analysis, argumentation, style, and presentation (international technical conference). Structures and vocabulary are addressed as needed. Students receive feedback from the instructor on each writing assignment.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction (2 hours) <ol style="list-style-type: none"> 1.1 Syllabus and overview of course 1.2 Discussion of current difficulties in writing 1.3 Main contents and requirements of the course 2. Literature Review (6 hours) <ol style="list-style-type: none"> 2.1 Fundamental concepts 2.2 Reading Skills 2.3 Critical Reading I – Identifying Key Ideas 2.4 Critical Reading II – Evaluating a Text 2.5 Case study 3. Methods/Approach (6 hours) <ol style="list-style-type: none"> 3.1 Basic concepts 3.2 The Nature of Research 3.3 Academic Ethic 3.3 Making Decisions about Style 3.4 Structuring your research papers 8. Presentations(2 hours) <ol style="list-style-type: none"> 8.1 Poster 8.2 Oral 		

Teach Method	All the contents will be taught in class, together with some case discussion. And the students are expected to complete the pre-reading contents and assignments after class. Finally, a course report is requested.
Test and Examination	Attendance 10%; Report 30%, Final Examination 60%
Pre-request Course	<ul style="list-style-type: none"> ■ Knowledge of basic grammar ■ Basic concept about literature searching methods
References	<ul style="list-style-type: none"> ■ An English-to-English dictionary: the Longman Advanced American Dictionary ■ A grammar handbook (reference guide): Chartbook: A Reference Grammar from the Understanding and Using English Grammar series by Betty Azar ■ Reference books and reading materials: <ul style="list-style-type: none"> ✓ Swales, John and Cristine Feak. English in Today's Research World: A Writing Guide. Ann Arbor: University of Michigan Press, 2000 ✓ Alfred, Gerald, Charles T. Brusaw, and Walter E. Oliu. Handbook of Technical Writing. St. Martin's Press, 2003. (with an online companion site) ✓ John M. Swales and Christine B. Feak, Academic Writing for Graduate Students Essential Tasks and Skills, 3rd edition, 2012.

Course Introduction

Code	073103	Teaching Hours	32
Course	Geometrical Product Specification for Digital Manufacturing		
Key Words	Geometrical product definition; G&T standards and specifications; digital manufacturing		
Brief Description of the Course	Main topics include: ISO GD&T new standards; The mathematical foundations of GD&T; Languages for geometrical product specification and verification; Functional design, manufacturing and statistical tolerancing; Geometrical metrology, uncertainty and discrete shape processing in fabrication and inspection.		
Main Chapters and Teaching Hours	General introduction - Design and Manufacturing in the Modern and Global Era - (2 hours) Part1: Models and Languages for geometrical product specification and verification (8 hours) Part2: Tolerancing for function, Tolerancing for Manufacturing, Computer-Aided Tolerancing (10 hours) Part3: Dimensional and Geometrical Metrology, reverse engineering (6 hours) CATIA V5 Functional Tolerancing and Reverse Engineering Capabilities (6 hours Lab)		
Teach Method	Lectures, in-class discussions, final project with demonstration		
Test and Examination	Homework and report		
Pre-request Course			
References			

Course Introduction

Code	073109	Teaching Hours	32
Course	Modern Product Design Methodology		
Key Words	Modern Product Design; Design Methodology; Robot		
Brief Description of the Course	<p>In this course, we will introduce the flow of product design, including requirement analysis, concept design, detailed design, manufacture, evaluation and test etc. Typical mechatronics products such as intelligent robots, haptic devices will be used as examples to enable project-based learning and practice.</p> <p>Course objectives</p> <ol style="list-style-type: none"> 1. Understand fundamental topics in product design methodology. 2. Improve paper reading and presentation skills. 3. Experience defining a research problem and investigating it. 		
Main Chapters and Teaching Hours	<p>Course overview</p> <p>Chapter 1: Introduction (2 hours)</p> <p>Chapter 2: Requirement analysis (4 hours)</p> <p>Chapter 3: Concept design (4 hours)</p> <p>Chapter 4: Detailed design (8 hours)</p> <p>Chapter 5: Prototyping (4 hours)</p> <p>Chapter 6: Paper review and Projects (8 hours)</p> <p>Chapter 7: Summary (2 hours)</p>		
Teach Method	Lectures, in-class discussions, final project with demonstration		
Test and Examination	<p>50% Project (team-based)</p> <p>40% Paper presentation</p> <p>10% Class participation</p>		
Pre-request Course			
References			

Course Introduction

Code	073125	Teaching Hours	32
Course	Advanced Principle of Mechanics		
Key Words	Mechanism; Analysis and Synthesis of Mechanism; Spatial Linkages		
Brief Description of the Course	<p>The analysis and synthesis of mechanisms is one of important contents in the mechanism research field. The research results which some of them are presented in monograph <i>Analysis and Synthesis of Spatial Linkages (Volume 1)</i> by later academician Zhang Qixian laid the important position for China in the world in the mechanisms research. In the past decades, some new research results have also been obtained. Although knowledges of analysis and synthesis of mechanisms are taught to undergraduate students in the course <i>Theory of Machines and Mechanisms</i>, the contents of the course are mainly concentrated in analysis and synthesis of planar mechanisms and seldom deal with the spatial mechanisms which are used more widely. Based on the requirements for further and comprehensive knowledge teaching about mechanisms, the course <i>Advanced Kinematic and Dynamic Analysis of Mechanisms</i> is created.</p> <p>This course is an important basic theory course which belongs to the mechanical engineering discipline. Taking linkages as research subject, kinematic and dynamic analysis and synthesis of closed chain linkages are studied in this course. The solid theoretical foundations of further studying on mechanisms, especially on spatial closed chain mechanisms are laid by learning the course.</p> <p>The course is on an important position in the knowledge system of mechanical engineering disciplines.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Introduction (1 hour)</p> <p>Chapter 2 Structure Analysis and Composition Principle of Mechanisms (5 hours)</p> <p>Chapter 3 Kinematic Analysis of Planar Mechanisms (8 hours)</p> <p>Chapter 4 Kinematic Analysis of Spatial Mechanisms (6 hours)</p> <p>Chapter 5 Geometry of Planar Motion and Kinematic Analysis of Planar Mechanisms (4 hours)</p> <p>Chapter 6 Basic Dynamics (2 hours)</p> <p>Chapter 7 Dynamic Analysis of Mechanisms (6 hours)</p> <p>Chapter 8 Dynamic Responses of Mechanisms (4 hours)</p> <p>Chapter 9 Balance of Mechanisms (4 hours)</p>		
Teach Method	Classroom-based lecture.		
Test and Examination	Homework (20%), Closed-book examination (80%).		
Pre-request Course			
References			

Course Introduction

Code	073130	Teaching Hours	32
Course	Aircraft Digital Manufacturing Engineering		
Key Words	Aircraft; digital; manufacturing		
Brief Description of the Course	<p>On the basis of the three-dimensional model-based definition, this course discusses the most advanced digital manufacturing technology and data management technology in the international, particularly discusses the advanced digital technology of the European Airbus and Boeing in the development of the A380 and B787 large commercial aircraft. the course aims to make the graduate students of the manufacturing field to understand and master aircraft digital design, digital manufacturing, digital information management, digital interchangeable coordination, and other aspects of advanced technology and its application in the modern aviation manufacturing industry, and comprehensively understand and grasp the modern aircraft digital manufacturing technology.</p>		
Main Chapters and Teaching Hours	<p>(1) Aircraft manufacturing digital technology and its progress (3 hours) (2) Aircraft digital assembly manufacturing technology (4 hours) (3) Concurrent product digital definition (4 hours) (4) Large part digital manufacturing and forming technology (3 hours) (5) Aircraft manufacturing digital coordination technology (4 hours) (6) Composite digital manufacturing technology (4 hours) (7) The development of aircraft digital technology and its application background (3 hours) (8) Model Based Definition technology and its application (4 hours) (9) Product Collaborative Development Technology (3 hours)</p>		
Teach Method	Classroom-based lecture		
Test and Examination	Final report		
Pre-request Course			
References			

Course Introduction

Code	073137	Teaching Hours	32
Course	Pneumatic Hydrau servo System		
Key Words	Pneumatic; Hydraulic; Servo system		
Brief Description of the Course	<p>This course examines the construction, principles of operation, and calculation of pneumatic hydra servo systems. Special attention is paid to building a solid theoretical background in the subject, which should enable the reader to go on to further study and analysis of the static and dynamic performance of the different pneumatic hydra servo elements and systems. In addition to theory, the course includes case studies of typical pneumatic hydra servo systems. These systems are categorized, and the special features of their design and performance are discussed.</p>		
Main Chapters and Teaching Hours	<ul style="list-style-type: none"> 1 Introduction <ul style="list-style-type: none"> 1.1 Historical View and Motivation for pneumatic hydra servo 1.2 Aims and Focus of the Course 1.3 Outline of the Chapters 2 General Description of Hydraulic Servo-systems <ul style="list-style-type: none"> 2.1 Basic Structure of Hydraulic Servo-systems 2.2 Description of the Components 2.3 Classification of Hydraulic Servo-systems 2.4 Measurement and Control Devices 2.5 Application Examples 3 Hydraulic Servo Actuators <ul style="list-style-type: none"> 3.1 Construction and Operation 3.2 Applications of Hydraulic Servo Actuators 3.3 The Mathematical Model of HAS 3.4 The Transfer Function of HAS 3.5 Valve-Controlled Actuators 3.6 Modeling and Simulation of a Hydraulic Servo Actuator 4 Electrohydraulic Servovalve Technology <ul style="list-style-type: none"> 4.1 Introduction 4.2 Applications of Electrohydraulic Servos 4.3 Electromagnetic Motors 4.4 Servovalves Incorporating Flapper Valve Amplifiers 4.5 Servovalves Incorporating Jet Pipe Amplifiers 4.6 Servovalves Incorporating Jet Deflector Amplifiers 4.7 Jet Pipe Amplifiers Versus Nozzle Flapper Amplifiers 5 Modeling and Simulation of Electrohydraulic Servosystems <ul style="list-style-type: none"> 5.1 Introduction 5.2 Electromagnetic Torque Motors 5.3 Flapper Valves 5.4 Modeling of an Electrohydraulic Servo Actuator 		

	<p>5.5 10A Modeling and Simulation of an EHSA</p> <p>5.6 Design of P, PI, and PID Controllers</p> <p>6 Introduction to Pneumatic Systems</p> <p>6.1 Introduction</p> <p>6.2 Peculiarities of Pneumatic Systems</p> <p>6.3 Advantages and Disadvantages of Pneumatic Systems</p> <p>6.4 Basic Elements of Pneumatic Systems</p> <p>6.5 Case Studies: Basic Pneumatic Circuits</p>
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	Course Project 100%
Pre-request Course	
References	

Course Introduction

Code	073140	Teaching Hours	32
Course	Principle of Computed Tomography		
Key Words	X-ray; computed tomography; imaging reconstruction		
Brief Description of the Course	<p>Computed Tomography (CT) is an imaging technique that utilizes computer-processed X-rays to produce tomographic images or 'slices' of specific areas of bodies or samples and permits the non-destructive visualization of internal structures. It has been widely applied to medical imaging, material evaluation, industrial non-destructive inspection and reverse engineering. It plays a key role to improve the clinical diagnosis and the product quality. This course includes two parts, some introduction about basic concepts and some introductory experiments at laboratory. Videos and images will always be around you.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1.Introduction to Computer Tomography (2 hours) 2.Basic Principle of CT and CT Technology(4 hours) 3.Applications of CT Technology (4 hours) 4.Projection Data Acquisition Geometries (4 hours) 5.CT Image Reconstruction Algorithms (4 hours) 6.Computer Programming (6 hours) 7.CT Image Quality (4 hours) 8.Challenges in CT/ Future Research Areas (4 hours) 		
Teach Method	Classroom-based lecture +Experiments in Lab		
Test and Examination	Attendance 20% + Assignment Report/home works 80%		
Pre-request Course			
References			

Course Introduction

Code	073153	Teaching Hours	32
Course	Sheet Forming Comprehensive Experiment		
Key Words	sheet forming; formability; process technology		
Brief Description of the Course	<p>This is a one-semester public experiment course designed for master's and doctor's degree candidates of aeronautics manufacturing engineering. The main purpose of the course is to enable students</p> <p>1)To learn drawing test, earing test, forming limit curve test, Erichsen cup test, hydraulic test, Fukui test and biaxial tensile test etc.</p> <p>2)To study how to manipulate different experimental equipment.</p> <p>3)To master the experimental scientific research method.</p>		
Main Chapters and Teaching Hours	<p>Lecture: 3 hours</p> <p>Visit: 1hour</p> <p>Test: 10 hours</p> <p>Summary: 2 hours</p>		
Teach Method	Lectures, in-class discussions, experiments		
Test and Examination	attendance, test report		
Pre-request Course			
References			

Course Introduction

Code	073154	Teaching Hours	32
Course	Experiments on Computer Graphics		
Key Words	3D Computer Graphics; OpenGL; programming		
Brief Description of the Course	<p>Computer Graphics is an important branch of computer science. OpenGL is a 3D graphics programming library, which is in fact the industrial standard in this field. Most of 3D graphics systems (including CAD/CAE/CAM, games, etc.) have been developed from it. This class will teach students the basic knowledge of OpenGL programming and related principles. At the end, they will really understand 3D computer graphics while get a useful skill.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1、 Introduction to OpenGL and Using GLAUX (2 hours) Chapter 2、 Geometric Primitive and Scene Representation (2 hours) Chapter 3、 Rendering Pipeline (2 hours) Chapter 4、 Transformations in OpenGL (2 hours) Chapter 5、 Lighting In OpenGL (2 hours) Chapter 6、 Texture Mapping (2 hours) Chapter 7、 Selection and Picking (2 hours) Chapter 8、 Display Lists and Text Display (2 hours)</p>		
Teach Method	Classes in computer room, introducing principles and studying examples.		
Test and Examination	Attendance 20% +Examination 80%		
Pre-request Course			
References			

Course Introduction

Code	073155	Teaching Hours	16
Course	Basis of Software Technique (lab)		
Key Words	data structure; linear list; stack and queue; binary tree;		
Purpose and Role of the Course	<p>It is the major core course for students to learn programming languages, procedural methods, and database system.</p> <p>The purpose of the lab is to enable students to learn basic methods and procedures. The lab focuses on training students' ability to solve problems on computer, and how to apply the theory and methods of software to solve actual problems.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Visual C++ 6.0 (2 hours) <ol style="list-style-type: none"> 1.1 Introduce the Visual C++6.0 development environment 1.2 Program debugging method 2. Design procedure (2 hours) <ol style="list-style-type: none"> 2.1 A case of calculation 2.2 Design a simple score system 3. The linear list (2 hours) <ol style="list-style-type: none"> 3.1 Chain list structure in various operations 4. The stack (2 hours) <ol style="list-style-type: none"> 4.1 Design a program to solve the maze problem 5. The queue (2 hours) <ol style="list-style-type: none"> 5.1 Design a program to realize the bank's electronic line business 6. Tree and binary tree (2 hours) <ol style="list-style-type: none"> 6.1 Create a binary tree and realize the preorder traversal and the inorder traversal 7. The graph (2 hours) <ol style="list-style-type: none"> 7.1 Establish adjacency list of undirected graph 7.2 Realize the depth-first traversal and breadth-first traversal of graph 8. Sorting algorithm (2 hours) <ol style="list-style-type: none"> 8.1 Design a program that requires 		
Teach Method	All the labs will be taught in class, using Visual C++. And the students are expected to complete the labs and get results from the program. Finally, a programming design is requested.		
Test and Examination	Attendance 10%; labs 60%, Final programming design 30%		
Pre-request Course	<ul style="list-style-type: none"> ■ Knowledge of basic C programming language ■ Basic operations on Visual C++ 		
References	<ul style="list-style-type: none"> ■ Textbook: 唐发根.数据结构（第二版）.科学出版社.2004 ■ Reference books and reading materials: <ul style="list-style-type: none"> ✓ Clifford A.Shaffer. Data Structures and Algorithm Analysis in C++ (3rd edit.). 2013 		

Course Catalogue for International Postgraduates

(School of Economics & Management)

编号 No.	英文课程名称 Course Title	中文课程名称 Course Title	学时 Hours	学分 Credits	开课季节 Semester	任课教师 Lecturer
083501	Microeconomics	微观经济理论	32	2	Spring	魏亿钢
083504	Corporate Finance	公司财务	32	2	Fall	白明
083505	Marketing Management	营销管理	32	2	Fall	许文媿
083506	Accounting	会计学	32	2	Fall	周宁
083507	International Finance	国际金融学	32	2	Fall	陈向东
083509	Statistics	统计学	32	2	Spring	杨继平
083510	Macroeconomics	宏观经济学	32	2	Spring	牟晖
083511	Operational Research	运筹学	32	2	Spring	周泓
083512	Decision Analysis	决策分析	32	2	Fall	方卫国
083513	Project Management	项目管理	32	2	Spring	杨敏
083514	Supply Chain Management	供应链管理	32	2	Fall	赵秋红
083515	Operations Management	运作管理	32	2	Fall	贾国柱
083516	Investment	投资学	32	2	Spring	杨海军
083519	Econometrics	计量经济学	32	2	spring	马杰
083521	Decision Modeling and Analysis with MS Excel	Excel 决策建模与分析	32	2	Fall	姚忠
083524	Modern Heuristic Optimization Theory and Algorithms	现代启发式优化理论与算法	32	2	Spring	方卫国
083530	International Trade	国际贸易学	32	2	Spring	田东文
083535	Human Resource Management	人力资源管理	32	2	Spring	苏文平
083538	Retail Management	零售管理	32	2	Spring	许文媿
083546	Economics of Electronic Commerce	电子商务经济学	32	2	Spring	窦一凡
083547	Scientific Thesis Writing	科技论文写作	16	1	Spring	赵秋红
083545	Organizational Behavior	组织行为学	32	2	Fall	武欣
083548	International economics	国际经济学	32	2	Fall	田东文/喻雪莹
083549	Management Information Systems	管理信息系统	32	2	Spring	姚忠
083551	Engineering Economy	工程经济学	32	2	Fall	李亚帅

083556	Ergonomics and work organization	工效学与工作组织	32	2	Fall	陈喆
083555	Applied Statistics	管理统计学	32	2	Fall	马莹莹
083554	Electronic Commerce	电子商务	32	32	Fall	陈婧

Course Introduction

Code	083501	Teaching Hours	32
Course	Microeconomics		
Key Words	Supply; demand; market; exchange		
Purpose and Role of the Course	<p>This course focuses on the following topics: basic theory of consumer behavior; production and costs; partial equilibrium analysis of pricing in competitive and monopolistic markets; general equilibrium; welfare; and externalities.</p> <p>This course offers some tools and skills for economic analysis. In particular, it covers advanced and relatively recent theories of modern microeconomics, especially in information economics and game theory. It is intended to introduce the main branches and methodologies of these new developments. Students are required to understand the theories and concepts intuitively, to master the modeling techniques and derivations, and to solve simple versions of the problems.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction (3 hours) 2. Comparative advantage: the basis for exchange (3 hours) 3. Supply and demand: an introduction (3 hours) 4. Elasticity (3 hours) 5. Demand: the benefit side of the market (3 hours) 6. Perfectly competitive supply: the cost side of the market (3 hours) 7. Efficiency and exchange (3 hours) 8. The quest for profit and the invisible hand (3 hours) 9. Monopoly and other forms of imperfect competition (3 hours) 10. Externalities an property rights (3 hours) 11. Economics of public policy (2 hours) 		
Teach Method	Lectures will be presented mainly by PowerPoint PPT files with demos of images and image operations. Question-and-answer are also needed. Practices on Adobe Photoshop and other software of remote-sensing image processing both in classroom and at home will be encouraged.		
Test and Examination	1、Q&A : 10% 2、Practice: 30% 3、Final Exam: 60%		
Pre-request Course	None		
References	<ol style="list-style-type: none"> 1、 Robert H Frank, Ben Bernanke. Principles of Macroeconomics, 3rd edition, 2007. 2、朱善利,《微观经济学》,北京大学出版社,2005年第3版. 		

Course Introduction

Code	083504	Teaching Hours	32
Course	Corporate Finance		
Key Words	investment, financing, corporate		
Purpose and Role of the Course	<p>Corporate finance is an application science which is a required course for the master study of business administration. Based on economics and mathematic, corporate finance explores how to efficiently acquire and effectively apply resources for a corporation, and further guides the financial manager deal with the acquisition, financing, and management of assets with some overall goal in mind. At the end of course, the students should:</p> <ul style="list-style-type: none"> --Understand the importance of finance and of financial markets for corporations and be able to describe the firm's financing and investment cycles. --Be able to assess the profitability of an investment project, by making cash flow forecasts and by calculating and interpreting criteria such as the Net Present Value, the Internal Rate of Return, and other complementary criteria. --Know the characteristics of the financial resources used by corporations. --Be able to calculate the cost of equity, the cost of debt, and the weighted average cost of capita. 		
Main Chapters and Teaching Hours	<p>Chapter 1 The role of financial management (2-hour)</p> <p>Chapter 2 Time value of money (2-hour)</p> <p>Chapter 3 The valuation of long term securities (4-hour)</p> <p>Chapter 4 Risk and return (2-hour)</p> <p>Chapter 5 Capital budgeting and estimating cash flows (6-hour)</p> <p>Chapter 6 Required returns and the cost of capital (4-hour)</p> <p>Chapter 7 Operating and financial leverage (4-hour)</p> <p>Chapter 8 Capital structure determination (4-hour)</p> <p>Chapter 9 Dividend policy (2-hour)</p> <p>Summary (2-hour)</p>		
Teach Method	Lectures, exercises and case studies		
Test and Examination	Examination: 90%, Attendance:10%		
Pre-request Course	Accounting		
References	<p>1. Corporate Finance (9th Edition), Stephen A Ross, Randolph W. Westerfield, Jeffrey F. Jaffe, Mc Graw Hill</p> <p>2. Fundamental financial management (12th Edition), James C. Van Horne and John M. Wachowicz, JR., Prentice Hall</p>		

Course Introduction

Code	083505	Teaching Hours	32
Course	Marketing Management		
Key Words	Marketing plan; consumer behavior, segmentation and targeting, marketing mix		
Purpose and Role of the Course	<p>The course will provide an understanding of the dynamic role marketing plays in the global and national economy as well as the organization. You will have the opportunity to build a knowledge base about the following areas: strategic marketing, research, consumer behavior, segmentation and targeting, marketing mix planning, implementation, and evaluation.</p> <p>The learning objectives:</p> <ul style="list-style-type: none"> ● Define elementary marketing concepts ● Apply relevant marketing theory and strategy ● Identify the principles involved in consumer choice ● Apply the principles of marketing to basic planning and consumptive situations ● Tackle ethical issues involved in marketing planning and practice ● Improve written expression and communication through the use of formal and informal writing as tools for learning 		
Main Chapters and Teaching Hours	<ul style="list-style-type: none"> ● An Overview of Marketing, 3 hours ● Strategic Planning for Competitive Advantage, 3hours ● Marketing Environment, 3 hours ● Consumer Decision Making, 3 hours ● Segmenting and Targeting Markets, 3 hours ● Product Concepts, 3 hours ● Marketing Channels and Supply Chain Management, 3 hours ● Integrated Marketing Communication, 3 hours ● Pricing Concepts, 3 hours ● Case discussion, 3 hours 		
Teach Method	The course uses a variety of instructional methods including lectures, short case presentations, in-class team activities, individual assignments, and team projects.		
Test and Examination	Class participate/ case discussion	40%	
	Marketing project final report	30%	
	Marketing project final presentation	30%	
Pre-request Course	none		
References	Marketing Management, Kotler, P., Prentice-Hall International, Inc. Principles of Marketing, Kotler, P., Armstrong, G., etc., 机械工业出版社		

Course Introduction

Code	083506	Teaching Hours	32
Course	Accounting		
Key Words	Financial Accounting; Financial Statements; Cost		
Purpose and Role of the Course	<p>Accounting is a product of the economic environment and language of business. It is concerned with processing and reporting economic information to decision makers. So, for today's manager, a knowledge and understanding of accounting numbers is a prerequisite. Therefore basic accounting theory and knowledge will be given in order to provide students an understanding how the information can be produced and used. This course is target towards graduate students of management, in fact, anyone who dealing with management and investments did not have the facility of prior formal education in accounting. Also, this course, more specifically, accounting for the non-specialist. Through the learning, students are expected to understand financial accounting statements, accounting rules and methods. In addition, the application of accounting theory and technical methods to business practice by students would be strengthened.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 The Nature and Purpose of Accounting Chapter 2 Basic Accounting Concepts: The Balance Sheet Chapter 3 Basic Accounting Concepts: The Income Statement Chapter 4 Accounting Records and Systems Chapter 5 Revenue and Monetary Assets Chapter 6 Cost of Sales and Inventory Chapter 7 Long-Lived Non-monetary Assets and Their Amortization Chapter 8 Sources of Capital: Debt Chapter 9 Sources of Capital: Owners' Equity Chapter 11 The Statement of Cash Flows Chapter 13 Financial Statement Analysis Chapter 14 Understanding Financial Statements</p>		
Teach Method	<ul style="list-style-type: none"> ➤ Way of teaching: lectures will contribute about 60% of the total teaching period. Cases study and class problems practice will contribute around 30% and 10% respectively. ➤ Way of learning: students are expected to prepare reading materials as indicated by lecturers prior to attend the class, take key notes and to participate in class discussion actively throughout the subject. 		
Test and Examination	<ul style="list-style-type: none"> ➤ Attendance 20% ➤ Case report 30% ➤ final exam 50% 		
Pre-request Course	<ul style="list-style-type: none"> ➤ ECONOMICS, ➤ MANAGEMENT 		
References	<ul style="list-style-type: none"> ➤ Textbook: Robert N. Anthony, David F. Hawkins, Kenneth A. Merchant), Accounting, (12th Edition), China Machine Press, June 2007 ➤ Reference book and material: <ul style="list-style-type: none"> ✓ N Ramachandran, Ram Kumar Kakani, Financial Accounting For Management , McGraw-hill, June 2007 ✓ International Financial Reporting Standards 		

Course Introduction

Code	083507	Teaching Hours	International finance
Course	International finance		
Key Words	International monetary system, Bretton Woods System, international balance of payment, international financial market, Eurocurrency market, foreign exchange determination, Purchasing Power Parity, Interest Rate Parity, foreign exchange market, international financial risk management.		
Purpose and Role of the Course	The major purpose of learning this course is for students to understand important concepts and theories on international financial operations, especially understand special operating background with Chinese international economic operations. This course will provide students on international business management and financial studies with fundamental and practical knowledge for other relevant studies.		
Main Chapters and Teaching Hours	I. national monetary system, historical events and implications (4hours) II. International balance of payment: theories and practical issues (4 hours) III. International market: introductions and Eurocurrency market (4 hours) IV. Foreign exchange rate determination (4 hours) V. Foreign exchange market (4 hours) VI. International exchange risk management and other issues in international financial risk management. (4 hours) VII. International investment (4 hours) VIII. Discussion on hot issues in international finance (4 hours)		
Teach Method	Lecturing, classroom discussion, case study, team work on designated topics.		
Test and Examination	Final evaluation scores for each student will be determined by three kind of performance. <ul style="list-style-type: none"> ■ Open book examination (2-3 hours based on requirement from the administrative office) (70%) ■ Performance of the team work on special topic designated (25%) . ■ Class performance (5%) . 		
Pre-request Course	Macro economics International economics		
References	Jeff Madura textbook on International financial management.		

Course Introduction

Code	083509	Teaching Hours	32
Course	Statistics		
Key Words	Descriptive statistics, Inferential statistics, regression analysis		
Purpose and Role of the Course	This course is designed to give student the ability to analyze data in a useful way. It is an introduction to applied statistics. Topics include presenting and organizing, point and interval estimation, hypothesis testing, simple and multiple linear regression. It is not a course in mathematical statistics, but provides a balance between statistical theory and application.		
Main Chapters and Teaching Hours	Ch 1 Introduction Ch 2 Descriptive Statistics Ch 3 Probability and Random Variables Ch 4 Point Estimation Ch 5 Interval Estimation Ch 6 Hypothesis Testing Ch 7 Linear Correlation and Regression Ch 8 Multiple Regression		
Teach Method	Lectures will be used in the course and teaching material will be provided in the class.		
Test and Examination	Course Report.		
Pre-request Course	Calculus, linear algebra, and probability theory.		
References	Lind, D., Marchal, W. and Mason, R., Statistical Technique in Business & Economics: with Global Data Sets(13 th edition), The McGraw-Hill Companies, Inc., 2009.		

Course Introduction

Code	083510	Teaching Hours	32																						
Course	Macroeconomics																								
Key Words	GDP, inflation, unemployment rate, wage, economic growth, saving, macroeconomic policy																								
Purpose and Role of the Course	<p>As an integral part of economics, macroeconomics studies how the aggregate economy works. It examines, based upon appropriate models, how output is determined in the general equilibrium of goods market, financial markets and labor market, and how output, unemployment and inflation affect one another. It also explains the dynamics of an economic adjustment from the short run to the medium run, and to the long run.</p> <p>The objective of this course is to provide students with an effective framework for analyzing aggregate economic activity and understanding the implications of economic policy changes or other changes in the economic environment. Students are encouraged to apply basic economic principles to understand and explain what they observe in the world around them.</p>																								
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 80%;">1. Macroeconomics Introduction</td><td style="text-align: right;">2</td></tr> <tr><td>2. Spending, Income, and GDP</td><td style="text-align: right;">3</td></tr> <tr><td>3. Inflation and the Price Level</td><td style="text-align: right;">3</td></tr> <tr><td>4. Wage and Unemployment</td><td style="text-align: right;">3</td></tr> <tr><td>5. Economic Growth</td><td style="text-align: right;">3</td></tr> <tr><td>6. Saving, Capital Formation, and Financial Markets</td><td style="text-align: right;">3</td></tr> <tr><td>7. Money, Prices and the Financial System</td><td style="text-align: right;">3</td></tr> <tr><td>8. Short-term Fluctuations</td><td style="text-align: right;">3</td></tr> <tr><td>9. Spending and Output in the Short Run</td><td style="text-align: right;">3</td></tr> <tr><td>10. Stabilizing the Economy: The Role of the Federal Reserve</td><td style="text-align: right;">3</td></tr> <tr><td>11. Macroeconomic Policy</td><td style="text-align: right;">3</td></tr> </table>			1. Macroeconomics Introduction	2	2. Spending, Income, and GDP	3	3. Inflation and the Price Level	3	4. Wage and Unemployment	3	5. Economic Growth	3	6. Saving, Capital Formation, and Financial Markets	3	7. Money, Prices and the Financial System	3	8. Short-term Fluctuations	3	9. Spending and Output in the Short Run	3	10. Stabilizing the Economy: The Role of the Federal Reserve	3	11. Macroeconomic Policy	3
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Teach Method	Lectures, class discussion, small group discussion, videotapes.																								
Test and Examination	Assignment (10%), Team reporting (30%) Final report on current macroeconomic issues (60%)																								
Pre-request Course	Microeconomics																								
References	Principles of Macroeconomics. 5th Edition, Robert H. Frank, Ben S. Bernanke. Tsinghua University Press/McGraw-Hill, 2013.																								

Course Introduction

Code	083511	Teaching Hours	32
Course	Operational Research		
Key Words	linear and integer programming; non-linear programming; network optimization		
Purpose and Role of the Course	<p>It is the major core course for students in the discipline of management science and engineering, with the focus on introducing how to apply the theory and methods of management science / operations research to solving managerial problems.</p> <p>The goal of the course is to provide the prospective students a relatively thorough understanding of fundamental concepts and principles of optimization theory, various classical optimization techniques, how to establish an optimization model with managerial scenarios, and how to solve it with Excel solver.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction (2 hours) <ol style="list-style-type: none"> 1.1 Essentials of management science 1.2 Systematic process of conducting management science research 1.3 History of management science 1.4 Main contents and requirements of the course 2. Linear Programming (6 hours) <ol style="list-style-type: none"> 2.1 Fundamental concepts 2.2 Graphical methods 2.3 Solving LP with Excel Solver 2.4 Case study 3. What/if Analysis (2 hours) <ol style="list-style-type: none"> 3.1 Basic concepts for sensitivity analysis 3.2 Sensitivity analysis for objective function 3.3 Sensitivity analysis for constraints 4. Transportation and Assignment Problems (4 hours) <ol style="list-style-type: none"> 4.1 Transportation problems 4.2 Assignment problems 4.3 Case study 5. Integer Programming (4 hours) <ol style="list-style-type: none"> 5.1 Basic principles and properties of integer programming 5.2 Problem formulation and modeling with integer programming 6. Non-Linear Programming and Goal Programming (4 hours) <ol style="list-style-type: none"> 6.1 Non-linear programming problems 6.2 Goal programming problems 7. Network Optimization (4 hours) <ol style="list-style-type: none"> 7.1 Minimum-cost flow problems 7.2 Maximum flow problems 7.3 Shortest path problems 7.4 Minimum spanning tree problems 8. PERT Technique (4 hours) <ol style="list-style-type: none"> 8.1 Project network 8.2 Critical path and activity scheduling 8.3 Risk estimate 8.4 Time-cost tradeoff 9. Summary and Review (2 hours) 		
Teach Method	<p>All the contents will be taught in class, together with some case discussion. And the students are expected to complete the pre-reading contents and assignments after class. Finally, a course report is requested.</p>		

Test and Examination	Attendance 10%; Course report 40%, Final Examination 50%
Pre-request Course	<ul style="list-style-type: none"> ■ Knowledge of basic calculus, linear algebra, and probability ■ Basic operations on Excel
References	<ul style="list-style-type: none"> ■ Textbook: Frederick S. Hillier, Karl Schmedders, Mark S. Hillier, Molly Stephens. Introduction to Management Science (3rd edit.). McGraw-Hill, 2007 ■ Reference books and reading materials: <ul style="list-style-type: none"> ✓ Frederick S. Hillier, Gerald J. Lieberman. Introduction to Operations Research (8th edit.). McGraw-Hill, 2005 ✓ Papers published in journals relative to operations research and management science

Course Introduction

Code	083512	Teaching Hours	32
Course	Decision Analysis		
Key Words	Decision Making, Decision Analysis, Multi-objective Decision Making		
Purpose and Role of the Course	<p>Decision Analysis is a branch of Management Science/Operations Research. The kernel of management can be thought of as decision making. Thus, being able to exploit scientific decision making procedure to make right decisions is an essential qualification for managers. This course is an elective course tailored for foreign graduate students in MS/OR, which is an extension to the content of decision analysis in classic OR. More sophisticated decision making methods under complicated decision situations will be introduced in this course.</p> <p>Through the study of this course, students are required to</p> <ul style="list-style-type: none"> (i) understand the fundamental concepts of decision analysis and different decision situations, (ii) grasp the basic decision making principles, methods and criteria under different decision situations, including individual decision making, group decision making, multiple-objective decision making, and game theory. And (iii) be able to select and use structured and systematical decision making approaches to solve complicated decision problems in real life. 		
Main Chapters and Teaching Hours	<p>Chapter 1 Fundamentals of Decisions (2 hours)</p> <p>Chapter 2 Utility Theory (3 hours)</p> <p>Chapter 3 Criteria for Decision-making under Uncertainty (3 hours)</p> <p>Chapter 4 Decision Trees (3 hours)</p> <p>Chapter 5 Decision Making with Multiple Objectives (9 hours)</p> <p>Chapter 6 Group Decision Making (6 hours)</p> <p>Chapter 7 Game Theory (6 hours)</p>		
Teach Method	Lecture with teacher in classroom mainly, assisted with references reading and class discussion		
Test and Examination	Attendance 10%, Assignments 30%, Course report 60%		
Pre-request Course	Probability Theory, Operations Research		
References	<p>[1] Decision Analysis (unpublished, only for foreign graduate students), edited by Fang Weiguo, 2006</p> <p>[2] Wayne L. Winston. Operations Research: Decision Making (Third edition). Tsinghua University Press, 2004 (authorized by Thomson Learning)</p>		

Course Introduction

Code	083513	Teaching Hours	32
Course	Project Management		
Key Words	Project Management; project schedule; project work and budgets		
Purpose and Role of the Course	<p>It is one of the fundamental courses for all students in today's world. This course focuses on a holistic approach to project management. The content deals with initiating, planning, executing, monitoring and controlling, and closing projects. The course includes all nine project management areas – project integration, scope, time, cost, quality, human resources, communications, risk, and procurement management. Primary class emphasis is on the project management process and tools. After the study of the course, students will (1) be familiar with the project management processes and best practices; and (2) be able to apply the most important tools and techniques needed to plan and manage projects.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction to PM 2. PM Process and Integration 3. Gathering and arranging a project 4. Planning project work and budgets 5. Setting a project schedule 6. Monitoring project progress 7. Socio/cultural issues of PM 8. Closing down projects 		
Teach Method	<ol style="list-style-type: none"> 1. Lecture; 2. Case Study; 3. Presentation 		
Test and Examination	<ol style="list-style-type: none"> 1. Attendance: 5%; 2. Participation: 5%; 3. Individual Assignments: 30%; 4. Term Paper and Presentation: 60% 		
Pre-request Course	N/A		
References	<ol style="list-style-type: none"> 1、 Larson, E.W., and Gray, C.F. <i>Project Management: The Managerial Process</i> (5th Edition). McGraw-Hill. 2011 2、 Schwalbe, K., <i>Information Technology Project Management</i> (6th Edition). Course Technology, 2010 3、 Clifford F. Gray and Erik W. Larson. <i>Project Management</i>, Posts & Telecom PRESS, 2005 		

Course Introduction

Code	083514	Teaching Hours	32																																				
Course	Supply Chain Management																																						
Key Words	Supply chain management, Logistics management; Inventory policy																																						
Purpose and Role of the Course	<p>The discussion ranges from basic topics of inventory management, logistics network design, distribution systems, and customer value to more advanced topics of strategic alliances, the value of information in the supply chain, information technology, decision-support systems, and international issues in supply chain management. The purpose of this course is to have the students get know the key factors affecting the performance of supply chain management, understand basic strategies and methods of logistics management, identify the role of logistics and supply chain management in enterprise management. After learning the course, the students will be familiar with knowledge and methods related to logistics strategies, planning and operations, capable of unitizing the methods to deal with the related problems in the reality.</p>																																						
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="text-align: right; font-weight: bold;">Class hours</th> </tr> </thead> <tbody> <tr><td>Chapter 1: Understanding the Supply Chain</td><td style="text-align: right;">2</td></tr> <tr><td>Chapter 2: Supply Chain Performance: Achieving Strategic Fit and Scope</td><td style="text-align: right;">1</td></tr> <tr><td>Chapter 3: Supply Chain Drivers and Metrics</td><td style="text-align: right;">1</td></tr> <tr><td>Chapter 4: Designing Distribution Networks and Applications to e-Business</td><td style="text-align: right;">2</td></tr> <tr><td>Chapter 5: Network Design in the Supply Chain</td><td style="text-align: right;">2</td></tr> <tr><td>Chapter 6: Network Design in an Uncertain Environment</td><td style="text-align: right;">2</td></tr> <tr><td>Chapter 7: Demand Forecasting in a Supply Chain</td><td style="text-align: right;">2</td></tr> <tr><td>Chapter 8: Aggregate Planning in the Supply Chain</td><td style="text-align: right;">2</td></tr> <tr><td>Chapter 9: Planning Supply and Demand in the Supply Chain: Managing Predictable Variability</td><td style="text-align: right;">2</td></tr> <tr><td>Chapter 10: Managing Economies of Scale in the Supply Chain: Cycle Inventory</td><td style="text-align: right;">3</td></tr> <tr><td>Chapter 11: Managing Uncertainty in the Supply Chain: Safety Inventory</td><td style="text-align: right;">3</td></tr> <tr><td>Chapter 12: Determining Optimal Level of Product Availability</td><td style="text-align: right;">2</td></tr> <tr><td>Chapter 13: Transportation in the Supply Chain</td><td style="text-align: right;">2</td></tr> <tr><td>Chapter 14: Sourcing Decisions in a Supply Chain</td><td style="text-align: right;">2</td></tr> <tr><td>Chapter 15: Pricing and Revenue Management in the Supply Chain</td><td style="text-align: right;">2</td></tr> <tr><td>Chapter 16: Information Technology and the Supply Chain</td><td style="text-align: right;">1</td></tr> <tr><td>Chapter 17: Coordination in the Supply Chain</td><td style="text-align: right;">1</td></tr> </tbody> </table>				Class hours	Chapter 1: Understanding the Supply Chain	2	Chapter 2: Supply Chain Performance: Achieving Strategic Fit and Scope	1	Chapter 3: Supply Chain Drivers and Metrics	1	Chapter 4: Designing Distribution Networks and Applications to e-Business	2	Chapter 5: Network Design in the Supply Chain	2	Chapter 6: Network Design in an Uncertain Environment	2	Chapter 7: Demand Forecasting in a Supply Chain	2	Chapter 8: Aggregate Planning in the Supply Chain	2	Chapter 9: Planning Supply and Demand in the Supply Chain: Managing Predictable Variability	2	Chapter 10: Managing Economies of Scale in the Supply Chain: Cycle Inventory	3	Chapter 11: Managing Uncertainty in the Supply Chain: Safety Inventory	3	Chapter 12: Determining Optimal Level of Product Availability	2	Chapter 13: Transportation in the Supply Chain	2	Chapter 14: Sourcing Decisions in a Supply Chain	2	Chapter 15: Pricing and Revenue Management in the Supply Chain	2	Chapter 16: Information Technology and the Supply Chain	1	Chapter 17: Coordination in the Supply Chain	1
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Teach Method	Lectures will be presented mainly by PowerPoint PPT files with videos and pictures. Paper reading, Question-and-answer and assignments are also needed.																																						
Test and Examination	1、Q&A : 10% 2、Practice and assignment: 20% 3、Final Exam: 70%																																						
Pre-request Course	Advanced mathematics, Probability and Statistics, Management																																						
References	Sunil Chopra, Peter Meindl, Supply Chain Management: Strategy, Planning and Operations, 4 rd Edition, Prentice Hall (Tsinghua University Press 影印) 2009.																																						

Course Introduction

Code	083515	Teaching Hours	32
Course	Operations Management		
Key Words	Operations management, operation system design, planning&control		
Purpose and Role of the Course	<p>This course, which focuses on the design and management of manufacturing or service systems, is a core course for the education of Master of Business Administration. The course may offer the students the knowledge including: (1) the theories and methodologies concerning the development of operation strategy; (2) the theories and methods of the design of manufacturing or service systems; (3) the theories and methods of production/operation planning and control.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction to Production/Operation Management (POM) <ol style="list-style-type: none"> 1.1. The concepts of POM 1.2. The role of POM in an organization 1.3. POM in the manufacturing and service 1.4. The types of operation 2. Operations Strategy for Competitive Advantage <ol style="list-style-type: none"> 2.1. Identifying missions and strategy 2.2. Strategic decisions in OM functional areas 2.3. The ways to achieve competitive advantages 2.4. Strategy development and implement 3. Product Strategy <ol style="list-style-type: none"> 3.1. Goods and services selection 3.2. The design process 3.3. Issues for product development 3.4. Design documents 3.5. Service design – nature of customer participation 4. Process Strategy <ol style="list-style-type: none"> 4.1. Types of process strategy 4.2. Process analysis and design 4.3. Environmental friendly process 4.4. Process reengineering 4.5. Supplement: Process technology 5. Location Strategy <ol style="list-style-type: none"> 5.1. The strategic importance of location 5.2. Location decision sequence 5.3. Methods of evaluating location alternatives 5.4. Service location strategy 6. Layout Strategy <ol style="list-style-type: none"> 6.1. The strategic importance of layout decisions 6.2. Types of layout 6.3. The design of process layout 		

- 6.4. The design of cellular layout
- 6.5. The design of product layout
- 6.6. The design of office layout
- 6.7. The design of service layout
- 7. Human Resources and Job Design
 - 7.1. Human resource strategy for competitive advantage
 - 7.2. Labor planning
 - 7.3. Job design
- 8. Quality Management
 - 8.1. An overview of quality
 - 8.2. The evolution of quality thought
 - 8.3. Measurement of quality
 - 8.4. The quality of loss function
 - 8.5. Employees and quality improvement
 - 8.6. Data analysis tools
 - 8.7. Statistical process control
- 9. Supply Chain Management
 - 9.1. The strategic importance of the supply chain
 - 9.2. Purchasing
 - 9.3. Vendor selection
 - 9.4. Managing the supply chain
- 10. Inventory Management
 - 10.1. Functions of inventory
 - 10.2. Inventory management
 - 10.3. Inventory models
- 11. Capacity planning
 - 11.1. Defining capacity
 - 11.2. Capacity planning process
- 12. Aggregate Planning
 - 12.1. What is aggregate plan
 - 12.2. The nature of aggregate planning
 - 12.3. Aggregate planning strategies
 - 12.4. The planning process
 - 12.5. Methods for aggregate planning
- 13. Material Requirement Planning
 - 13.1. What is MRP
 - 13.2. What is required to run MRP
 - 13.3. MRP structure
 - 13.4. Lot size techniques
 - 13.5. Extension of MRP
- 14. Just-In-Time Systems
 - 14.1. Just-In-Time philosophy
 - 14.2. JIT in service
 - 14.3. JIT&MRP

	<p>15. Short-Term Scheduling</p> <p>15.1. Strategic importance of short-term scheduling</p> <p>15.2. Short-term scheduling issues</p> <p>15.3. Scheduling process-focused work centers</p> <p>15.4. Loading jobs in work centers</p> <p>15.5. Scheduling for services</p> <p>16. Project management</p> <p>16.1. Defining project</p> <p>16.2. Work breakdown structure</p> <p>16.3. Project organization</p> <p>16.4. Developing a project plan</p>
Teach Method	Lectures will be presented mainly by PowerPoint PPT files with demos of images and image operations. In the course some case studies and some discussions will be arranged.
Test and Examination	Final Exam: 80%; Attendance:20%
Pre-request Course	Operation research
References	Richard B. Chase et al., <i>Operations Management Competitive Advantage</i> (ed.11), McGraw Hill, 2011

Course Introduction

Code	083516	Teaching Hours	32
Course	Investments		
Key Words	CAPM, EMH, Option Valuation, APT		
Purpose and Role of the Course	<p>This course aims to introduce participants to essential concepts and techniques in Investment and aims to provide an understanding of financial institutions. Furthermore, the course aims to improve the level of competency of financial practitioners, investors and participants.</p> <p>A brief overview of securities and their analysis is provided, focusing on fundamental theoretical concepts such as efficient market hypothesis (EMH) and the capital asset pricing model (CAPM), as well as risk and return, the two most vital aspects of any investment. The results of option valuation will be introduced also.</p>		
Main Chapters and Teaching Hours	<p>1 Introduction (demo and practice) (3)</p> <p>2 Markets and Instruments (demo and practice) (3)</p> <p>3 Interest Rates and Risk Premiums (demo and practice) (2)</p> <p>4 Risk and Risk Aversion (demo and practice) (2)</p> <p>5 Learning About Return and Risk from the Historical Record (demo and practice) (2)</p> <p>6 Risk Aversion and Capital Allocation to Risky Assets (demo and practice) (2)</p> <p>7 Optimal Risky Portfolios(demo and practice) (2)</p> <p>8 The Capital Asset Pricing Model (demo and practice) (4)</p> <p>9 Arbitrage Pricing Theory and Multifactor Models of Risk and Return (demo and practice) (4)</p> <p>10 The Efficient Market Hypothesis (demo and practice) (4)</p> <p>11Option Valuation (demo and practice) (4)</p>		
Teach Method	Lectures will be presented mainly by PowerPoint PPT files with demos of images and image operations. Practices on Microsoft Office Excel and other software both in classroom and at home will be encouraged.		
Test and Examination	Report(70%) Q&A (30%)		
Pre-request Course	Calculus		
References	Zvi Bodie Alex Kane and Alan J.Marcus Investments (Eighth Edition)		

Course Introduction

Code	083519	Teaching Hours	32
Course	Introductory Econometrics: A Modern Approach		
Key Words	Regression; Error term; Least squares; Testing		
Purpose and Role of the Course	<p>Similar to the position of Physics in Natural Science, Econometrics is one of the most “technical” courses in Social Science, and is one of the most important courses for anybody who majors in Finance, Economics and Management.</p> <p>Trough studying Econometrics, students might learn how to figure out the social problems by the quantitative analysis, other than the qualitative analysis. In order to do this, I shall illustrate the main concepts, methods and applications of Econometrics for students. Students should have some background knowledge on matrix, probability and statistics.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1 The Nature of Econometrics; Several kinds of Economic data (3 学时) 2 The Simple Regression Model (4 学时) 3 Multiple Regression Analysis: Estimation (1) (2 学时) 4 Multiple Regression Analysis: Estimation (2); Multiple Regression Analysis: Inference (1) (2 学时) 5 Multiple Regression Analysis: Inference (2) (2 学时) 6 Multiple Regression Analysis: Inference (2) Multiple Regression Analysis: OLS Asymptotics (1) (3 学时) 7 Multiple Regression Analysis: Further issues (2 学时) 8 How to process the Multiple Regression Analysis through a software: Eviews Examples and Practices (1) (2 学时) 9 Multiple Regression Analysis with Qualitative Information: Binary Variables (2 学时) 10 Heteroskedasticity (2 学时) 11 More on Specification and Data Problems (2 学时) 12 Examples and Practices (2) Basic Regression Analysis with Time Series Data (1) (2 学时) 13 Basic Regression Analysis with Time Series Data (2) (2 学时) 14 Further issues in Using OLS with Time Series Data (2 学时) <p>Final Report or Exam</p>		
Teach Method	<ol style="list-style-type: none"> 1. Lectures will be presented mainly by PowerPoint PPT files, and examples will be presents with Eviews software. 2. Question-and-answer is also needed in the class. 3. Students will be asked to learn to use the Econometrics software to process the analysis on the practical issues themselves. 		
Test and Examination	Final Report or Exam		
Pre-request Course	None		
References	Jeffrey M. Wooldridge, Introductory Econometrics: A Modern Approach, 4 th Edition, Tsinghua University Press, 2009.		

Course Introduction

Code	083521	Teaching Hours	32
Course	Decision Modeling and Analysis with MS Excel		
Key Words	Decision Modeling, Decision Analysis, Excel Applications		
Purpose and Role of the Course	The main objective of this course is to learn basic skills using Microsoft Excel to model business problems and using some Excel add-in software to analyze some decision making problems in business environments. Based on the models constructed on Excel Spreadsheet, students can analyze some decision problems in real world. In addition, the course also provides some advanced add-ins (Solver, Crystal Ball, @Risk, and Treeplan, Extend LT et al.) to analyze some advanced business decision making problems. The course also can help students to do some research problems.		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction Models and Modeling and Spreadsheet Modeling (2 hours) 2. Linear Optimization with Excel Spreadsheet (Linear Programming 1) (6 Hours) (student assignment 1: case study) 3. Decision Analysis 1 (5 Hours) 4. Monte Carlo Simulation 1 (6 Hours) (student assignment 2: case study) 5 Discrete event Simulation (5 Hours) 6. Multi-Objective Decision Making and Heuristics (AHP) (2 Hours) 7. Forecasting 1 (Time Serials Forecasting) (4 Hours) 8. Project Management: PERT and CPM (2 Hours) (student assignment 3: case study) 		
Teach Method	Lecture notes will be presented through PowerPoint files and different case studies, together with some practices on computers. Classroom discussion and student positive participation are required and welcomed.		
Test and Examination	70%: Two Course Reports and One Case Study 20%: Students classroom discussion 10%: Students Attendance Records		
Pre-request Course	Operations Research Production and Operations Management.		
References	<ol style="list-style-type: none"> 1. Moore JH, and Weatherford LR, Decision Modeling with Microsoft Excel, 6rd Edition, Upper Saddle River, New Jersey 07453, Prentice Hall, 2001 2. Hillier F.S. and Hillier M.S., Introduction to Management Science. 2th, Edition, McGraw-Hill Company, 2006. 		

Course Introduction

Code	083524	Teaching Hours	32
Course	Modern Heuristic Optimization Theory and Algorithms		
Key Words	Optimization Theory, Heuristic Algorithm		
Purpose and Role of the Course	<p>This course is the supplement and extension of classic optimization theories. The fundamentals of combinatorial optimizations, the basic principles and algorithms design of modern heuristic optimization methods, as well as their applications in engineering and management realms, are introduced in this course. The aim of this course is to provide efficient solving tools and approaches for complicated engineering and management optimization problems, especially for combinatorial optimization problems.</p> <p>Through the study of this course, students are required to</p> <p>(1) grasp the basic principles and algorithmic processes of heuristic optimization methods which are used extensively in various fields, including Genetic Algorithms, Simulated Annealing, Particle Swarm Optimization, and Ant Colony Optimization. And</p> <p>(2) be able to design efficient heuristic optimization algorithms to solve complicated engineering or management problems.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1 Introduction to modern heuristic search methods (1 hours)</p> <p>Chapter 2 Genetic Algorithms (8 hours)</p> <p>Chapter 3 Simulated Annealing (8 hours)</p> <p>Chapter 4 Particle Swarm Optimization (8 hours)</p> <p>Chapter 5 Ant Colony Optimization (7 hours)</p>		
Teach Method	Lecture with teacher in classroom mainly, assisted with references reading and class discussion		
Test and Examination	Attendance 10%, Assignments 40%, Course report 50%		
Pre-request Course	Operational Research or Optimization Theory and Methods or Mathematical Programming		
References	<p>[1] Pham D T, and Karabaga D. Intelligent Optimisation Techniques. Springer-Verlag, 2000</p> <p>[2] Kwang Y Lee, and Mohamed A EI-Sharkawi. Modern Heuristic Optimization Techniques. IEEE Press, 2008</p> <p>[3] James Kennedy, and Russell C Eberhart. Swarm Intelligence. Academic Press, 2001</p> <p>[4] Dorigo M, and Stützle T. Ant Colony Optimization. The MIT Press, 2004</p>		

Course Introduction

Code	083530	Teaching Hours	32
Course	International Trade		
Key Words	Theory, Policy, Method, Facts		
Purpose and Role of the Course	<p>The course will be an overview of international trade theory and policy. The goal is to expose the student to the basic facts of international trade theory, the political economy of international trade policy, the usage of the corresponding models to the analysis of international trade policies, and also the evidence from typical countries and enterprises respectively.</p> <p>The course will help the students to understand what determines the flow of goods across countries, i.e. international trade. The world is now deeply into the second great wave of globalization, in which product, capital and labor markets are becoming more and more integrated across countries. As the world becomes more integrated, countries become more interdependent. Increasingly, events and policy changes in one country affect many other countries. Also increasingly, companies make decisions about production and product development based on global markets. In the course we will both cover the basic tools and some topics of current interest.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction 2. The Law of Comparative Advantage 3. The Standard Theory of International Trade 4. Demand and Supply, Offer Curves, and the Terms of Trade 5. Factor Endowments and the Heckscher-Ohlin Theory 6. Economies of Scale, Imperfect Competition and International Trade 7. Economic Growth and International Trade 8. Trade Restrictions: Tariffs 9. Nontariff Trade Barriers and the New Protectionism 10. Economic Integration: Customs Unions and Free Trade Areas 11. International Trade and Economic Development 12. International Resource Movements and Multinational Corporations 		<ol style="list-style-type: none"> 2 hour 2 hours 2 hours 3 hours 3 hours 4 hours 3 hours 4 hours 3 hours 2 hours 2 hours 2 hours
Teach Method	<p>Way of teaching: lectures will contribute about 70% of the total teaching period. Cases study and class problems practice will contribute around 20% and 10% respectively.</p> <p>Way of learning: students are expected to prepare reading materials as indicated by lecturers prior to attend the class, take key notes and to participate in class discussion actively throughout the subject.</p>		
Test and Examination	Students will be required to form teams for the purpose of class discussion, negotiation and exercises. Assessment will be based on a 5,000-word midterm paper (50%) and a case report (50%).		
Pre-request Course	Micro and Macro Economics		
References	<p>Reference books:</p> <p>Dominick Salvatore, International Economics, 10th Edition, Tsinghua University Press, 2011.1</p> <p>Charles W. L. Hill, International Trade Theory, 6th Edition, Beijing: Posts & Telecom Press, 2008.3</p> <p>Thomas A. Pugel, International Trade, 12th Edition, Beijing: Renmin University Press, 2005.2</p> <p>Reading Materials:</p> <p>Electronic Sources (www.wto.org, www.worldbank.org, www.oecd.org, www.unctad.org, www.intracen.org/tradstat, etc.)</p> <p>Print Sources (journal papers)</p>		

Course Introduction

Code	083535	Teaching Hours	32
Course	Human Resource Management		
Key Words	Human Resource Management, Competency model,, Performance management,		
Purpose and Role of the Course	<p>This course is designed to provide a comprehensive introduction on human resource management (HRM) methods, practice and research for foreign students in BUAA. Students are expected to develop the understanding of the linkage between HRM and competitive advantages of an organization and the abilities of analyzing employee management problems in practice, and grasp critical techniques of human resource management, e.g., competency modeling, staffing, performance management, compensation management and so on. Students also have opportunities to learn the frontiers of HRM research and basic research methods in human resource management.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction to HRM (3 hours) 2. Competency modeling and Job analysis (3 hours) 3. Human Resources Planning and Recruitment (4 hours) 4. Personnel Assessment (2 hours) 5. Performance management (4 hours) 6. Compensation and benefits management (3 hours) 7. Human resource development and Career management (4 hours) 8. Employee relations management (2 hours) 9. Organizational culture and HRM (3 hours) 10. Cross-culture HRM (4 hours) 		
Teach Method	Class lectures, case analysis, paper presentation and discussion, simulation and exercises		
Test and Examination	<ol style="list-style-type: none"> 1. Class participation 40% 2. Group assignment and presentation 30% 3. Individual Essay and Paper 30% 		
Pre-request Course	Management, Organizational behavior		

Course Introduction

Code	083538	Teaching Hours	32
Course	Retail Management		
Key Words	Retail decision making, multichannel retailing, marketing strategy		
Purpose and Role of the Course	<p>This course is designed to explore all facets of the retail industry from the functions retailers perform to a comparison of store types, to strategic decisions retailers make, to tactical decisions. Case discussions and group activities will be involved</p> <p>Objective:</p> <ol style="list-style-type: none"> 1. To critically analyze the retailing process, the environment within which it operates, and the institutions and functions that are performed. 2. To provide a foundation for those students who plan to work in retailing or related disciplines. 		
Main Chapters and Teaching Hours	<p>Chapter 1: Introduction to the World of Retailing and Retail Decision Making (6 hours)</p> <p>Chapter 2: Types of Retailers (3 hours) video and case discussion</p> <p>Chapter 3: Multichannel Retailing Case discussion(3 hours)</p> <p>Chapter 4: Retail Market Strategy (3 hours)</p> <p>Chapter 5: Retail Locations and Retail Site Location Video Case (3 hours)</p> <p>Chapter 6: Store Layout, Design, and Visual Merchandising (3 hours)</p> <p>Chapter 7: CRM (2 hours)</p> <p>Store visiting (3 hours)</p> <p>Store visiting discussion (6 hours)</p>		
Teach Method	Lecture, Videos and Case discussions, as well as group activities will be involved		
Test and Examination	Class participate/ discussion	20%	
	Store visiting and presentation	40%	
	Assignment	40%	
Pre-request Course	none		
References	<p><i>Retailing Management</i> by Levy and Weitz, Irwin/McGraw Hill</p> <p>Some materials may be posted on Web, so please check the site before the class time. Also, a few materials may be handed out in class.</p>		

Course Introduction

Code	083546	Teaching Hours	32
Course	Economics of Electronic Commerce		
Key Words	E-business, network economy, social media, software pricing, marketing strategy		
Purpose and Role of the Course	<p>This course provides fundamental understandings of economics in contemporary electronic commerce led by Apple, Google, Facebook, etc. The course covers a line of electronic business models such as search engine advertising, software versioning, product seeding, two-sided market, crowdsourcing contest, user-generated content, social media, online retailing, and China's electronic commerce industry. Each session of class would focus on one specific business model and students are supposed to participate through in-class presentations and discussions.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction to electronic commerce TODAY. 2. Money making in the era of FREE - Google. 3. Software Versioning - Microsoft . 4. Social Networks - Facebook. 5. Two-sided market – Apple AppStore 6. Crowdsourcing contest. – Innocentive. 7. Mid-term examination. 8. User-generated content – Wikipedia. 9. Online retailing – Amazon. 10. China's electronic commerce – Baidu. 11. China's electronic commerce – Alibaba. 12. China's electronic commerce – Tencent. 13. Course review 14. Final exam. 		
Teach Method	<p>In-class presentations by the lecturer and the student groups. Students will also learn through games and computer-based experiments.</p>		
Test and Examination	<p>Student group presentation Mid-term Exam Final Exam.</p>		
Pre-request Course	N/A		
References	Background readings and teaching cases will be distributed before each class.		

Course Introduction

Code	083547	Teaching Hours	16
Course	Scientific Thesis Writing		
Key Words	Research Paper, Thesis paper, Report paper		
Purpose and Role of the Course	The course provides overall information, aspects and techniques about the writing of the Scientific/Research papers, including: Basic information about the research paper, Choosing a Topic, The library, The thesis and the outline, Using the computer in your research, Doing the research, Transforming the notes into a rough draft, Revising your rough draft, The MLA, APA and CMS systems of documentation. After learning the course, the students are able to know the difference of the scientific thesis from other papers, the basic procedures of finishing an available scientific thesis.		
Main Chapters and Teaching Hours		Class hours	
	Chapter 1: Basic information about the research paper		1
	Chapter 2: Choosing a Topic		1
	Chapter 3: The library		1
	Chapter 4: The thesis and the outline		1
	Chapter 5: Using the computer in your research		2
	Chapter 6: Doing the research		2
	Chapter 7: Transforming the notes into a rough draft		2
	Chapter 8: Revising your rough draft		2
	Chapter 9: The MLA, APA and CMS systems of documentation		2
	Chapter10: Sample students papers		2
Teach Method	Lectures will be presented mainly by PowerPoint PPT files with videos and pictures. Paper reading, Question-and-answer and assignments are also needed.		
Test and Examination	1、Q&A : 10% 2、Practice: 40% 3、Final Exam: 50%		
Pre-request Course	None		
References	Anthony C. Winkler, Jo Ray McCuen-Metherell. Writing the Research Paper (A Handbook), Seventh Edition. Peking University Press. 2012.		

Course Introduction

Code	083545	Teaching Hours	32
Course	Organizational Behavior		
Key Words	Organizational behavior, individual, group and team, organization		
Purpose and Role of the Course	<p>This course is designed to provide the students with a foundation of knowledge and skills that could be applied to understand and manage the people side of work organizations. In this course, the students will have a chance to be acquainted of fundamental concepts, theories and practice about the nature and dynamics of individual, group and organization. And also, the students will learn how to conduct organizational behavior research. After the completion of this course, the students are expected to:</p> <ul style="list-style-type: none"> (a) have a comprehensive and systematic understanding about the people-related phenomena in organizational context; (b) develop their skills in the analysis and understanding of organizational behavior; (c) Apply the knowledge and skills learned in this course in order to take more effective action in the organizational context and succeed through people skills; (d) be able to conduct some basic research in organizational behavior. 		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction to organizational behavior (2 hours) 2. Social perception, attribution and attitude (3 hours) 3. Judgment and decision making (3 hours) 4. Individual difference (3 hours) 5. People and organization (3 hours) 6. Motivation (3 hours) 7. Group and team (3 hours) 8. Communication and conflict management (3 hours) 9. Leadership and influence (3 hours) 10. organizational structure and change (3 hours) 11. organizational culture and cross-cultural OB (3 hours) 		
Teach Method	Class lectures, case analysis, paper discussion, simulation and exercises		
Test and Examination	<ol style="list-style-type: none"> 1. Class participation 40% 2. Assignment and presentation 30% 3. Individual Essay and Paper 30% 		
Pre-request Course	Management		

Course Introduction

Code	083548	Teaching Hours	32
Course	International Economics		
Key Words	Theory of absolute advantage, Theory of comparative advantage, H-O theory, Balanced and biased growth, Conditions for international trade, Technology trade, Trade protection, Tariff and non-tariff barriers for trade, import substitution, Institutions governing exchange rates, International payments, Factor mobility, International investment and transnational corporation		
Purpose and Role of the Course	<p>The course is designed to meet the need of master students in applied economics. Students will be prepared with the professional skills of:</p> <ul style="list-style-type: none"> ✓ Analyzing typical phenomenon and issues during international economic development, including the rule and policy of internal trade, the relationship between international trade and economic growth, tariff and non-tariff barriers for international trade, theories of international exchanges rates, the effect of change in exchange rates and policy, international flow of production factors, foreign direct investment, formation of transnational corporation, and etc. ✓ Comprehensive knowledge about international economic corporation. ✓ Mastering the complicated international factors affecting local economic development from an macroeconomic perspective. 		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction (3 hrs) 2. Comparative advantages and the theories of international trade (3hrs) 3. Advantages and disadvantages of international trade (3hrs) 4. International trade and economic growth (3hrs) 5. Tariff and non-tariff barriers for international trade (3hrs) 6. The trade policy of development countries and transition countries (3 hrs) 7. International monetary system and the institutions governing exchanges rates (3 hrs) 8. Balance of international income and payments (3hrs) 9. Theories of exchanges rate (3hrs) 10. International mobility of factors (3hrs) 11. Foreign Direct Investment (FDI) and transnational corporation (3hrs) 12. Course Review (1hr) 		
Teach Method	Lecturing, classroom discussion, case study, group work on designated topics.		
Test and Examination	80% for final term exam, 20% for case study report		
Pre-request Course	Macro economics, Micro economics		
References	Dminick Salvatore. (2005) International Economics, 8 th Edition. Tshinghua University Press Paul R. Krugman & Maurice Obstfeld (2006). International Economics: Theory and Policy, 6 th Edition. Tshinghua University Press		


Course Introduction

Code	083549	Teaching Hours	32
Course	Management Information Systems		
Key Words	Information Systems, Information Management, Data Management, emerging IT		
Purpose and Role of the Course	The main objective of this course is to learn basic knowledge and theory in data, information and knowledge management with internet-based business environment. Students need to learn how organization or enterprise in new IT to management and building the information systems and help them to improve the decision making effectiveness and efficiency. The role of this course is fundamental for advanced course study.		
Main Chapters and Teaching Hours	PART ONE: Organization, Management, and the Networked Enterprise (8 Hours) PART TWO: Information Technology Infrastructure (8 Hours) PART THREE: Key Systems Application for the Digital Age (8 hours) PART FOUR: Building and Managing Systems (8 hour)		
Teach Method	Lecture notes will be presented through PowerPoint files and different case studies, together with some practices on computers. Student's presentations will be included in classroom. Classroom discussion and student positive participation are required and welcomed.		
Test and Examination	60%: Two Course Reports and One Case Study Report 30%: Students classroom discussion and presentations 10%: Students Attendance Records		
Pre-request Course	Introduction to Database. Computer Basic Knowledge		
References	KC. Laudon and JP Laudon,2010. Management Information Systems. Pearson Education Group. JA. O'Brien and GM.Marakas, 2010. Management Information Systems. McGraw-Hill Company.		

Course Introduction

Code	083551	Teaching Hours	32
Course	Engineering Economy		
Key Words	Time value of money; cash flow analysis; comparison & selection of multiple projects; depreciation and income taxes; sensitivity analysis		
Purpose and Role of the Course	Engineering Economy is the primary course for students from School of Engineering and Business as it provides a sound basis for them to make a decision among a number of alternatives. It plays a key role in the course list of School of Economics and Management.		
Main Chapters and Teaching Hours	<p>Introduction to Engineering Economy (2)</p> <p>Concepts of Cost, Single Variable Trade-off Analysis, and Present Economy (4)</p> <p>Time Value of Money (4)</p> <p>Cost and Cash Flow Estimation Techniques (4)</p> <p>Evaluating a Single Project (2)</p> <p>Comparison and Selection among Alternatives (4)</p> <p>Breakeven and Sensitivity Analysis (3)</p> <p>Depreciation and Income Taxes (5)</p> <p>Multi-attribute Decision Making (2)</p>		
Teach Method	Based on the teaching of the instructor, this course incorporates the homework and mid-term to enhance the knowledge transfer.		
Test and Examination	<p>Homework (20%)</p> <p>Mid-term Exam (30%)</p> <p>Final Exam (50%)</p>		
Pre-request Course	No		
References	<ol style="list-style-type: none"> 1. Sullivan, W. G., Wicks, E. M., and Koelling, C. P. (2015). Engineering Economy (15th Edition). Pearson, Upper Saddle River, NJ, United States. 2. Fleischer, G. A. (1994). Introduction to Engineering Economy. PWS Publishing. 3. Whitman, D. and Terry, R. (2012). Fundamental of Engineering Economics and Decision Analysis. Morgan & Claypool Publishers. 		

CURRICULA OUTLINE

COURSE NUMBER	083554	
COURSE NAME	ELECTRONIC COMMERCE	
LECTURER	CHEN JING	
HOURS	32	
CREDITS	2	
COURSE PROPERTY	<input type="checkbox"/> Compulsory <input type="checkbox"/> Elective <input type="checkbox"/> Lecture	
KEYWORDS	Electronic Commerce, Information Technologies	
COURSE DESCRIPTION	<p>Information technologies have significantly reshaped the business landscape in the past two decades, generating new business opportunities both online and offline. A knowledge and understanding of electronic commerce is therefore a prerequisite for almost any future business talent to develop business plans and conduct business practices. This course will equip students a solid basis for further explorations and practices in relevant fields. Students with knowledge background on management are preferred, but no prior knowledge on electronic commerce is required.</p>	
COURSE OBJECTIVE	<p>This course is designed to provide graduate students with an overview of electronic commerce practices. Through the learning, students are expected to understand basic business strategies for electronic commerce, key technologies for electronic commerce, the status quo of electronic commerce industry.</p>	
CONTENTS and ARRANGEMENTS	<p>Chapter 1 Introduction Chapter 2 E-Commerce Platforms and Applications Chapter 3 E-Commerce Business Models Chapter 4 E-Commerce Strategy Chapter 5 Selling on the Web Chapter 6 Marketing on the Web Chapter 7 Mobile Commerce Chapter 8 E-Commerce and Social Media Chapter 9 E-Commerce and Society Chapter 10 Environment of E-Commerce Chapter 11 E-Commerce Trends</p>	
TEACHING METHODS	<ul style="list-style-type: none"> ■ Way of teaching: lectures will contribute about 70% of the total teaching period. Case discussions and project presentations will contribute around 20% and 10% respectively. ■ Way of learning: students are expected to prepare reading materials as indicated by the lecturer prior to attend the class, take key notes and to participate in class discussion actively throughout the subject. 	


COURSE ASSESSMENT	Attendance 10%, Project Report and Presentation 40%, Final Examination 50%
PREQUISITE	MANAGEMENT
REFERENCES	<ul style="list-style-type: none"> ■ Textbook: Gary Schneider, Electronic Commerce, (11th Edition), Course Technology, May 2014 ■ Reference materials <ul style="list-style-type: none"> ■ Efraim Turban, Electronic Commerce 2012: Managerial and Social Networks Perspectives (7th Edition), Prentice Hall, October 2011

CURRICULA OUTLINE

COURSE NUMBER	083555	
COURSE NAME	Applied Statistics	
LECTURER	Yingying Ma	
HOURS	32	
CREDITS	2	
COURSE PROPERTY	<input checked="" type="checkbox"/> Compulsory <input type="checkbox"/> Elective <input type="checkbox"/> Lecture	
KEYWORDS	Generalized Linear/Linear regression, estimation, case studies	
COURSE DESCRIPTION	This course is an introduction to applied statistics and data analysis with statistical software. Topics include collecting and exploring data, estimation and test, simple and multiple linear regression, diagnostics of regression, generalized linear regression and time series	
COURSE OBJECTIVE	It is a course with sufficient emphasis on applications and practical issues at the intermediate or beginning graduate level. It is not a course in statistics, but provides an introduction to applied statistics.	
CONTENTS and ARRANGEMENTS	1. Introduction to statistical software and Basic Operation 2. Summarizing and Exploring Data 3. Estimation and Test 4. Linear Regression 5. Diagnostics and Alternative Methods of Regression 6. Generalized Linear Regression 7. Time Series Analysis 8. Conclusion and Presentation	2 hours 2 hours 4 hours 6 hours 4 hours 4 hours 6 hours 4 hours
TEACHING METHODS	Material is presented through its comprehensive set of lecture notes. Students receive hands-on experience with statistical software R through the assignments and with examples in	

	the lecture notes.
COURSE ASSESSMENT	1. Assignments : 40% 3. Final Exam:60%
PREQUISITE	None
REFERENCES	David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Jeffrey D. Camm and James J. Cochran. <i>Statistics for Business& Econometrics</i> . R download: https://www.r-project.org

CURRICULA OUTLINE

COURSE NUMBER	083556	
COURSE NAME	Ergonomics and work organization	
LECTURER	CHEN Zhe	
HOURS	36	
CREDITS	2	
COURSE PROPERTY	<input checked="" type="checkbox"/> Compulsory <input type="checkbox"/> Elective <input type="checkbox"/> Lecture	
KEYWORDS	Ergonomics, work organization, culture difference	
COURSE DESCRIPTION	Ergonomics help people understand and optimize the interaction among human and other elements of a system (e.g. computer), especially useful to help to design a user-friendly system or product. Work organization help people to work with efficiency and satisfaction.	
COURSE OBJECTIVE	The objective of this course is 1) to understand the ergonomics and work organization 2) to learn the tools and process to evaluate and design a user-friendly system/product.	
CONTENTS and ARRANGEMENTS	Chapter 1 Introduction Chapter 2 Human Body Chapter 3 The System Chapter 4 Culture difference Chapter 5 Evaluation principles Chapter 6 Evaluation techniques Chapter 7 Development process Chapter 8 Design issues Chapter 9 Work organization	
TEACHING METHODS	Lectures will contribute about 60% of the total teaching period. Course project and class discussion will contribute about 40%.	
COURSE ASSESSMENT	Attendance 20%, Reports 50%, Examination 30%	
PREQUISITE	None	
REFERENCES	<ul style="list-style-type: none"> ■ Human-Computer Interaction, Alan Dix ■ Designing the User Interface : Strategies for Effective Human-Computer Interaction, Ben Shneiderman, Catherine Plaisant 	

Course Catalogue for International Postgraduates

(School of Humanities and Social Sciences)

编号 No.	英文课程名称 Course Title	中文课程名称 Course Title	学时 Hours	学分 Credits	开课季节 Semester	任课教师 Lecturer
113002	The Study of Organization's Theory	组织理论研究	36	2	Spring	Yan Hongqin
113005	Theory of Governance	治理理论	32	2	Fall	Ren Bingqiang
113004	Human Resource Management	人力资源管理	32	2	Fall	Xie Lingling
113006	Government Public Relation	政府公共关系专题	32	2	Fall	LI Danyang
113024	Quantitative Research Method of Education	教育定量研究方法	32	2	Fall	Yu Xiaomin
111502	Economics of education	教育经济学	32	2	Spring	Ma Yonghong
111506	Instructional Media	教育媒体技术与实验	32	2	Spring	Fan Wenqiang
111511	Introduction of Science and Technology Center	科技馆概论	32	2	Spring	Yu Xiaomin
113014	The Advanced Research of Social Security	社会保障前沿专题研究	32	2	Fall	Jia Hongbo
111515	Digital Science Communication	数字化科普	32	2	Spring	Fan Wenqiang
113026	Comparative Higher Education	比较高等教育	32	2	Fall	Bao Yanhua
111521	Administration Management of Contemporary China	当代中国行政管理前沿	32	2	Spring	Hu Xiangming
113003	Quantitative method and model	定量研究方法建模	32	2	Fall	Wang Junxia
111315	Senior Research Methods of Education	高级教育研究方法	32	2	Spring	Liu Yang
111321	Theories of public administration	公共管理理论	32	2	Fall	Tu Xiaofang
111381	The Theory of the Latest Issues of Public Management	公共管理前沿理论	32	2	Fall	Hu Xiangming
111322	Public Policy Analysis	公共政策分析	32	2	Spring	Fang Weihua
111371	History of Economic Thought	经济思想史	48	3	Spring	Huang Yan
113041	Qualitative research method of education	教育的质性研究方法	32	2	Fall	

113023	Research Writing & Practice, Education	教育研究综合实践	48	3	Fall	Liu Yang
111309	Science Communication and Science Popularization	科学传播与科学普及	32	2	Fall	Tian Hua
111534	Philosophy of Science and Philosophy of technology	科学哲学与技术哲学	32	2	Fall	Han Lianqing
111320	Organizational Management	组织管理学	32	2	Fall	Yan Hongqin
113025	Theory of Educational Management	教育管理理论	48	3	Fall	Song Zhongying
111523	Frontier Research on Human Resource Management	人力资源管理前沿研究	32	2	Fall	Xie Lingling
111525	Governance Theory	治理理论	32	2	Fall	Ren Bingqiang
111330	History of Philosophy	哲学史	48	3	Fall	Wang Na
111532	Research on Classics in Dialectics of Nature	自然辩证法经典研读	32	2	Fall	Wang Yan
111536	Science and Technology Policy and Management	科技政策与管理	32	2	Spring	Wu Sizhong
111533	Sociology of Science-technology	科学技术社会学	32	2	Spring	Xu Zhili
111524	An Research To Public Project Management	公共项目管理专题	32	2	Spring	Yang Aihua
113007	Qualitative method and the study design	定性方法与研究设计	32	2	Fall	Yang Lihua
111838	High-Technology Strategy and Knowledge Management	高科技战略与知识管理	32	2	Spring	Zhang Yan
111537	Technology Innovation Study	技术创新研究	32	2	Spring	Zhang Yan
111310	Philosophy of higher education	高等教育哲学	32	2	Fall	Zhao Tingting
111301	Principal of education	教育学原理	32	2	Fall	Zhao Tingting
111526	Nonprofit Organization Management	非营利组织管理	32	2	Spring	Cao Qingping
113001	Public Administration	公共管理理论	48	3	Fall	Tu Xiaofang
113021	Educational psychology	教育心理学	32	2	Fall	Wang Hang
113022	Principles of Higher Education	高等教育原理	48	3	Fall	Bao Yanhua

Course Introduction

Code	113002	Teaching Hours	36
Course	The Study of Organization's Theory		
Key Words	macro-problems; comprehensive questions; fundamental topics		
Purpose and Role of the Course	<p>This course is one of the two researches concerning organization studies, which differs from Organizational Behavioral Science. It mainly discusses the macro-problems, comprehensive questions and fundamental topics on organizations, including the structure, culture, reform and innovation of organizations.</p> <p>Students would acquire knowledge of the macro-problems, comprehensive questions and fundamental topics on organization, and their own opinions about those questions will be formed. This course would attribute to students' further works on organization management in practice or researches concerning organization studies.</p>		
Main Chapters and Teaching Hours	<p>1 Individuals and organizations</p> <p>1.1 The motivation of Joining Organizations</p> <p>1.2 Main ideas about human behaviors in organizations.</p>		
Teach Method	<p>This course would be accomplished by teacher and students together. The professor teaches main gist of each session, and assigns required readings and discussion topics to the students. Students will be separated into different groups, and all the members of each group are required to cooperate for accomplishment of the assigned task.</p>		
Test and Examination	<p>1. Homework 40%</p> <p>2. Final exam (open book) 60%</p>		
Pre-request Course	<p>Basic knowledge of Management is required.</p> <p>Familiar with the development history of organization research.</p>		
References	<p>[1] W. Richard Scott. Organizations: Rational, Natural, and Open Systems 4th Ed. Beijing: HuaXia Press, 2002</p>		

Course Introduction

Code	113005	Teaching Hours	32
Course	Theory of Governance		
Key Words	Governance; Participation; Globalization		
Purpose and Role of the Course	<p>The purpose of the course is to make the graduate students for master degree have a deep understanding of the theory of governance. Governance theory is one of the most advanced theory in the public management. By studying the course, the students could re-think the role of the government and the complicated problems it facing, think about the solutions for social and political problems by creative ideas</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction to governance theory 2. Governance and Common-pool resources theory 3. Governance and social capital theory 4. Globalization and global governance 5. EU's governance 6. New public administration and governance 7. Non-government Organizations(NGOs) and governance 8. Public participation and governance 9. Governance in rural and urban communities in China 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 10% 2. Final exam 90% 		
Pre-request Course	Knowledge of government and other basic political theories		

References	<p>[1] Elinor Ostrom, <i>Governing the commons: the evolution of institutions for collective action</i>, Cambridge Univ. Press, 1990. (Chinese edition, Shanghai:shanlian Press, 2000.)</p> <p>[2] Robert Putnam, <i>Making democracy work</i>, Preceton University Press, 1993(Chinese edition, Jiangxi Renmin Chubanshe, 2000.) Chapter1, 4, 5,6.</p> <p>[3] David Held, Anthony McGrew, D. Goldblatt, J. Perration, <i>Golbal Transformations: Politics, Economics, and Culture</i>, Stanford University Press; 1 edition (April 1, 1999)(Chinese edition 戴维·赫尔德等:《全球大变革: 全球化时代的政治、经济与文化》, 社会科学文献出版社, 2001). Chapter 1.</p> <p>[4]B.Guy Peters, <i>The future of governing</i>, University Press of Kansas, 2001. (Chinese edition, 彼德斯:《政府未来治理的模式》, 中国人民大学出版社, 2001).</p> <p>[5]Lester M. Salamon, <i>Partners in Public Service: Government-Nonprofit Relations in the Modern Welfare State</i>, The Johns Hopkins University Press (April 1, 1995) (Chinese edition, 莱斯特·萨拉蒙:《公共服务中的伙伴关系——现代福利国家中政府与非营利组织的关系》, 商务出版社, 2008, 第一章和第二章)</p>
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Course Introduction

Code	113004	Teaching Hours	32
Course	Human Resource Management		
Key Words	human resource; theory; frontier		
Purpose and Role of the Course	<p>An introduction to the human resources function and related elements and activities. The course will focus on such subjects as the selection process, compensation, performance management.</p> <ul style="list-style-type: none"> • Recognize and appreciate importance of effective Human Resource Management • Understand the key functions of the Human Resource Management • Become familiar with Human Resource Management in China 		
Main Chapters and Teaching Hours	<p>Chapter 1: Introduction Chapter 2 Indigenous Study on HRM Research in China(1) Chapter 3: Performance Appraisal Chapter 4: Compensation Management Chapter 5: HRM in SOE/PE/FE Chapter 6: HRM of M&A Chapter 7: Strategic Human Resource Management Chapter 8: Indigenous Study on HRM Research in China(2)</p>		
Teach Method	The course is given in the form of class lectures and case study.		
Test and Examination	<p>1. Homework 2. Final exam (open book)</p>		
Pre-request Course			
References			

Course Introduction

Code	113006	Teaching Hours	36
Course	Government Public Relations		
Key Words	Government; public relations; public administration		
Purpose and Role of the Course	<p>In the 21st century, governments play a more and more important role in the development of society. During this process, they have to communicate with private sector and civil society as well. Everyone who wants to become a leader in modern government should learn something about government public relations. Because it helps government to live in harmony with other sectors and facilitates governments in public management and public policy. This course focuses on several hot and vital issues the governments (i.e. Chinese government) are facing nowadays. Through learning and researching the graduate students are anticipated to have a full image of this field.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction: the coming of the era of Government Public Relations <ol style="list-style-type: none"> 1.1 selected government public relations cases 1.2 introduction to public relations and government public relations 1.3 the background of the coming of the era of government public relations 1.4 the implications of the era of government public relations 2. Government Public Relations and the Building of Government Images <ol style="list-style-type: none"> 2.1 the essential factors of government images 2.2 the CIS system and building strategy of government public relations 2.3 cases seminar on government image building 3. Government's Mass Public Relations <ol style="list-style-type: none"> 3.1 government's internal mass public relations 3.2 government's external mass public relations 3.3 government's international public relations 3.4 cases seminar on government's mass public relations 4. Government's Media Public Relations <ol style="list-style-type: none"> 4.1 the importance of government's media public relations 4.2 understanding the media 4.3 the principles and strategies of government's media public relations 4.4 seminar on government's mass public relations 5. Government's Network Public Relations <ol style="list-style-type: none"> 5.1 the concept of government's network public relations 5.2 network society's impact on government 5.3 Chinese government's network public relations 5.4 seminar on government's network public relations 5.5 simulation on designing a plan of government's network public relations 6. The Issue Design and Arrangement of Government Public Relations <ol style="list-style-type: none"> 6.1 publishing and exhibiting activities in government public relations 6.2 participation and experiencing activities in government public relations 6.3 discussion, simulation and presentation 		

	<p>7. The Strategic and Practice of Government Crisis Public Relations</p> <p>7.1 the outline of government crisis public relations</p> <p>7.2 government crisis public relations to victim-crisis</p> <p>7.3 government crisis public relations to media-crisis</p> <p>7.4 government crisis public relations to society-crisis</p> <p>7.5 cases analysis and discussion</p> <p>8. The Planning of Government Public Relations</p> <p>8.1 the content of the planning of government public relations</p> <p>8.2 the procedure of the planning of government public relations</p> <p>8.3 the design and presentation of the planning of government public relations</p> <p>9. The Etiquette in Government Activities</p> <p>9.1 the importance of etiquette in government activities</p> <p>9.2 detailed etiquettes in Chinese government activities</p> <p>9.3 detailed etiquettes in Chinese society</p>
Teach Method	The course is given in the forms of class lectures, seminars, cases discussions, and presentations.
Test and Examination	<p>1. statistics of attendant 10%</p> <p>2. presentation in class 40%</p> <p>3. final paper 50%</p>
Pre-request Course	Knowledge of basic politics, public administration, and public relations and the curiosity to explore an emerging field.
References	<p>[1]Jun Tang, the strategy and practice of government public relations, China Media University Press,2008.</p> <p>[2]Wendu Zhan, government public relations, South China Univeristy of Science and Technology Press,2004.</p> <p>[3]Fraser P. Seitel, the practice of public relations, Mechanical Industry Press,2004.</p> <p>[4]Otis Baskin, Craig Aronoff, Dan Lattimore, public relations: career and practice, Renmin University Press,2008.</p>

Course Introduction

Code	111304	Teaching Hours	32
Course	Quantitative methods in educational research		
Key Words	Survey, Data Description, Factor analysis, Regression		
Purpose and Role of the Course	<p>This course is a compulsory course opened to the graduates majored in Educational Economics and Management, and Educational Technology by the Institute for Higher Education in the School of Humanities and Social Sciences.</p> <p>The course of quantitative methods in educational research was focused on the educational research, aimed to help the graduate students to carry out their master's thesis by statistical methods. The course departure from the principle of statistical data around the field of educational research questionnaire development, data collection, reliability and validity analysis, factor analysis and regression model building.</p> <p>This course introduces some commonly methods in quantitative researches, including: 1) quantitative study design; 2) questionnaire developing and distribution; 3) reliability and validity analysis; 4) Exploratory factor analysis and Confirmatory factor analysis; 5) Correlation Analysis; 6) Regression Analysis.</p> <p>This course will enhance the basic operation capabilities of the graduate in conducting quantitative research. And also, this course will help the students to improve their ability of students to use SPSS, EXCEL and AMOS in dealing with research data, hypothesis testing and interpretation of results of data analysis.</p>		
Main Chapters and Teaching Hours	<p>Chapter I Introduction to Research method</p> <p>Chapter II Data</p> <p>Chapter III Questionnaire developing and distribution</p> <p>Chapter IV Reliability and Validity analysis</p> <p>Chapter V Descriptive Analysis</p> <p>Chapter VI Correlation Analysis;</p> <p>Chapter VII Regression Analysis</p>		
Teach Method	Classroom-based lecture		
Test and Examination	Final Quantitative Research Design		
Pre-request Course	Statistics		
References	<p>[1] Wu Minglong. Wenjuan Tongjifenxi Shiwu. Chongqing University Press, 2010. (in Chinese)</p> <p>[2] Neil J.Salkind. Statistics for people who hate statistics(3rd ed). Chongqing University Press, 2011.</p> <p>[3] Rong Taisheng. SPSS and research methods, Dongbei University of Finance & Economics Press, 2012.</p>		

Course Introduction

Code	111502	Teaching Hours	32
Course	Economics of Education		
Key Words	Humam Capital Theory; Investment on Education & Return to Education; Cost & Benefit of Education		
Purpose and Role of the Course	<p>This is a one-semester course designed to introduce Economics of Education to master's degree candidates and doctoral degree candidates.</p> <p>This course aims to widen and strengthen students' basic knowledge on Education Economics, and to improve their skills on using theory and method of Education Economics to deal with some items in education field.</p>		
Main Chapters and Teaching Hours	<p>Chapter I Introduction to Economics of Education</p> <p>Chapter II Humam Capital Theory</p> <p>Chapter III Demand and Supply of Education</p> <p>Chapter IV Investment on Education</p> <p>Chapter V Efficiency of education Invest</p> <p>Chapter VI Cost & Benefit of Education</p> <p>Chapter VII Education finance</p> <p>Chapter VIII Development of Human Capital Theory</p>		
Teach Method	Seminars, reports based on projects		
Test and Examination	Reports, engagement in class, thesis		
Pre-request Course	Education Science		
References	<p>[1]Shanmai Wang . Economics of education . Beijing Normal University Press, 1995. (in Chinese)</p> <p>[2] Weifang Min. Exploring Education Reform. Peking University 2005. (in Chinese)</p> <p>[3] E.Cohn. Economics of education. Huadong Normal University Press, 1989. (in Chinese)</p>		

Course Introduction

Code	111506	Teaching Hours	32																								
Course	Instructional Media																										
Key Words	Instructional media, photography, image editing, camera shooting, video editing																										
Purpose and Role of the Course	<p>Instructional Media is one of the fundamental courses designed for the Master program of Education and the Master program of Modern Educational Technology. This course is divided into the knowledge part and the practice part. Through this course, the students are expected to: be familiar with the application of various media in the setting of education; have the ability to use common media technologies. The contents of this course include: basis concepts and fundamental theories of instructional media, projector technology, photography and image editing, electronic sound system and sound processing, camera shooting and video editing, animation, educational video programs and digital courses. This course will focus on the design and development of instructional video program.</p>																										
Main Chapters and Teaching Hours	<p>The part of knowledge:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 20px;">Chapter 1 concepts and theories of instructional media</td> <td style="text-align: right;">4hour</td> </tr> <tr> <td style="padding-left: 20px;">Chapter 2 projector technology</td> <td style="text-align: right;">1hour</td> </tr> <tr> <td style="padding-left: 20px;">Chapter 3 photography and image editing</td> <td style="text-align: right;">4hours</td> </tr> <tr> <td style="padding-left: 20px;">Chapter 4 electronic sound system and sound processing</td> <td style="text-align: right;">2hours</td> </tr> <tr> <td style="padding-left: 20px;">Chapter 5 camera shooting and video editing</td> <td style="text-align: right;">4hours</td> </tr> <tr> <td style="padding-left: 20px;">Chapter 6 animation</td> <td style="text-align: right;">1hours</td> </tr> <tr> <td style="padding-left: 20px;">Chapter 7 educational video programs</td> <td style="text-align: right;">1hour</td> </tr> <tr> <td style="padding-left: 20px;">Chapter 8 digital courses</td> <td style="text-align: right;">1hour</td> </tr> </table> <p>The part of practice:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 20px;">Activity 1 photography and image editing</td> <td style="text-align: right;">3hours</td> </tr> <tr> <td style="padding-left: 20px;">Activity 2 sound pickup and sound processing</td> <td style="text-align: right;">2hours</td> </tr> <tr> <td style="padding-left: 20px;">Activity 3 camera shooting and video editing</td> <td style="text-align: right;">5hours</td> </tr> <tr> <td style="padding-left: 20px;">Activity 4 multimedia integration</td> <td style="text-align: right;">4hours</td> </tr> </table>			Chapter 1 concepts and theories of instructional media	4hour	Chapter 2 projector technology	1hour	Chapter 3 photography and image editing	4hours	Chapter 4 electronic sound system and sound processing	2hours	Chapter 5 camera shooting and video editing	4hours	Chapter 6 animation	1hours	Chapter 7 educational video programs	1hour	Chapter 8 digital courses	1hour	Activity 1 photography and image editing	3hours	Activity 2 sound pickup and sound processing	2hours	Activity 3 camera shooting and video editing	5hours	Activity 4 multimedia integration	4hours
Chapter 1 concepts and theories of instructional media	4hour																										
Chapter 2 projector technology	1hour																										
Chapter 3 photography and image editing	4hours																										
Chapter 4 electronic sound system and sound processing	2hours																										
Chapter 5 camera shooting and video editing	4hours																										
Chapter 6 animation	1hours																										
Chapter 7 educational video programs	1hour																										
Chapter 8 digital courses	1hour																										
Activity 1 photography and image editing	3hours																										
Activity 2 sound pickup and sound processing	2hours																										
Activity 3 camera shooting and video editing	5hours																										
Activity 4 multimedia integration	4hours																										
Teach Method	<p>The part of knowledge: classroom-based lecture, case analysis. The part of practice: under the principle of task-orientation, exercise basic skills through practice tasks. Personal learning and group learning.</p>																										
Test and Examination	<p>Practice work:80% Participation and discussion:20%</p>																										
Pre-request Course	Instructional design and course development																										
References	<p>[1] Fan Wenqiang. Lecture notes on instructional media and practice. Inner teaching materials, 2010. (in Chinese) [2] Xu Fuyin, Li Yunlin, Hu Xiaoyong. Instructional media theories and practices. Beijing Normal University Press, 2010. (in Chinese) [3] Diana Laurillard (Author) Tong Kang (translator). Rethinking University Teaching(2nd Edition). East Normal University of China, 2011. (in Chinese) [4]Richard E. Mayer. Multimedia Learning. The Commercial Press,2006. (in Chinese)</p>																										

Course Introduction

Code	111511	Teaching Hours	32
Course	Introduction of Science and Technology Center		
Key Words	Science museum, Exhibition, Education activities		
Purpose and Role of the Course	<p>One of the directions of the development of the museum is Science and Technology Museum. It becomes an important platform to disseminate scientific and technological knowledge and develop intelligence. In modern times, the Science and Technology Museum is an indispensable aspect of inform education.</p> <p>The purpose of this course is to enable students to well-known the generation and development of the Science and Technology Museum. And have a clear understanding how its institutional set up and manage. The focus is enable students master how science and technology museum use its exhibitions and educational activities to arouse public interest in science and technology and to promote public understanding of science and technology.</p> <p>Introduction to science and technology museum is a professional course for science and technology education professional. This course is a core curriculum of enable students to understanding the basic procedure of science exhibition and well-known the operation and management of science enterprise and Science and Technology Museum. And further study for creativity of popular science exhibition, scheme of whole exhibition and display of content, and assessment effect of science education.</p>		
Main Chapters and Teaching Hours	<p>Chapter I General remarks to Science and Technology Museum</p> <p>Chapter II The structure and management of Science and Technology Museum</p> <p>Chapter III The exhibition activities of Science and Technology Museum</p> <p>Chapter IV The educational activities and social services of Science and Technology Museum</p> <p>Chapter V Digital science museum</p> <p>Chapter VI Assessment of Science and Technology Museum</p>		
Teach Method			
Test and Examination			
Pre-request Course			
References	<ol style="list-style-type: none"> 1. Viktor Danilova, Science and Technology Centers. Academy Press. 1989.9 2. Bernard Schiele, Science Centers for This Century. China Science and Technology Press. 2007.9 3. Editorial board of China science and technology museum, Essays of Science and Technology Museums. China Film Press. 1998.9 		

Course Introduction

Code	113014	Teaching Hours	32
Course	The Advanced Research of Social Security		
Key Words	The theory of social security, Social aging insurance, Social medical insurance		
Purpose and Role of the Course	Let students to know the basic concepts of social security and grasp tightly on the related theories. To make students know the basic concepts of social aging insurance and hold largely on the related contents and theories. To introduce the basic concepts of social medical insurance to students and make them understand the related contents and theories deeply.		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Social Security Theory 2. Social Security Development and Reform in the World 3. The Pooling Level of Basic Aging Insurance 4. The Coverage of Basic Aging Insurance and the Pension Discrimination among the different groups 5. The Replacement Rate of Basic Aging Insurance 6. Increasing the Retirement Age 7. The Existence of Individual Account in the Employee's Basic Medical Insurance 8. The Optimum Premium Rate of Basic Medical Insurance 9. Seeing a Doctor beyond the Pooling District of the Basic Medical Insurance 10. Moral Hazard in Basic Medical Insurance 		
Teach Method	Classroom-based lecture		
Test and Examination	Open book examination		
Pre-request Course	Social Security Introduction, Economics		
References	<ol style="list-style-type: none"> 1. Zheng Gongcheng, The Strategy of Social Security System Reform in China—General Theory Volume, Renmin Press, 2011. 2. Zheng Gongcheng, The Strategy of Social Security System Reform in China—Aging Insurance Volume, Renmin Press, 2011. 3. Zheng Gongcheng, The Strategy of Social Security System Reform in China—Medical Security Volume, Renmin Press, 2011. 4. Nicholas Barr, The Economics of the Welfare States, Labour and Social Security Press in China, 2003. 5. Zheng Gongcheng, The Strategy of Social Security System Reform in China—Social Assistance and Social Welfare Volume, Renmin Press, 2011. 		

Course Introduction

Code	111515	Teaching Hours	32																								
Course	Digital Science Communication																										
Key Words	Online Science Communication, Digitalization of Science Museums, Digital Resources																										
Purpose and Role of the Course	<p>Digital Science Communication is one of the courses designed for the Master program of Science and Technology Education. This course includes the knowledge part and the practice part. Through this course, the students are expected to: be familiar with the impact of digital technologies on Science Communication; be familiar with the definition and the foundation of digital science communication; know the characteristics of online science communication resources and the characteristics of online science communication activities; know the application of digital technologies in physical science museums; have the ability to development web pages, online science communication resources and activities; be familiar with the management of digital science communication projects; be familiar with the research of digital science communication; have the awareness to use digital technologies to promote the science communication; have the potential competence to take further study on this field.</p>																										
Main Chapters and Teaching Hours	<p>The part of knowledge:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Chapter 1 what is digital science communication</td> <td style="width: 20%; text-align: right;">1hour</td> </tr> <tr> <td>Chapter 2 the foundations of digital science communication</td> <td style="text-align: right;">1hour</td> </tr> <tr> <td>Chapter 3 online science communication resources</td> <td style="text-align: right;">4hours</td> </tr> <tr> <td>Chapter 4 online science communication activities</td> <td style="text-align: right;">2hours</td> </tr> <tr> <td>Chapter 5 digitalization of science museums</td> <td style="text-align: right;">2hours</td> </tr> <tr> <td>Chapter 6 digital science communication design</td> <td style="text-align: right;">6hours</td> </tr> <tr> <td>Chapter 7 digital science communication research</td> <td style="text-align: right;">1hour</td> </tr> <tr> <td>Chapter 8 management of digital science communication projects</td> <td style="text-align: right;">1hour</td> </tr> </table> <p>The part of practice:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Activity 1 development of web pages of science communication</td> <td style="width: 20%; text-align: right;">3hours</td> </tr> <tr> <td>Activity 2 design of digital science communication resources</td> <td style="text-align: right;">4hours</td> </tr> <tr> <td>Activity 3 development of digital resources</td> <td style="text-align: right;">5hours</td> </tr> <tr> <td>Activity 4 design and development of online activities</td> <td style="text-align: right;">2hours</td> </tr> </table>			Chapter 1 what is digital science communication	1hour	Chapter 2 the foundations of digital science communication	1hour	Chapter 3 online science communication resources	4hours	Chapter 4 online science communication activities	2hours	Chapter 5 digitalization of science museums	2hours	Chapter 6 digital science communication design	6hours	Chapter 7 digital science communication research	1hour	Chapter 8 management of digital science communication projects	1hour	Activity 1 development of web pages of science communication	3hours	Activity 2 design of digital science communication resources	4hours	Activity 3 development of digital resources	5hours	Activity 4 design and development of online activities	2hours
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Activity 4 design and development of online activities	2hours																										
Teach Method	<p>The part of knowledge: classroom-based lecture, case analysis, group discussion. The part of practice: under the principle of task-orientation, exercise basic skills through practice tasks.</p>																										
Test and Examination	<p>Practice work:80% Web pages:20% Digital resources:40% Online activity design:20% Participation and discussion:20%</p>																										
Pre-request Course	<p>Science communication and science popularization Instructional design and course development</p>																										
References	<p>[1]Information Center of Beijing Science and Technology Association. Innovative technology promoting digital museums. Communication University of China Press, 2012. (in Chinese) [2] Information Center of Beijing Science and Technology Association. Study and practice of digital museums. Communication University of China Press, 2009. (in Chinese) [3] Herminia Din and Phyllis Hecht (Editors). The Digital Museum: A Think Guide. Washington, DC: AAM, 2007.</p>																										

Course Introduction

Code	113026	Teaching Hours	32																																													
Course	Comparative Higher Education																																															
Key Words	Higher Education, Internationalization, International Comparisons																																															
Purpose and Role of the Course	The course is to explore the development rules of higher education and trying to conclude the common characteristics of current higher education through international comparisons to different countries' higher education, including the development history and the current situation.																																															
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">Chapter 1</td> <td style="width: 80%;">Introduction</td> <td style="width: 10%; text-align: right;">2</td> </tr> <tr> <td>Chapter 2</td> <td>Case Studies 1</td> <td style="text-align: right;">6</td> </tr> <tr> <td></td> <td>Section 1 American Higher Education</td> <td></td> </tr> <tr> <td></td> <td>Section 2 British Higher Education</td> <td></td> </tr> <tr> <td>Chapter 3</td> <td>Case Studies 2</td> <td style="text-align: right;">9</td> </tr> <tr> <td></td> <td>Section 1 Canadian Higher Education</td> <td></td> </tr> <tr> <td></td> <td>Section 2 Australian Higher Education</td> <td></td> </tr> <tr> <td></td> <td>Section 3 Singapore Higher Education</td> <td></td> </tr> <tr> <td>Chapter 4</td> <td>Case Studies 3</td> <td style="text-align: right;">6</td> </tr> <tr> <td></td> <td>Section 1 German Higher Education</td> <td></td> </tr> <tr> <td></td> <td>Section 2 French Higher Education</td> <td></td> </tr> <tr> <td>Chapter 5</td> <td>Case Studies 4</td> <td style="text-align: right;">6</td> </tr> <tr> <td></td> <td>Section 1 Russian Higher Education</td> <td></td> </tr> <tr> <td></td> <td>Section 2 Japanese Higher Education</td> <td></td> </tr> <tr> <td>Chapter 6</td> <td>Conclusion</td> <td style="text-align: right;">3</td> </tr> </table>			Chapter 1	Introduction	2	Chapter 2	Case Studies 1	6		Section 1 American Higher Education			Section 2 British Higher Education		Chapter 3	Case Studies 2	9		Section 1 Canadian Higher Education			Section 2 Australian Higher Education			Section 3 Singapore Higher Education		Chapter 4	Case Studies 3	6		Section 1 German Higher Education			Section 2 French Higher Education		Chapter 5	Case Studies 4	6		Section 1 Russian Higher Education			Section 2 Japanese Higher Education		Chapter 6	Conclusion	3
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	Section 1 Russian Higher Education																																															
	Section 2 Japanese Higher Education																																															
Chapter 6	Conclusion	3																																														
Teach Method	Exploration; Inspiration; Discussion																																															
Test and Examination	Attendance+Presentation+Paper																																															
Pre-request Course																																																
References	比较高等教育 黄建如 社会科学文献出版社 2008 比较高等教育：知识、大学与发展 阿特巴赫著 人民教育出版社 2001 比较教育学 张蓉 南京师范大学 2009 比较高等教育概论 杨汉清 人民教育出版社 1997																																															

Course Introduction

Code	111521	Teaching Hours	32
Course	Administration Management of Contemporary China		
Key Words	Contemporary China; Administration Management		
Purpose and Role of the Course	Lectures on “Contemporary Chinese Administrative Reform”, “Administrative Measures in Globalization” and “Contemporary Chinese Emergency Management” ; Help students sort out basic administrative knowledge and professional skills, expand their academic horizons of current Chinese administration and administrative reform.		
Main Chapters and Teaching Hours	<p>Chapter 1: The historical process of the administrative reform in China (2 class hour)</p> <p>Chapter 2: The mode transformation of China's government function (4 class hour)</p> <p>Chapter 3: Chinese government institutional reform (4 class hour)</p> <p>Chapter 4: The Globalization of Administrative management (2 class hour)</p> <p>Chapter 5: The challenge and countermeasure China faces in globalization (2 class hour)</p> <p>Chapter 6: Administrative building under the vision of globalization(Part 1)(3 class hour)</p> <p>Chapter 7: Administrative building under the vision of globalization(Part 2) (3 class hour)</p> <p>Chapter 8: The construction and management of contingency plans in China (2 class hour)</p> <p>Chapter 9: The construction of emergency management system in China(2 class hour)</p> <p>Chapter 10: The construction of emergency management mechanism in China (2 class hour)</p> <p>Chapter 11: The construction of emergency management legality in China (2 class hour)</p> <p>Chapter 12: Social stability risk management of Major Project(4 class hour)</p>		
Teach Method	1 /Class lecture 2/Discussion		
Test and Examination	1/Paper 2/Research design		
Pre-request Course	Administration Management; Crisis Management		
References	Administrative Reform in China-the Responsibility, Responsiveness and Efficiency of the Government, published by National School of Administration Press, 2010		

Course Introduction

Code	113003	Teaching Hours	32
Course	Quantitative method and model		
Key Words	quantitative analysis, model construct, research method		
Purpose and Role of the Course	The course belongs to methodology courses. It focuses on theories of statistics and the operational approaches of statistics methods in software SPSS. It tells the basic principles of different statistics methods and its application to many practical problems.		
Main Chapters and Teaching Hours	Chapter1 Introduction hours Chapter 2 Preparation of Research hours Chapter 3 Sampling methods hours Chapter 4 Data collecting methods hours Chapter5 Summarizing and displaying of data hours Chapter 6 Features of data distribution hours Chapter 7 Parameter estimation and hypothesis testing hours Chapter 8 Cross table analysis hours Chapter 9 Analysis of variance hours Chapter 10 Correlation and regression analysis hours Chapter 11 Multiple regression and Logistic regression analysis hours Chapter 12 Time Series analysis hours		2 2 2 4 2 2 4 4 2 4 2 4
Teach Method	Lecturing case study, discussion about practical problems.		
Test and Examination	Course work		
Pre-request Course	Probability Theory & Mathematical Statistics; Advanced Mathematics		
References	Earl Babbie, Social Research Methods (10th Edition), Huaxia Press, Jan. 2005 Newman. Social Research Methods: qualitative and quantitative approaches, Renming University Press, Jan 2007 Guo Zhigang et al, Methods of social statistics: application of Software SPSS, Renming University Press, Dec.1999		

Course Introduction

Code	111315	Teaching Hours	32
Course	Senior Research Methods of Education		
Key Words	Senior, Research Method , Education		
Purpose and Role of the Course	<p>Educational research method has the key role in the postgraduates' cultivation in the field of education. Senior Research Methods is the higher level methodology course for helping doctoral students to learn how to do educational research scientifically. This course is based on the assumption that students have had the basic knowledge in both quantitative and qualitative methods. So this course has the significant effect and function in PhD students' cultivation.</p> <p>The purpose of this course is to help PhD students to clarify the research questions and cultivate them to have the awareness that they should comprehensively consider the research questions, theoretical framework, and research methodology at the same time. Through the learning of this course, student would be cultivated to develop some skills in operationalization of the research questions and theories, and their key capability of research would be improved significantly after the learning of the course.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1. Research Method Introduction (4 hours)</p> <p>Chapter 2. Quantitative Research Method (6 hours)</p> <p>Chapter 3. Qualitative Research Method (6 hours)</p> <p>Chapter 4. Presentation and Method Discussion (4 hours)</p> <p style="padding-left: 40px;">Presentation and Method Discussion (4 hours)</p> <p style="padding-left: 40px;">Presentation and Method Discussion (4 hours)</p> <p style="padding-left: 40px;">Presentation and Method Discussion (4 hours)</p>		
Teach Method	This course mainly adopts three kind of instructional methods: lectures given by the instructor, students' presentation, and interactive method discussion.		
Test and Examination	Course final paper (60%), presentation and report using PPT (30%), times of having class (10%)		
Pre-request Course	Quantitative Research Method of Education Qualitative Research Method of Education		
References	<p>① WEN, Zhonglin, Psychology and Educational Statistics, Guangdong Higher Education Press. 2006.9</p> <p>② XIE, Yu, Sociological Methodology and Quantitative Research. Social Science Academic Press (China), 2006.7</p> <p>③ CHEN xiang-ming, Qualitative Research Method and Social Science Research, Educational Science Press. 2000.1</p> <p>④ Johnson, B. and Christensen, L., Educational Research: Quantitative, Qualitative, and Mixed Approaches (Second Edition). USA: Pearson Education Inc. 2004</p> <p>⑤ Flick, U. An introduction to qualitative research (Fourth Edition), London: Sage Publications LTD, 2009</p> <p>⑥ Merriam, S. B. Qualitative Method Applications in Educational Research: Expanded from Case Study Research, Translated by YU Zeyuan, Chongqing University Press. 2008.1</p> <p>⑦ Gall, M.M. , Borg, W. and Gall, J.J. Educational Research: an Introduction. Jiangsu Education Press</p>		

Course Introduction

Code	111321	Teaching Hours	32
Course	Theories of public administration		
Key Words	Public management, bureaucracy, public decision, public service		
Purpose and Role of the Course	This course systemizes public administration theory according to the time. Reinforce the theoretical basis, improve the academic acumen and enhance research skills of students with the combination of lecture and seminar.		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1.Introduction to public administration 2.Managerial approach 3.Bureaucracy Theory 4.Institutional analysis 5.Public decision 6.New public administration Theory 7.New Public participation 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	1. Homework 50% 2. Final exam 50%		
Pre-request Course	Knowledge of government and other basic political theories		
References	<p>Books:</p> <ol style="list-style-type: none"> 1、 Public Participation in Public Decisions: New Skills and Strategies for Public Managers, John Clayton Thomas 2、 Towards a Subjective Approach to Policy Planning & Evaluation: Common-sense Structured, Hoklin Leung 3、 Governing the Commons:The Evolution of Institutions for Collective Action, Elinor Ostrom 4、 The Logic of Collective Action: Public Goods and the Theory of Groups, Mancur Olson 5、 The New Public Service Serving,Not Steering, Janet V.Denhardt <p>Articles:</p> <ol style="list-style-type: none"> 1、 Public Administration and the Public Interest, E. Pendleton Herring 2、 Toward a New Public Administration, H.George Frederickson 3、 Public and Private Management:Are They Fundamentally Alike in All Unimportant Respects? Graham T.Allison4、 4、 Policy Paradox: The Art of Political Decision Making, Deborah Stone 5、 From Public Administration To Public Management:Reassessing a Revolution?Andrew Gray and Bill Jenkins 		

Course Introduction

Code	111381	Teaching Hours	32
Course	The Latest Issues of Western Public Management Theory		
Key Words	Public Management Theory; Latest Issues		
Purpose and Role of the Course	Enable students to understand the history and the contemporary theory of public management, the basic structure and main characteristics of development of public management, to enable students to deepen their understanding of the theory, method and practice of public management.		
Main Chapters and Teaching Hours	<p>Chapter 1: The Theoretical Paradigms of Western Public Management Theory (4 class hour)</p> <p>Chapter 2: The Content of Western Public Management Theory (4 class hour)</p> <p>Chapter 3: New Public Administration Theory(6 class hour)</p> <p>Chapter 4: New Public Management Theory (6 class hour)</p> <p>Chapter 5: Governance Theory (6 class hour)</p> <p>Chapter 6: Public Crisis Management Theory (6 class hour)</p>		
Teach Method	<p>1 /Class lecture</p> <p>2/Discussion</p>		
Test and Examination	<p>1/Paper</p> <p>2/Research design</p>		
Pre-request Course			
References	<p>Nicholas Henry. Public Administration and Public Affairs. Published by China Renmin University Press, 2011.</p> <p>Michael K. Lindell. Introduction to Emergency Management. Published by China Renmin University Press, 2011.</p> <p>David Osborne, Ted Gaebler. Reinventing Government. Published by Shanghai Translation Publishing House, 2006.</p> <p>Elinor Ostrom. Governing the commons: the evolution of institutions for collective action. Published by The Joint Publishing Company Ltd. , 2000.</p> <p>H. George Frederickson. The Spirit of Public Administration. Published by China Renmin University Press, 2003.</p>		

Course Introduction

Code	111322	Teaching Hours	32
Course	Public Policy Analysis		
Key Words	Public policy; Analysis; Model		
Purpose and Role of the Course	This course systemizes public policy theory. Reinforce the theoretical basis, improve the academic acumen and enhance research skills of students with the combination of lecture and seminar.		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1.Introduction to public policy (4 hours) 2.Process model(4 hours) 3.Rational model(4 hours) 4.Institutional model(4 hours) 5.Elite and group model(4 hours) 6.System model(4 hours) 7.Game thory(4 hours) 8.Conclusion(4 hours) 		
Teach Method	<ol style="list-style-type: none"> 1. Class Lectures 2. Case Teaching 3. Discussions 		
Test and Examination	<ol style="list-style-type: none"> 1. Test 2. Paper 		
Pre-request Course			
References	William N. Dunn. Public Analysis: Introduction. Second Edition .Prentice Hall, INC , a Pearson Education Company 1994. Translation. China Renmin University Press 2002		

Course Introduction

Code	111371	Teaching Hours	48
Course	History of Economic Thought		
Key Words	Schools of economics, policy advocated, value theory, distribution theory, supply, demand,		
Purpose and Role of the Course	<p>The History of Economic Thought is based on a certain historical period of each school of economic thought for the study, research these economic thought, development and other doctrine instead of the laws of history of science.</p> <p>Learning course to students to master various historical periods of the different schools of economic thought and the history of the development, training students the dialectical materialism historical analysis method to analyze these economic thought, to find out it generates, development and demise of the nature of law, improve the understanding of the problem, analyze problems and problem-solving skills, and to lay a solid foundation for better learning economic theory.</p>		
Main Chapters and Teaching Hours	<p>This course is a total of eight chapters:</p> <p>The first chapter of the formation of classical economics (3 hours) to discuss (3 lessons)</p> <p>Chapter II of the development of classical economics (6 hours)</p> <p>The third chapter of the new direction of development of classical economics (3 hours)</p> <p>The fourth chapter of the Historical School and Marxist critique of classical economics and development (6 hours), discussions (3 hours)</p> <p>Chapter marginal utility school - the establishment of modern economics (6 hours)</p> <p>Chapter Marshall Cambridge school: the perfection of modern economics (6 hours)</p> <p>Chapter VII Wicksell and Keynes: the completion of the modern economics (3 hours) to discuss (3 lessons)</p> <p>Chapter VIII of modern economics supplement (6 hours)</p>		
Teach Method	This course, the focus of teachers' classroom lectures, the students to read the monograph and information and regularly organizes symposia combination of learning methods to complete this course of study in the next lesson.		
Test and Examination	Submit a History of Economic Thought papers,		
Pre-request Course	Economic History		
References	<p>“History of Economic Thought tutorial”, Ma Tao, Fudan University Press, 2002.1.</p> <p>Adam Smith's "Wealth of Nations".</p> <p>Marx's "Das Kapital".</p> <p>Cairns “Employment, Interest and Money ”.</p> <p>"The history of economics.", Kai-Jian Yao, China Renmin University Press, 2011.4.</p> <p>"Economics 300", Cheng - pin Ho, Hunan Science and Technology Press, 2010.10.</p>		

Course Introduction

Code	113041	Teaching Hours	32
Course	Qualitative research method of education		
Key Words	Education, Qualitative research method		
Purpose and Role of the Course	<p>Educational research method has the key role in the postgraduates' cultivation in the field of education, and this course is the basic methodology basis for postgraduates to do educational research scientifically. A qualitative method is the important and popular method in the educational research, so it has the significant effect.</p> <p>The purpose of this course is to let students to know the theoretical basis, main branches, specific operation and method of qualitative research. Through the learning of this course, student could be cultivated to develop some skills in qualitative research, and students should learn how to do interview, make observation, and deal with literature and data, and theoretical construction after the course study.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1. Qualitative Research Introduction (4 hours) Chapter 2. Research design and main contents (4 hours) Chapter 3. Sampling and its affecting factors (4 hours) Chapter 4. Entering the field (4 hours) Chapter 5. Interview and observation (4 hours) Chapter 6. Data learning up, classification, and analysis (4 hours) Chapter 7. Theoretical construction and paper writing (4 hours) Chapter 8. Research quality evaluation, validity and ethic (4 hours)</p>		
Teach Method	This course mainly adopts three kind of instructional methods: teaching by teachers, reports of students, and interactive discussion.		
Test and Examination	Course final paper (60%), presentation and report using PPT (30%), times of having class (10%)		
Pre-request Course	Social science research methods		
References	<p>Chen xiang-ming, Qualitative Research Method and Social Science Research, Educational Science Press. 2000</p> <p>Johnson, B. and Christensen, L, Educational Research: Quantitative, Qualitative, and Mixed Approaches (Second Edition). USA: Pearson Education Inc. 2004</p> <p>Flick, U. An introduction to qualitative research (Fourth Edition), London: Sage Publications LTD, 2009</p>		

Course Introduction

Code	113023	Teaching Hours	48
Course	Research Writing & Practice, Education		
Key Words	Scientific research, research writing, education		
Purpose and Role of the Course	The purpose of the course is to train the students who major in higher education, educational economics and management, and institutional technology, the ability to conduct research. The course teaches how to raise questions or spot problems in research, how to do critical thinking, how to evaluate the appropriate methodology to answer the questions or solve the problems, how to write academic papers, how to write proposals, and how to present or report the research.		
Main Chapters and Teaching Hours	<p>Chapter 1 How to write academic papers 30hrs</p> <p>1. Why do we conduct research?</p> <p>2. References, and Plagiarism</p> <p>3. Literature Review</p> <p>4. How to spot the research questions?</p> <p>5. Introduction</p> <p>6. Methodology and results</p> <p>7. Discussion and conclusion</p> <p>8. Abstract and keywords</p> <p>9. Journals and publication</p> <p>10. Presentations by students</p> <p>Chapter 2 How to write proposal 9hrs</p> <p>1. Introduction to proposals</p> <p>2. Case studies</p> <p>3. Presentations by students</p> <p>Chapter 3. How to present the research orally 9hrs</p> <p>1. Why do we communicate?</p> <p>2. Prepare for the presentations</p> <p>3. Presentations by students</p>		
Teach Method	By case study or samples, the teacher presents the gist of writing in different sections of the academic paper, proposals, and presentations. The students read the English literature assigned by the teacher, and write the homework based on the theme selected by the student and his/her advisor.		
Test and Examination	Attendance + Discussion + Homework + Paper + Proposal + Presentation		
Pre-request Course	Higher Education, etc.		
References	<p>(美) 安吉利卡·H. 霍夫曼, 任胜利、莫京、安瑞等译. 科技写作与交流: 期刊论文、基金申请及会议讲演 [M]. 北京: 科学出版社, 2012.</p> <p>Angelika H. Hofmann. <i>Scientific Writing and Communication: Papers, Proposals, and Presentations</i></p> <p>English papers assigned by the teacher</p>		

Course Introduction

Code	111309	Teaching Hours	32																						
Course	Science Communication and Science Popularization																								
Key Words	Science Communication, Science Popularization																								
Purpose and Role of the Course	<p>Science Communication and Science Popularization is the required basic course for the profession of Science Communication. Science communication becomes more important after the professionalization of scientists. From the course, the students can first learn the fundamental concepts in science communication, such as science communication, science popularization, media, mechanism of communication, and the subjects and the objects of communication. Secondly, the learners can practice some skills in communicating science, including the ways to search the scientific innovations, how to communicate with scientists, how to write the communication materials, and how to evaluate communication. Thirdly, the students learn the relationships among science communication and government, NGOs, scientists, public and science centers and museums, involving the science communication policies, science development, and etc.</p>																								
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr><td>1. Introduction to science communication</td><td style="text-align: right;">3 hrs</td></tr> <tr><td>2. Media in science communication</td><td style="text-align: right;">3hrs</td></tr> <tr><td>3. Research methods in science communication</td><td style="text-align: right;">3hrs</td></tr> <tr><td>4. Design and evaluation in science communication</td><td style="text-align: right;">3hrs</td></tr> <tr><td>5. Scientists community and science communication</td><td style="text-align: right;">3hrs</td></tr> <tr><td>6. How to search the science communication themes</td><td style="text-align: right;">3hrs</td></tr> <tr><td>7. How to write in science communication</td><td style="text-align: right;">3hrs</td></tr> <tr><td>8. How to present science communication</td><td style="text-align: right;">3hrs</td></tr> <tr><td>9. Public understanding of science</td><td style="text-align: right;">3hrs</td></tr> <tr><td>10. Science and society</td><td style="text-align: right;">3hrs</td></tr> <tr><td>11. Students' presentation</td><td style="text-align: right;">2hrs</td></tr> </table>			1. Introduction to science communication	3 hrs	2. Media in science communication	3hrs	3. Research methods in science communication	3hrs	4. Design and evaluation in science communication	3hrs	5. Scientists community and science communication	3hrs	6. How to search the science communication themes	3hrs	7. How to write in science communication	3hrs	8. How to present science communication	3hrs	9. Public understanding of science	3hrs	10. Science and society	3hrs	11. Students' presentation	2hrs
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8. How to present science communication	3hrs																								
9. Public understanding of science	3hrs																								
10. Science and society	3hrs																								
11. Students' presentation	2hrs																								
Teach Method	<p>The teacher will deliver the fundamentals and then organize the group discussion based on different themes and next the communications among the groups. The students will read the English papers and reports assigned by the teacher, do the homework, and prepare for the class discussion.</p>																								
Test and Examination	Attendance + homework + discussion + term paper																								
Pre-request Course	No.																								
References	<p>[1] Bucchi,M.,Trench, B.(ed.). Handbook of Public Communication of Science and Technology, NY,USA: Routledge, 2008. [2] (美) 丹尼尔·里夫, 斯蒂文·赖斯, 弗雷德里克·G. 菲克著 嵇美云译.内容分析法: 媒介信息量化研究技巧, 北京: 清华大学出版社, 2010. [3] (美) 特里·K. 甘布尔, 迈克尔·甘布尔著 熊婷婷译. 有效传播, 北京: 清华大学出版社, 2005. [4] 邵培仁. 传播学, 北京: 高等教育出版社, 2007. [5] (美) 德博拉·布鲁姆, 玛丽·努森, 罗宾·马兰兹·赫尼格编 田秋生主译.科技记者报道指南, 北京: 中国时代经济出版社, 2009. [6] 翟杰全. 让科技跨越时空, 北京: 北京理工大学出版社, 2002. [7] 任福君, 翟杰全.科技传播与普及概论, 北京: 中国科学技术出版社, 2012.</p>																								

Course Introduction

Code	111534	Teaching Hours	32
Course	Philosophy of Science and Technology		
Key Words	Philosophy; Science; Technology		
Purpose and Role of the Course	<p>Through this course, students can understand the history, basic theories, and the contemporary conditions of philosophy of science and technology. Students can acquire the basic ability to read the texts and prepare for the further study of other courses, such as the classic readings in the philosophy of science and technology, sociology of science, etc.</p>		
Main Chapters and Teaching Hours	<p>This course includes two parts, the philosophy of science and philosophy of technology, each requiring 16 teaching hours. The first part includes the pre-history of philosophy of science, logical positivist philosophy of science, historian philosophy of science and debates of contemporary philosophy of science. The second parts includes the development of philosophy of technology, engineering philosophy of technology, humanist philosophy of technology, and the empirical turning of contemporary philosophy of technology. Each chapter needs 4 teaching hours.</p>		
Teach Method	<p>Teacher mainly instructs. Students reading textbooks under the guidance of teacher and discuss the relevant issues with teacher.</p>		
Test and Examination	<p>Write paper under the guidance of teacher</p>		
Pre-request Course	<p>History of Western Philosophy; History of Science and Technology</p>		
References	<p>Han lianqing: History of philosophy of science and technology, Hunan Science and Technology Publisher, 2010 Class readings in the philosophy of science and technology, Chinese Renmin University Press, 2011</p>		

Course Introduction

Code	111320	Teaching Hours	32
Course	Organizational Management		
Key Words	Organizational Structure, Power and Politics, Organizational Culture, Organizational Reform		
Purpose and Role of the Course	<p>As scholars have pointed out that <i>management</i> means <i>the management of the organization</i>, the course <i>Organizational Management</i> is a basic course for the graduate students of major in management. It will help the students acquire some important theories and enlarge the understanding of the classics of the field of management. Moreover, The students can know better about some important content and knowledge on organizational management such as individuals and organizations, organizational structure, organizational culture, power and politics, and organizational reform. The course will provide students a sound preparation for the work of research or management in the future.</p>		
Main Chapters and Teaching Hours	<p><i>Organizational Management</i> is composed of five chapters.</p> <p>Chapter 1 Individuals and Organizations(6 teaching hours)</p> <p>Chapter 2 Evolution of Organizational Structure(8 teaching hours)</p> <p>Chapter 3 Power and Politics of the Organizations(6 teaching hours)</p> <p>Chapter 4 The Management of Organizational Culture(6 teaching hours)</p> <p>Chapter 5 The Management of Organizational Reform(6 teaching hours)</p>		
Teach Method	<p>The teacher gives students a reading list and some questions when teaching, and the students have a discuss after reading, and then the teacher makes a conclusion. The sutudents must listen carefully ,read books and discuss the questions actively, At last write an academic paper with an optional thesis. All these performances will be the students' regular grades.</p>		
Test and Examination	Regular Grades and Final Examination		
Pre-request Course			
References	<p>W. Richard Scott.<i>Organization:Rational,Natural,and Open System</i> [M].Beijing: Hua Xia Press,2002.</p> <p>Gary S. Becker. <i>Human Action: A Treatise on Economics</i>[M].Shang Hai: Ge Zhi Press,2008.</p> <p>G.J.Miller.<i>Managerial Dilemmas: Political Economyof Hierarchy</i>[M]. Shang Hai:Shanghai People's Press,2002.</p> <p>Mancur Lloyd Olson.<i>The Logic of Collective Action: Public Goods and the Theory of Groups</i>[M].Shang Hai: Shanghai Joint Press.,2011.</p> <p>Michel Crozier.<i>Hierarchy phenomenon</i>[M]. Shang Hai:Shanghai People's Press, 2002.</p> <p>Michel Crozier.<i>Actors and Systems: The Politics of Collective Action</i>[M]. Shang Hai:Shanghai People's Press,2007.</p>		

Course Introduction

Code	113025	Teaching Hours	48
Course	Theory of Educational Management		
Key Words	New Public Management, Political Philosophy, New Institutional Economics		
Purpose and Role of the Course	<p>This is a one-semester course designed to introduce master's degree candidates to educational economy and management. In this course, we will study some basic theories, including management science, new public management, political philosophy, new institutional economics, and so on. This course aims to widen students' theoretical basis of educational administration, and to enhance the ability to study educational problems by use of multiple theoretical perspectives.</p>		
Main Chapters and Teaching Hours	<p>Topic 1 Management Science 4 hours</p> <p>Topic 2 New Public Management 6 hours</p> <p>Topic 3 Political Philosophy 8 hours</p> <p>Topic 4 New Institutional Economics 6 hours</p> <p>Topic 5 Governance of Higher Education 8 hours</p>		
Teach Method	Seminar and Lecture		
Test and Examination	Classroom discussion and one paper		
Pre-request Course	Education, Educational Administration		
References	<p>[1] Wren, Daniel A. The evolution of management thought. John Wiley & Sons, Inc. 1994</p> <p>[2] Owen E. Hughes. Public management and administration: an introduction. New York: Palgrave, 2003.</p> <p>[3] Kymlicka, Will. Contemporary political philosophy: an introduction. Oxford University Press, 2001.</p> <p>[4] North, Douglass Cecil. Institutions, institutional change and economic performance. Cambridge University Press, 1990.</p>		

Course Introduction

Code	111523	Teaching Hours	32
Course	Frontier Research on Human Resource Management		
Key Words	Human resource management ,theory, trend		
Purpose and Role of the Course	" Frontier Research on Human Resource Management " plays an important role in administrative management discipline. This course aims to widen and strengthen students' basic knowledge on human resource management, and to improve their skills on analyzing and solving HRM problems in organizations. Besides, the hot topics and new trends in the field of HRM home and abroad are also discussed.		
Main Chapters and Teaching Hours	Chapter 1: Introduction Chapter 2 Indigenous Study on HRM Research in China(1) Chapter 3: Recruitment and Selection Chapter 4: Performance Appraisal Chapter 5: Compensation Management Chapter 6: HRM in SOE/PE/FE Chapter 7: HRM of M&A Chapter 8: Strategic Human Resource Management Chapter 9: Indigenous Study on HRM Research in China(2)		
Teach Method	Elicitation Method of Teaching Case Teaching		
Test and Examination	Opened book examination		
Pre-request Course			
References	Raymond A. Noe : Human Resource Management:Gaining A Competitive Advantage China Renmin University Press, 2005. (in Chinese)		

Course Introduction

Code	111525	Teaching Hours	32
Course	Governance Theory		
Key Words	Governance, Global governance, NGOs, Public participation		
Purpose and Role of the Course	<p>The purpose of the course is to make the graduate students for master degree have a deep understanding of the theory of governance. Governance theory is one of the most advanced theory in the public management. By studying the course, the students could re-think the role of the government and the complicated problems it facing, think about the solutions for social and political problems by creative ideas.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1. The introduction of governance theory 4 hours Chapter 2. The theoretical foundation of governance theory 4 hours Chapter 3. Globalization and global governance 4 hours Chapter 4. The governance of EU 4 hours Chapter 5. New public management and governance 4 hours Chapter 6. Public participation and governance 4 hours Chapter 7. NGOs and governance 4 hours Chapter 8. Local governance 4 hours</p>		
Teach Method	Teaching by multi-media and discussions with students		
Test and Examination	Test		
Pre-request Course	no		
References	<p>Yu keping, Governance and good governance, Social Sciences Academic Press, 2000. Robert Putnam, Making democracy work, Preceton University Press, 1993. Yu Keping, Governance: Global Governance, Social Sciences Academic Press, 2004. J.K. Thomas, Public participation in public decision (Chinese edition), Renmin University Press, 2010.</p>		

Course Introduction

Code	111330	Teaching Hours	48
Course	History of Philosophy		
Key Words	Philosophy; history of philosophy; thinking mode		
Purpose and Role of the Course	<p>Purpose:</p> <ol style="list-style-type: none"> 1. Understand the basic concept in philosophy clearly. 2. Have a comprehensive understanding to the development of Chinese Philosophy and Western Philosophy. 3. Have a comprehensive understanding to the basic issues in Chinese Philosophy and Western Philosophy. 4. Grasp the Western Philosophical methods, especially the methods related to the Philosophy of Science. 5. Have a comprehensive understanding to the core idea of Chinese Philosophy. <p>Role of the Course It is the basic course to the students majoring in Philosophy and Philosophy of Science.</p>		
Main Chapters and Teaching Hours	<p>Chapter One Introduction (4 Teaching Hours); Chapter Two Graeco Philosophy (8 Teaching Hours); Chapter three the philosophy in early modern times. (8 Teaching Hours); Chapter Four the philosophy in late modern times. (4 Teaching Hours); Chapter Five the philosophy in 20th century (8 Teaching Hours); Chapter Six Chinese Philosophy: philosophy of the pre-Qin period (6 Teaching Hours); Chapter Seven Introduction Chinese Philosophy: Wei Jin metaphysics (2 Teaching Hours); Chapter Eight Introduction Chinese Philosophy: Confucian school of idealist philosophy of the Song and Ming dynasties (5 Teaching Hours); Chapter Nine Chinese Philosophy: Contemporary New Confucianism (3 Teaching Hours)</p>		
Teach Method	Teacher teaching & Students making Presentation		
Test and Examination	Open-book examination		
Pre-request Course	Nothing		

References	<ol style="list-style-type: none"> 1. Samuel Enoch Stumpf, James Fieser .Socrates to Sartre and Beyond: A History of Philosophy. The world book publishing company,2013.1 2. Robert C. Solomon, Kathleen M. Higgins. Big Questions: A Short Introduction to Philosophy. Wadsworth Publishing Co Inc,2009-03. 3. Feng Youlan. A Short History of Chinese Philosophy. The world book publishing company ,2011.2 4. Zhao Dunhua. A short History of Western Philosophy. Peking University Press,2012.7 (Chinese Edition). 5. Zhang Dainian. The Outline of Chinese Philosophy. Kunlun Press , 2010.3. (Chinese Edition).
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Course Introduction

Code	111532	Teaching Hours	32
Course	Research on Classics in Dialectics of Nature		
Key Words	Dialectical View of Nature Dialectical View of Science Dialectical Thought		
Purpose and Role of the Course	<p>“Research on Classics in Dialectics of Nature” is a fundamental theoretical course for students in Philosophy of Science and Technology. Reading classic works, analyzing contents and participating in seminars engage students understand the evolution and development of nature dialectics, along with its perspectives and methods. In this course, we will discuss the world-wide influence of natural dialectics in contemporary society from international perspectives. We aim to enhance students' scientific capability of dialectical materialism and inspire their philosophical thinking.</p>		
Main Chapters and Teaching Hours	<p>ChapterI. Introduction to Dialectics of Nature (8hours)</p> <p>ChapterII. Dialectics of Nature (4hours)</p> <p>ChapterIII. Dialectics is the higher thinking of understanding nature (4hours)</p> <p>ChapterIV. The philosophy question of natural science (4hours)</p> <p>ChapterV. The dialectics of natural science (4hours)</p> <p>ChapterVI. Labor creates human (8hours)</p>		
Teach Method	Classroom-based lecture		
Test and Examination	Paper		
Pre-request Course	History of science and technology and historiography of Science		
References	<p>Central compilation and translation bureau. Works of Marx and Engels. People's Press,2009.</p> <p>ZengGuoping.Contemporary dialectics of nature. Tsinghua University press,2005.</p> <p>Helena Sheeham.Marxism and the Philosophy of Science. New Jersey: Humanities Press ,1993.</p> <p>Martin Heidegger. Contributions to Philosophy, Indiana University Press,2012.</p>		

Course Introduction

Code	111536	Teaching Hours	32
Course	Science and Technology Policy and Management		
Key Words	Policy; Innovation; Sustainable Development		
Purpose and Role of the Course	<p>In the Science and Technology Policy and Management course, we, mainly using philosophy of science and technology, sociology of science and technology, history of science and technology and public policy theory, study the theory and practice of policy and management issues in science, technology and social development. This course covers the theory of science and technology policy, science and technology legislation, reform of the management system of science and technology, science and technology organization and management, technology and innovation policy, science and technology development strategy, technology and public policy, domestic and foreign scientific policy comparison etc., with the interdisciplinary character.</p> <p>In this course, we mainly learn: system of science and technology, STS, science and technology into practical productive forces, science and technology and human sustainable development, as well as their relationships with science and technology policy; ethics of science and technology, science and technology policy and technology law; theory of science and technology policy; science and technology policies of the US, Japan and Europe, history and current situation of China's science and technology policies and strategies; intellectual property and intellectual property strategy.</p> <p>Expected that students, through the study of this course, have a deeper understanding of the relationships between technology and public policy, economy, ethics, law and human global issues etc., to deepen the understanding of the relationship between technology and society, and the interaction between technology and society is an important research part of the philosophy of science and technology.</p> <p>Also hoped that students, through the study of the basic theory and case analysis of the course, strengthen their thinking about science and technology policy and management, cultivate and improve the students' awareness and ability to analyze, understand and deal with the real problems, and lay a solid foundation for them to learn further related knowledge or to engage in relevant professional work.</p>		
Main Chapters and Teaching Hours	<p>Chapter I Science and Technology Systems and Policy; (4 hours)</p> <p>Chapter II STS and Science and Technology Policy; (4 hours)</p> <p>Chapter III Science and Technology Development, Transformation, Transfer and Use Policies; (4 hours)</p> <p>Chapter IV Ethics and Management of Science and Technology; (4 hours)</p> <p>Chapter V Overview of Science and Technology Policy and Management in the world; (4 hours)</p> <p>Chapter VI Science and Technology Policies and Management of the US, Japan and Europe; (4 hours)</p> <p>Chapter VII Science and Technology Policy and Management of China; (4 hours)</p>		

Teach Method	Necessary lecture, guidance, questions by teacher; students' questions, discussion and dialogue encouraged; theoretical discussion and case studies combined.
Test and Examination	Routine assessment and course paper
Pre-request Course	Sociology of Science and Technology
References	<p>[1] Wei Luo. Preliminary Study of Science and Technology Policy. Intellectual Property Publishing House, April 2007. (in Chinese)</p> <p>[2] Xiaofeng Fan. Development of Science and Technology Policy and Construction of Legal System on Science and Technology: Review and Consideration of Legislative Work on Science and Technology. Intellectual Property Publishing House. June 1, 2006. (in Chinese)</p> <p>[3] Guisheng Wu. Technology Innovation Management (2nd edition). Tsinghua University Press. April 2, 2009. (in Chinese)</p>

Course Introduction

Code	111533	Teaching Hours	32
Course	Sociology of Science-technology		
Key Words	Sociology of science; Sociology of technology; Science, technology and society		
Purpose and Role of the Course	<p>Purposes: Make students understand the social nature of science and technology; grasp the dialectical relationship between technology and society; research the social conditions of scientific and technological activities; explore social factors of scientific discovery and technological innovation; solve practical problems in science, technology and social development.</p> <p>Roles of the Course: The compulsory secondary discipline basic course for master of philosophy of science and technology; well versed in science and technology philosophy and the social studies of science and technology.</p>		
Main Chapters and Teaching Hours	<p>Introduction (4 hours) Chapter 1: The application of science (4hours) Chapter 2: Science and war(4hours) Chapter 3: Normative structure of science" (4 hours) Chapter 4: Priorities of Scientific Discovery" (4 hours) Chapter 5: "Matthew effect" of the scientific community (4 hours) Chapter 6: The methods in Sociology of Science(4 hours) Chapter 7: The space between Science-technology and politics and its tension (4hours)</p>		
Teach Method	<p>Overall: Lecture, discussion and self-study combined Students: Exploring, lecture and review; questions and answers; discussion Teacher: Review, supplement, summarize; pointed out the issues that should be further studied</p>		
Test and Examination	Normal results and final course papers		
Pre-require Course	<p>Philosophy of Science and Philosophy of Technology; History of science and technology and Study of Science history</p>		
References	<p>5. J.D. Bernal. The Social Function of Science [M]. Guangxi Normal University Press, 2003. 6. Robert K. Merton. The Sociology of Science[M]. The Commercial Press, 2003. 7. Xu Zhili. On the tension in the space between science-technology and politics [M]. The China Social Sciences Press, 2006. 8. Michael Mulkay. Sociology of Science: A Sociological pilgrimage [M]. The Commercial Press, 2006. 5. Li Qingzheng. Sociology of science and technology [M]. Shandong people's publishing house, 1990.</p>		

Course Introduction

Code	111524	Teaching Hours	32
Course	An Research To Public Project Management		
Key Words	Public Management 、 Project Management、 seminar		
Purpose and Role of the Course	This course is designed to meet the need of all graduates, helping them understand the history, core concepts, general methods and techniques of public project management through teaching, research, case studies and discussions, so that students can acquire the ideas and methods to solve practical problems related to public project.		
Main Chapters and Teaching Hours	<p>Course Outline:</p> <p>Chapter 1 Core concepts and history of project management (4 hours)</p> <p style="padding-left: 20px;">Section 1 Core concepts of project management</p> <p style="padding-left: 20px;">Section 2 History of project management</p> <p style="padding-left: 20px;">Section 3 Project management body of knowledge</p> <p style="padding-left: 20px;">Section 4 Organizational structure of projects</p> <p>Chapter 2 Theories and methods of the project assessment (4 hours)</p> <p style="padding-left: 20px;">Section 1 Related terms of project assessment</p> <p style="padding-left: 20px;">Section 2 Theories of project assessment</p> <p style="padding-left: 20px;">Section 3 Methods of project assessment</p> <p style="padding-left: 20px;">Section 4 Procedures of project assessment</p> <p>Chapter 3 Theories and methods of the planning and controlling of projects (4 hours)</p> <p style="padding-left: 20px;">Section 1 Project scope management</p> <p style="padding-left: 20px;">Section 2 Project resource plan</p> <p style="padding-left: 20px;">Section 3 Project schedule control</p> <p style="padding-left: 20px;">Section 4 Project cost control</p> <p style="padding-left: 20px;">Section 5 Project quality control</p> <p style="padding-left: 20px;">Section 6 Project risk management</p> <p style="padding-left: 20px;">Section 7 Project communications management</p> <p style="padding-left: 20px;">Section 8 Project procurement management</p> <p style="padding-left: 20px;">Section 9 Project integration management</p> <p style="padding-left: 20px;">Section 10 Project closure</p> <p>Chapter 4 Organizational structure of public project and identification of related concepts of public project (4 hours)</p> <p style="padding-left: 20px;">Section 1 Identification of related concepts of public project</p> <p style="padding-left: 20px;">Section 2 Organizational structure of public project</p> <p style="padding-left: 20px;">Section 3 Case discussion</p>		

	<p>Chapter 5 Study on performance management of public project (4 hours)</p> <p>Section 1 The research status of performance management of public project</p> <p>Section 2 Recommendations for performance assessment indicators of public project</p> <p>Section 3 Selecting performance assessment methods for public projects</p> <p>Section 4 Case study</p> <p>Chapter 6 Governance of public project management (4 hours)</p> <p>Section 1 The raising of the idea of public project governance</p> <p>Section 2 Corporate governance and project governance</p> <p>Section 3 Case analysis and discussion</p> <p>Chapter 7 Special reports and seminars on documentation (8 hours)</p>
Teach Method	With the guidance of related masterpieces, identifying basic concepts and ideas, together with case discussions
Test and Examination	case analysis and an open-book paper
Pre-request Course	N/A
References	<p>Aihua Yang. <i>Handbook of public project management</i>. China Personnel Press, 2012.</p> <p>David Royse. <i>Program evaluation: an introduction</i>, 3rd Edition. China Renmin University Press, 2007.</p> <p>H.Kerzner. <i>project management: a system approach to planning, scheduling, and controlling</i>, 10th edition. Publishing House of Electronics Industry, 2010.</p> <p>Dennis Lock. <i>Project management</i>. Publishing House of Electronics Industry, 2008.</p> <p>Aihua Yang. <i>Monographic study of public project management</i>. Beihang university press, 2013.</p>

Course Introduction

Code	113007	Teaching Hours	32
Course	Qualitative method and the study design		
Key Words	Methodology, Qualitative Analysis, Research Design		
Purpose and Role of the Course	<p>This course includes nine sections: (1)Methodology;(2)Experimental and Quasi-Experimental Designs; (3)Types Major Research Methods; (4)How to Write a Scientific Article; (5)Qualitative Data Analysis; (6)Literature review, secondhand data, historical analysis, content analysis, and meta-analysis; (7) Surveys, Interviews, Observations, and Focus Groups; (8)Grounded theory, social network analysis, GIS, statistics analysis and mixed methods; (9)Game theoretical analysis, product analysis, institutional analysis, capital analysis, and product-institutional analysis (PIA) framework.</p>		
Main Chapters and Teaching Hours	<p>W1.Methodology (4h) W2.Experimental and Quasi-Experimental Designs (4h). W3.Types Major Research Methods (4h). W4.How to Write a Scientific Article(4h). W5.Qualitative Data Analysis(4h). W6. Literature review, secondhand data, historical analysis, content analysis, and meta-analysis (4h). W7. Surveys, Interviews, Observations, and Focus Groups(4h). W8. Grounded theory, social network analysis, GIS, statistics analysis and mixed methods(4h). W9. Game theoretical analysis, product analysis,institutional analysis, capital analysis, and product-institutional analysis (PIA) framework(4h).</p>		
Teach Method	English lectures, social experiments, cases analysis, group discussion and reports, & other practices		
Test and Examination	<p>Requirements and Evaluation (1) Attendance and participation 10%. Although I believe that you can study at home or in your dorms, I still strongly recommend you to come to class having completed the required readings for the week and are prepared to engage in discussion. You should know that group and class studies are sometimes very useful, although not always. Especially, you should practice to learn from each other through communication. The required readings will be the basis of the class discussions, while the suggested readings are recommended for better understanding of the readings of a particular week. Also, you are suggested to compose several questions inspired by the specific week's readings or related to the general theme of the week. (2) Research Design Essay 30%. Since a good research design is the first step of a study, each student is required to write a English research design essay detailing the puzzle/question of the paper (indicate you independent and decedent variables), significance of the topic, you casual and structural hypotheses, methods used for the analysis, possible data sources and measures, and</p>		

	<p>validity of the study (internal, external, statistical and construction).</p> <p>(3) Social Experiments & Group discussion 20%.</p> <p>(4) Final Presentation 10%.</p> <p>Each student has about 10 minutes to present your study.</p> <p>(5) Research Paper 30%.</p> <p>First, you should remember that it is a scientific research article rather than only a literature review essay, although you should do it based on an extensive and thorough literature review (try to show it first in your research design essay). Please identify a question or puzzle related to public administration or governance, summarize the literature on this topic, and discuss room for improvement and especially how you proposed study can advance the literature. You should have a clear strategy to test you hypothesis and have engaged in either qualitative or quantitative analysis in the paper. Second, the general structure of this article should be five sections including “Introduction,” “Methods and Data,” “Results,” “Discussion,” and “Conclusion”.</p> <p>Third, research paper should be written in English, double-spaced, with stand-size font and margins. Also, it should be between 20-30 pages, and please make sure you include a word count and show the page numbers.</p> <p>(6) Reading Reports and Books Reviews.</p>
<p>Pre-request Course</p>	<p>Social Research Methods</p>
<p>References</p>	<p>Chen X, Anne ST, Fan J (Eds.). 2008. Empirical Methods in Organization and Management Research. Beijing: Peking University Press.</p> <p>Miles, MB, Huberman, AM. 2008. Qualitative Data Analysis: Methods and Practice, Congqing: Chongqing University Press, 2008.</p> <p>Chen X. 2011. Qualitative Research Methods and Social Science Research. Beijing: Education Science Press.</p> <p>Shadish, WR, Cook, TD, Campbell, DT. 2002. Experimental and Quasi-Experimental Designs for Generalized Causal Inference. Boston: Houghton-Mifflin.</p>

Course Introduction

Code	111838	Teaching Hours	32
Course	High-Technology Strategy and Knowledge Management		
Key Words	high-technology, innovation, strategy of technology, knowledge, the knowledge-based economy		
Purpose and Role of the Course	<p>This course is the professional elective course of postgraduate studies in philosophy of science and technology. Courses purpose is to describe basic theories and hot problems in the high-tech strategy and management research area, making students have a basic understanding, on the basic concept, development theory and law, the high-tech innovation and development on the enterprise level, and the high-tech development strategy mode on the area and national level, combined specific cases to boot students to explain the basic theory and views in the background of developing countries, and to lay the foundation for using relevant knowledge or further study in the future. For the characteristics of research-oriented learning mode of postgraduate training, it improves students ' questions, problem analysis, problem-solving research literacy and research capacity.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1: Introduction: Concept and Basic Theory (5 hours) Chapter 2: Case Study: Development Intellectual Property Right in China's automobile (5 hours) Chapter3: Technology and Market (5 hours) Chapter4: Technology and Organization (5 hours) Chapter5: Technology Strategy (5 hours) Chapter6: Knowledge Management (7 hours)</p>		
Teach Method	Combination of lecture, case studies and thesis writing		
Test and Examination	Open examinations		
Pre-request Course	No		
References	<ol style="list-style-type: none"> 1. Robert A. Burgelman, Modesto A. Maidique, Steven C, Wheelwrighe, Strategic Management of Technology and Innovation, China Machine Press,2004. 2. Chen Wei, Innovation Management, Science Press,1998. 3. Li Zhengfeng, Zeng Guoping, Study on Innovation System of China: Technology, Systems and Knowledge, Shandong Education Press, 1999. 4. Si Chunlin, Space of Enterprise Innovation and Technology Management, Tsinghua University Press, 2005. 5. Sigvald Harryson, Japanese Technology and Innovation Management: From Know-how to Know-Who, Peking University Press, 2004. 		

Course Introduction

Code	111537	Teaching Hours	32
Course	Study on Technology Innovation		
Key Words	innovation, technology, complementary assets, organization, innovation strategies		
Purpose and Role of the Course	<p>This course is compulsory major courses of postgraduate studies in philosophy of science and technology. Course objective is to introduce and explore the areas of technological innovation of basic theories and hot issues, so as to build technology innovation of basic concepts, a basic understanding of the methods and the latest advances in, and, on that basis, an in-depth discussion on a number of important issues, laying the foundations for using relevant knowledge or further study in the future. For the characteristics of research-oriented learning mode of postgraduate training, it improves students' questions, problem analysis, problem-solving research literacy and research capacity.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1: Introduction (5 hours) Chapter 2: Technology Life Cycle Theory and The Report Discussion (5 hours) Chapter3: Innovation Case Study (5 hours) Chapter4: Profiting from Technological Innovation (6 hours) Chapter5: Technology and Organization (5 hours) Chapter6: Original Innovation and Innovation Strategy (6 hours)</p>		
Teach Method	Literature reading and discussion, faculty presentations, as well as self-study, and supplemented by case studies and discussion on related issues		
Test and Examination	Open examinations		
Pre-request Course	No		
References	<ol style="list-style-type: none"> 1. Fu Jiaji, Technology innovation, Tsinghua University Press, 1999. 2. Chris Freeman, Luc Soete, The Economics of Industrial Innovation, Peking University Press, 2004. 3. Li Zhengfeng, Zeng Guoping, Study on Innovation System of China: Technology, Systems and Knowledge, Shandong Education Press, 1999. 4. Si Chunlin, Space of Enterprise Innovation and Technology Management, Tsinghua University Press, 2005. 5. Sigvald Harryson, Japanese Technology and Innovation Management: From Know-how to Know-Who, Peking University Press, 2004. 		

Course Introduction

Code	111310	Teaching Hours	32
Course	Philosophy of higher education		
Key Words	The development history of philosophy of higher education, schools of philosophy, value orientation, theoretical paradigms		
Purpose and Role of the Course	<p>This course is a basic theoretical course for doctoral candidates major in education economics and management by the institute of higher education, college of humanities and social sciences.</p> <p>This course clarifies the basic range and scope of the problem in the philosophy of higher education by comparison of the concept of philosophy, ideology and theory. It studies the value orientation and thoughts of different schools of philosophy by studying the philosophy, spirit and culture of different age in the history of higher education philosophy. It researches on the differences between regions by explores the nature, theoretical paradigms of higher education philosophy, and relationships between practice.</p> <p>Through the researches and discussions on these issues, it makes the students have a deep and comprehensive understanding on higher education philosophy, and train the ability to use it for the guidance of practice and research.</p>		
Main Chapters and Teaching Hours	<p>The main content of this course is divided into seven chapters:</p> <p>Chapter 1: Introduction (4 credits)</p> <p>Chapter 2: Zeitgeist and philosophy of higher education (6 credits)</p> <p>Chapter 3: Majority areas of higher education philosophy study (4 credits)</p> <p>Chapter 4: Philosophical schools and higher education philosophy (6 credits)</p> <p>Chapter 5: Value orientation in the philosophy of higher education (4 credits)</p> <p>Chapter 6: Relationship between practice and philosophy of higher education (4 credits)</p> <p>Chapter 7: Comparative study of philosophy of higher education (4credits)</p>		
Teach Method	Seminars. This course takes discussion as main teaching method, students prepare materials accordance with the themes in every chapters, and present in the class, teacher evaluates the research , answers the questions and discuss with students together.		
Test and Examination	Class reports and ending course paper		
Pre-request Course	Principles of Education		
References	<p>[1] John • S • Brubeck. On the philosophy of higher education. Zhejiang education press, 2001.(in chinese)</p> <p>[2] Ji Huang. The general theory of philosophy of education. Shanxi education press, 1998.(in chinese)</p> <p>[3] Chuting Zhang. Philosophy of education. Educational science publishing house, 2006. (in chinese)</p> <p>[4] Zhongying Shi. Philosophy of education. Beijing normal university press, 2006. (in chinese)</p> <p>[5] S •E •Frost. History and philosophy foundation of western education. Huaxia press, 1987. (in chinese)</p>		

Course Introduction

Code	111301	Teaching Hours	32
Course	Principal of education		
Key Words	Basic theory, higher education system, the structure, function, quality assurance, campus culture		
Purpose and Role of the Course	<p>This course is a basic theoretical course for master candidates major in education economics and management by the institute of higher education, college of humanities and social sciences.</p> <p>This course begins with the basic theory of higher education, on this basis, it researches into the status, developing process and future development trends of academic status and institutions on macro level. It explores the basic function of higher education—development of knowledge, social services, and their developing history and their characteristics, operation and organization in modern universities. It studies the teaching and postgraduate education issues at the micro level. These studies make students have a comprehensive understanding, and lay a solid foundation for further study of higher education.</p>		
Main Chapters and Teaching Hours	<p>The main content of this course is divided into ten chapters:</p> <p>Chapter 1: The general theory of education and higher education (2 credits)</p> <p>Chapter 2: Basic theoretical problem of higher education (4 credits)</p> <p>Chapter 3: Higher education system (4 credits)</p> <p>Chapter 4: The structure of higher education (4 credits)</p> <p>Chapter 5: Teaching (3 credits)</p> <p>Chapter 6: Function of the knowledge development of university (3 credits)</p> <p>Chapter 7: function of the social service of university (2 credits)</p> <p>Chapter 8: Postgraduate education (4 credits)</p> <p>Chapter 9: Higher education quality assurance (4 credits)</p> <p>Chapter 10: Campus culture (2 credits)</p>		
Teach Method	Seminars. This course takes discussion as main teaching method, students prepare materials accordance with the themes in every chapters, and present in the class, teacher evaluates the research , answers the questions and discuss with students together.		
Test and Examination	Class reports and ending course paper		
Pre-request Course	None		
References	<p>[1] Maoyuan Pan. New higher education. Beijing normal university,2009.(in chinese)</p> <p>[2]Daojun Wang. Pedagogic.People’s education press,2009.(in chinese)</p> <p>[3] Guoren Zhu. On the functions of higher education.Heilongjiang education press, 2011. (in chinese)</p> <p>[4] Keming Hao. Structure of higher education of china. People’s education press, 1987. (in chinese)</p> <p>[5] Futao Huang. Foreign higher education history. Shanghai education press, 2003. (in chinese)</p> <p>[6] Manli Li. General education—a university education. Qinghua university press, 1999. (in chinese)</p> <p>[7] Shengbing Li. The evolution of postgraduate education mode. Educational science publishing house,1997. (in chinese)</p> <p>[8] Shaoxue Liu. The history of Chinese university education. Shanxi education press, 2007. (in chinese)</p>		

Course Introduction

Course Code	111526	Teaching Hours/Season	32/ Spring			
Course Title	Nonprofit Organization Management					
Key Words	Non-profit, Volunteer, Management					
Purpose and Role of the Course	<p>This course is one of the professional elective courses for Administrative postgraduate. In this course, we will study the basic concepts of the non-profit organization, and then introduction and analysis of its basic characteristics, the development of the history, management and control and so on. Enable students to understand and grasp the meaning of non-profit organizations, historical context, and strategic management theory, methods and technology, and to get some combat methods in this course. At the same time, it request students are be able to make some analysis for the non-profit organization development status and trends. It also requires students to have at least once a non-profit organization of volunteers experienced and able to take certain specific tasks.</p>					
Main Chapters and Teaching Hours	<p style="text-align: center;">The course content is divided into five chapters:</p> <p>Chapter I The basic characteristics of the non-profit organizations (6 teaching hours)</p> <p>Chapter II The history of the development of the non-profit organization(6 teaching hours)</p> <p>Chapter III Chinese non-profit organizations(8 teaching hours)</p> <p>Chapter IV The management and control of non-profit organizations (8 teaching hours)</p> <p>Chapter V The marketing and management of non-profit organizations(6 teaching hours)</p>					
Teach Method	Mainly teachers open teaching, and graduate students participate in the case teaching and literature analysis work actively.					
Test and Examination	Usually combine with the case and the literature, End of the open-book examination					
Pre-request Course	Macroeconomics , Management , Sociology , Political science ,Organizational behavior					
Reference books	Name	Author	Press	The time Of publication	Materials category	Wheather school teachers
Major reference books	Introduction to Nonprofit Management	Wang Ming	China Renmin University Press	2002	Compile	no
General reference books	Business management of non-profit institutions	Peter Drucker	TaipeiYuan-Liou Publishing Company	1999	Monograph	no
	Nonprofit Management	Regina • E • Hertz Lin Jie	Renmin University of China Press, Harvard Business School Press	2000	Monograph	no
	Non-Profit Organization Management	Chen changbai	Unity Press	2000	Compile	yes
	History of Chinese Society	Wang shigang	Anhui People's Publishing House	1994	Monograph	no

Course Introduction

Code	113001	Teaching Hours	48
Course	Public Administration		
Key Words	Public management; public decision; public service		
Purpose and Role of the Course	This course systemizes public administration theory according to the time. Reinforce the theoretical basis, improve the academic acumen and enhance research skills of students with the combination of lecture and seminar.		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1.Introduction to public administration 2.Managerial approach 3.Bureaucracy Theory 4.Institutional analysis 5.Public decision 6.New public administration Theory 7.New Public participation 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	1. Term Paper	50%	2. Final exam 50%
Pre-request Course	Knowledge of government and other basic political theories		
References	<p>Books:</p> <ol style="list-style-type: none"> 1、Public Participation in Public Decisions: New Skills and Strategies for Public Managers, John Clayton Thomas 2、 Towards a Subjective Approach to Policy Planning & Evaluation: Common-sense Structured, Hoklin Leung 3、 Governing the Commons:The Evolution of Institutions for Collective Action, Elinor Ostrom 4、 The Logic of Collective Action: Public Goods and the Theory of Groups, Mancur Olson 5、 The New Public Service Serving,Not Steering, Janet V.Denhardt <p>Articles:</p> <ol style="list-style-type: none"> 6、 Public Administration and the Public Interest, E. Pendleton Herring 7、 Toward a New Public Administration, H.George Frederickson 8、 Public and Private Management:Are They Fundamentally Alike in All Unimportant Respects? Graham T.Allison4、 9、 Policy Paradox: The Art of Political Decision Making, Deborah Stone <p>From Public Administration To Public Management:Reassessing a Revolution?Andrew Gray and Bill Jenkins</p>		

Course Introduction

Code	113021	Teaching Hours	32
Course	Educational psychology		
Key Words	cognition; learning; instruction		
Purpose and Role of the Course	Educational psychology is the scientific study of human learning. The study of learning processes, both cognitive and affective, allows researchers to understand individual differences in behavior, personality, intellect, and self-concept. The field of educational psychology heavily relies on testing, measurement, assessment, evaluation, and training to enhance educational activities and learning processes. This can involve studying instructional processes within the classroom setting.		
Main Chapters and Teaching Hours	结合最新文献内容的研究主题，再进行分配。		
Teach Method	课堂讨论为主，结合教师评述。		
Test and Examination	课堂讨论表现计入平时成绩，学期末提交综述性论文，评定综合成绩。		
Pre-request Course			
References			

Course Introduction

Code	113022	Teaching Hours	32
Course	Principles of Higher Education		
Key Words	higher education principles; higher education structures; higher education functions		
Purpose and Role of the Course	The course is to explore the basic principles and functions of higher education. So the students could have a comprehensive understanding to the development of higher education, including its history, current situation and future tendencies.		
Main Chapters and Teaching Hours	<p>Chapter 1 Historical Development of Higher Education 4</p> <p>Section 1 The essence of higher education</p> <p>Section 2 Education and the development of society</p> <p>Section 3 Aims of education</p> <p>Chapter 2 Related Principles of Higher Education 8</p> <p>Section 1 Autonomy and freedom</p> <p>Section 2 General education and special education</p> <p>Section 3 Higher education and higher education institutions</p> <p>Section 4 Elite higher education and Mass higher education</p> <p>Chapter 3 Changes of Higher Education System 6</p> <p>Section 1 the Essence of higher education system</p> <p>Section 2 International case studies</p> <p>Chapter 4 Higher Education Structures 6</p> <p>Section 1 the Essence of higher education structure</p> <p>Section 2 Current development of Chinese higher education structures</p> <p>Chapter 5 Higher Education Functions 6</p> <p>Section 1 Knowledge transfer</p> <p>Section 2 Social service</p> <p>Section 3 Case studies</p> <p>Chapter 6 Graduate Education 8</p> <p>Section 1 Historical development</p> <p>Section 2 Meaning and targets</p> <p>Section 3 Chinese graduate education</p> <p>Section 4 Development of Professional degree</p> <p>Chapter 7 Quality Assurance 8</p> <p>Section 1 Relate concepts</p> <p>Section 2 Development</p> <p>Section 3 Essence</p> <p>Section 4 Case studies</p> <p>Chapter 8 University culture 2</p> <p>Section 1 Essence and characteristics</p> <p>Section 2 Contents</p> <p>Section 3 Meaning</p>		
Teach Method	Exploration; Inspiration; Discussion		
Test and Examination	Attendance+Presentation+Paper		

Course Catalogue for International Postgraduates

(School of Transportation Science and Engineering)

编号 No.	英文课程名称 Course Title	中文课程名称 Course Title	学时 Hours	学分 Credits	开课季节 Semester	任课教师 Lecturer
133102	Advanced Soil Mechanics	高等土力学	48	3	Spring /Fall	YAO Yangping
133103	Nonlinear analysis of concrete structures	混凝土结构非线性分析	32	2	Spring /Fall	Diao Bo Ye Yinghua
133104	Foundation Engineering	基础工程学	32	2	Spring /Fall	LUO Ting
133105	Design of Steel Structures	钢结构设计	32	2	Spring /Fall	Tu Yongqing
133106	Advanced Civil Engineering Materials	高等土木工程材料	32	2	Spring /Fall	ZHANG Wu-man
133107	Soil Dynamics	土动力学	32	2	Spring /Fall	YAO Yangping
133108	Advanced Rock Mechanics	高等岩石力学	32	2	Spring /Fall	ZHU Jian-ming
133203	Structural concepts and systems	结构概念与体系	36	2	Spring	Guo Quan-quan
133110	Theory of Elasticity	弹性理论	32	2	Spring /Fall	ZHENG Xiaoning
133111	Finite Element Analysis and Its Applications in Civil Engineering	有限元分析及其在土木工程中的应用	60	3	Spring /Fall	GAO Zhengguo
133112	Cartography & Geomatics	制图学与测绘学	18	1	Spring /Fall	TAN Yumin
133207	GIS-Theory and application	地理信息系统原理和应用	32	2	Spring /Fall	Tan Yumin
133208	Durability of concrete materials	高性能混凝土耐久性	16	1	Spring /Fall	ZHANG Wu-man
133115	Large-span Spatial Structures	大跨空间结构	32	2	Spring /Fall	Bai Yin
133116	Ground Treatment	地基处理	32	2	Spring /Fall	Tong Zhaoxia
133117	Testing of civil engineering structures	建筑结构检验	18	1	Spring /Fall	ZHOU Yao
133118	Application principal of	道路土工合成材	32	2	Spring	TONG Zhao-xia

	geosynthetics in road	料应用原理			/Fall	
133119	Application of Smart Materials and Structures in Civil Engineering	智能材料与结构在土木工程中的应用	32	2	Spring /Fall	Zhang Taotao
133120	Simulation Analysis of Automobile Aerodynamics	汽车空气动力学仿真分析	48	3	Spring /Fall	KANG Ning

Course Introduction

Code	133102	Teaching Hours	48
Course	Advanced Soil Mechanics		
Key Words	soil and geology; Seepage properties; Creep behavior		
Purpose and Role of the Course	<p>Advanced Soil Mechanics is one fundamental course in the field of road and railway engineering, which is also one required course. The physical and mechanical properties of soil, seepage theory, consolidation, the strength and deformation theory and the analysis and compute technique of foundation will be described in detail.</p> <p>Through this course, the students can learn the fundamental theories of soil mechanics well and lay solid foundation for the soil structure design.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction of soil and geology 2. Principal of effective stress 3. Deformation and strength properties of soil 4. Seepage properties of soil 5. Settlement calculation and consolidation theory 6. Creep behavior of soil 7. Bearing capacity of foundation 8. Stability analysis of soil slope 		
Teach Method	The course is given in the form of class lectures, discussion and homework assignments. Students are expected to improve their problem resolving capabilities.		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 40% 2. Final exam 60% 		
Pre-request Course	Soil Mechanics, Material Mechanics, Elastic and Plastic Mechanics		
References	<p>[1] Yin Z.Z., et al. Geotechnical Computing Principal. China WaterPower Press.1996.</p> <p>[2] Huang W.X.. Engineering Properties of soil. China WaterPower Press.</p>		

Course Introduction

Code	133103	Teaching Hours	32
Course	Nonlinear analysis of concrete structures		
Key Words	nonlinear mechanics; nonlinear constitutive laws; nonlinear analysis methods		
Purpose and Role of the Course	<p>Due to the obviously nonlinear characters of concrete materials, the experimental results are more corresponding with nonlinear analysis results. The major focus of this course is on nonlinear analysis theory and basic methods of concrete structures. The nonlinear numerical solution techniques and exercises are included.</p> <p>Introduce the basic theory of nonlinear mechanics. The emphasis is on nonlinear constitutive laws of concrete and steel bars, nonlinear analysis methods of concrete structures.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction: Basic concept of nonlinear mechanics 2. nonlinear constitutive laws of concrete and steel bars 3. nonlinear analysis methods of concrete structures 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 40% 2. Final exam (open book) 60% 		
Pre-request Course			
References	<p>[1]. 《Nonlinear analysis of concrete structures》, YEYinghua, Diao Bo, Harbin Institute of Technology Press 1996.12</p> <p>[2]. 《Computational mechanics of reinforced concrete structures》, Gunter Hofstetter, Herbert A. Mang, Vieweg & Sohn Verlagsgesellschaft mbH, Braunschweig/Wiesbaden, 1995</p>		

Course Introduction

Code	133104	Teaching Hours	32
Course	Foundation Engineering		
Key Words	Subgrade Calculation; Strip Foundation; Raft Foundation		
Purpose and Role of the Course	<p>Foundation engineering design calculation method and theory. Research production and design experience of strip foundation, box foundation, raft foundation, piled raft foundation, retaining and protecting for deep foundation excavation achieved by design organization and institutions of higher learning, while also some traditional, classical design and calculation method at home and abroad.</p> <p>Foundation engineering is a course for graduate students majored in geotechnical engineering. The emphasis is on design and calculation method of foundation and the ability to analyze and solve practical problems furthermore the research capability.</p>		
Main Chapters and Teaching Hours	<p>Chapter1. Subgrade Calculation (6 hours) Bearing capacity of foundation, Base stability calculation, Calculation of radius deformation of foundation base, Subbase deformation, Mechanics model of foundation base</p> <p>Chapter2. Strip Foundation (8 hours) Mechanics model of foundation base and calculation method of beam on subgrade such as static equilibrium method, inverted beam method, calculation method of Winkler Foundation-Beam, link method, finite difference method, finite element method.</p> <p>Chapter3. Box Foundation (8 hours) Determination of the specimen size, internal force analysis, strength and deformation check of foundation, calculation and design of member section and general construction requirements for box foundation.</p> <p>Chapter4. Raft Foundation (6 hours) Basic concept, common types and norms of raft foundation. Calculation method of raft foundation such as the strip method, inverse building cap method, finite difference method, finite element method.</p> <p>Chapter5.Pile-box Foundation and Piled Raft Foundation (4 hours) Pile layouts design, structural and settlement calculation of pile-box foundation and piled raft foundation and etc.</p> <p>Chapter6.Foundation Pit Support (4 hours) “M” method in foundation pit excavation and support</p>		
Teach Method	<p>The course is given in the form of class lectures with arrangement of discussion and interaction links. Students are expected to further grasp the contents through doing the homework assignments on key contents.</p>		
Test and Examination	<p>1. Usual performance 20%</p> <p>2. Final exam (Close exam) 80%</p>		
Pre-request Course	Soil mechanics, testing techniques in geotechnical engineering		

References	<p>[1] Wang Chenghua, Foundation Engineering, Tianjin:Tianjin University Press, January 2002</p> <p>[2] Qian Lihang, Design and Calculation of Box Foundation and Raft Foundation in High-rise Building, China Architecture & Building Press. June 2003.</p> <p>[3]Tomlinson M J. Foundation Design and Construction. 6th ed. UK: Addison Wesley Longman Limited, 1995</p> <p>[4]Braja M. Das. Principles of foundation engineering. PWS-KENT Publishing Company, 1990</p> <p>[5] Joseph E. Bowles. Foundation Analysis and Design. 5th ed. International Edition 1997</p>
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Course Introduction

Code	133105	Teaching Hours	32
Course	Design of Steel Structures		
Key Words	structural steel; beams and girders; plate girders		
Purpose and Role of the Course	<p>Introduce general and fundamental structural steel design procedures. Include: the basic material behavior of steel; discuss different structural components (tension members, columns under axial compression, beams, and beam-columns); the design methods for simple and eccentric connections; requirements for seismic design.</p> <p>Introduce the fundamental structural design process and provide a detailed discussion on the design of steel structures. The design procedures discussed are primarily based on the Load and Resistance Factor Design (LRFD), which is a modern design method widely used in the North America. However, the Chinese National Steel Structure Design Standards requirements are also discussed.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction 2. structural steel 3. tension member design 4. columns under axial compression 5. beams and girders 6. members under combined axial forces and moments 7. design of simple connections 8. design of eccentric connections 9. plate girders 10. introduction to seismic design 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 40% 2. Final exam (open book) 60% 		
Pre-request Course	Knowledge of strength of materials and structural Analysis		
References	[1] Yan, Xiao, J.C. Anderson, Design of Steel Structures. 1th Ed., Beijing: Higher Education Press. 2007		

Course Introduction

Code	133106	Teaching Hours	32
Course	Advanced Civil Engineering Materials		
Key Words	Civil Engineering Materials; physical properties; strength characteristics		
Purpose and Role of the Course	<p>This course deals with properties, applications and analysis of important materials of construction/civil engineering. It offers full coverage of how materials are made or obtained, their physical properties, their mechanical properties, how they are used in construction, how they are tested in the lab, and their strength characteristics—information that is essential for material selection and elementary design.</p> <p>Introduce the topics of properties of advanced civil engineering materials. The emphasis is that the properties of advanced civil engineering materials are very important to material selection and elementary design.</p>		
Main Chapters and Teaching Hours			
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	1. Homework 40% 2. Final exam (open book) 60%		
Pre-request Course	Knowledge of civil engineering materials		
References	[1] Shan Somayaji, Civil Engineering Materials, Prentice Hall, 2nd, 2001		

Course Introduction

Code	133107	Teaching Hours	32
Course	Soil Dynamics		
Key Words	Dynamic strength; deformation; pore water pressure		
Purpose and Role of the Course	<p>Soil Dynamics is one branch of soil mechanics and this is one optional course in the field of road and railway engineering. In this course, the deformation and strength properties and the stability of soil subjected to various dynamic loadings such as earthquake, blast, wave loadings and dynamic machines are described in detail.</p> <p>Through this course, students are expected to grasp the fundamental theories of soil dynamics and lay a solid foundation for the design of ground, foundation and structures with high resistance to the dynamic loadings.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction 2. Vibration and wave of soil under dynamic loadings 3. Dynamic strength, deformation and pore water pressure of soil 4. Liquefaction of saturated sands and silty clay 5. Testing apparatus and methods for dynamic properties of soil 6. Dynamic stress and strain relationship of soil 7. Introduction of geotechnical earthquake 		
Teach Method	The course is given in the form of class lectures focusing on the fundamental theories and concepts. And small contents are given to students for self-study. Students are expected to improve their problem thinking and resolving capabilities.		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 40% 2. Final exam 60% 		
Pre-request Course	Soil Mechanics, Material Mechanics, Elastic and Plastic Mechanics.		
References	<p>[1] Xie D.Y. Soil Dynamics. Xi'an Jiaotong University Press.</p> <p>[2] Wu S.M.. Principal of soil dynamics. Zhejiang University Press.</p>		

Course Introduction

Code	133108	Teaching Hours	32
Course	Advanced Rock Mechanics		
Key Words	physical properties; Deformation character; stability Analysis		
Purpose and Role of the Course	<p>The Advanced Rock Mechanics which is the Major Required Elementary Courses of the Geotechnical Engineer is one of main degree courses. This course main narrates rock physical properties, rock mass structure, rock mass deformation, rock mass theory of strength, surrounding rock mechanics computation and stability analysis of underground works.</p> <p>The object is to help the student to grasp the rock mass the deformation principle, the rock mass theory of strength and general computational method of the rock mass project, and lays theoretical principle for the Geotechnical Engineer's structural design.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. The Physical properties of the rock 2. The Deformation character of the rock 3. The structure of the rock mass 4. The Deformation and Strength of the rock mass 5. The Theory of the rock mass's strength 6. The mechanical Calculation of surrounding rock and stability Analysis of underground works 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 40% 2. Final exam (open book) 60% 		
Pre-request Course	Knowledge of basic material mechanics, elastic mechanics and Geology Engineering		
References	<p>[1] Bardy B.H.G.,Brown,E,F.. Rock Mechanics for Underground Mining . Geerge Allenand Vnwin, 1985.</p> <p>[2] Googman. R. ,Introduction to Rock Mechanics . John Wiley and Sons, 1980</p> <p>[3]A.A.Balkema ,Shear Behaviour of Rock Joints ,2000</p> <p>[4]G.P.Giani, Rock Slope Stability Analysis, Rotterdam :Balkema,1992</p>		

Course Introduction

Code	133203	Teaching Hours	32
Course	Structural concepts and systems		
Key Words	architectural design; Program analysis; structural system		
Purpose and Role of the Course	<p>This course shows basic mechanical concepts of the structural plans, focusing on the whole design methods from intact structural system, emphasizing choosing the most reasonable major forces and the importance of being geometrical characteristic of buildings in the whole structural system.</p> <p>This course aims at helping students to master the behavior and partial systems of structures that are a decisive factor of architecture style and to conduct the concept of the whole structural design.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Structural in architectural design 2. Considering architect style in the phase of draft design as the whole structural system 3. Relationship between the unity and major partial systems 4. Program analysis of the whole structural system 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 40% 2. Final exam (open book) 60% 		
Pre-request Course	Structural Mechanics, Advanced Mathematics, Reinforced Concrete Structure, Steel Structure, Foundation Engineering, Designing Structures of High Rising Buildings		
References			

Course Introduction

Code	133110	Teaching Hours	32
Course	Theory of Elasticity		
Key Words	Elasticity; Strain; Stress		
Purpose and Role of the Course	<p>This course systematically introduces the basic principles, and analytical and calculational methods of the theory of Elasticity.</p> <p>The emphasis is on the basic concepts and principles, which lays a solid theoretical foundation for structural analysis of civil engineering.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction: <ol style="list-style-type: none"> 1.1 Elasticity 1.2 Stress 1.3 Notation for Forces and Stresses 1.4 Components of Stress 1.5 Components of Strain 1.6 Hooke's Law 2. Plane Stress and Plane Strain <ol style="list-style-type: none"> 2.1 Plane Stress 2.2 Plane Strain 2.3 Stress at a Point 2.4 Strain at a Point 2.5 Measurement of Surface Strains 2.6 Construction of Mohr Strain Circle for Strain Rosette 2.7 Differential Equation of Equilibrium 2.8 Boundary Conditions 2.9 Compatibility Equations 2.10 Stress Function 3. Two-dimensional Problems in Rectangular Coordinates <ol style="list-style-type: none"> 3.1 Solution by Polynomials 3.2 End Effects. Saint-Venant's Principle 3.3 Determination of Displacements 3.4 Bending of a Cantilever Loaded at the End 3.5 Bending of a Beam by Uniform Load 3.6 Other Cases of Continuously Loaded Beams 3.7 Solution of the Two-dimensional Problem in the Form of a Fourier Series 3.8 Other Application of Fourier Series. Gravity Loading 3.9 End Effects. Eigensolutions 4. Two-dimensional Problems in Polar Coordinates <ol style="list-style-type: none"> 4.1 General Equations in Polar Coordinates 4.2 Stress Distribution Symmetrical about an Axis 		

	<p>4.3 Pure Bending of Curved Bars</p> <p>4.4 Strain Components in Polar Coordinates</p> <p>4.5 Displacements for Symmetrical Stress Distributions</p> <p>4.6 Rotating Disks</p> <p>4.7 Bending of a Curved Bar by a Force at the End</p> <p>4.8 Edge Dislocation</p> <p>4.9 The Effect of Circular Holes on Stress Distributions in Plates</p> <p>4.10 Concentrated Force at a Point of a Straight Boundary</p> <p>4.11 Any Vertical Loading of a Straight Boundary</p> <p>4.12 Force Acting on the End of a Wedge</p> <p>4.13 Bending Couple Acting on the End of a Wedge</p> <p>4.14 Concentrated Force Acting on a Beam</p> <p>4.15 Stresses in a Circular Disk</p> <p>4.16 Force at a Point of an Infinite Plate</p> <p>4.17 Generalized Solution of the Two-dimensional Problem in Polar Coordinates</p> <p>4.18 Application of the Generalized Solution in Polar Coordinates</p> <p>4.19 A Wedge Loaded along the Faces</p> <p>4.20 Eigenolutions for Wedge and Notches</p> <p>5. Analysis of Stress and Strain in Three Dimensions</p> <p>5.1 Introduction</p> <p>5.2 Principal Stresses</p> <p>5.3 Stress Ellipsoid and Stress-director Surface</p> <p>5.4 Determination of the Principal Stresses</p> <p>5.5 Stress Invariants</p> <p>5.6 Determination of the Maximum Shearing Stress</p> <p>5.7 Homogeneous Deformation</p> <p>5.8 Strain at a Point</p> <p>5.9 Principal Axes of Strain</p> <p>5.10 Rotation</p>
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments
Test and Examination	1. Homework 40% 2. Final exam (open book) 60%
Pre-request Course	Knowledge of basic mathematics analysis
References	[1] S.P.Timoshenko , J.N.Goodier, Theory of Elasticity, 1st Ed., Beijing: Tsinghua University Press, 2004

Course Introduction

Code	133111	Teaching Hours	60
Course	Finite Element Analysis and Its Applications in Civil Engineering		
Key Words	finite element methods; Geometric nonlinearities; Material nonlinearities		
Purpose and Role of the Course	<p>Basic principles of continuum mechanics and finite element methods, modern application to solution of practical problems in solid, structural, heat and mass transfer, other field problems. Kinematics of deformation, strain and stress measures, constitutive relations. Discretization of governing equations using finite element methods. Solution of central problems using existing computer programs..</p> <p>The objective is to teach in a unified manner the fundamentals of finite element analysis of solids and structures. This includes the theoretical foundations and appropriate use of finite element methods.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1 The formulation of finite element methods for linear static analysis of solids and structures: <ol style="list-style-type: none"> 1.1 Two- and three-dimensional solids 1.2 Beam, plate, and shell structures 2 The displacement-based finite element procedures, when they are effective, and mixed finite element methods for almost incompressible media and beams, plates, and shells. 3 The formulation of finite element methods for nonlinear static analysis: <ol style="list-style-type: none"> 3.1 Geometric nonlinearities (large displacements and large strains) 3.2 Material nonlinearities (nonlinear elasticity and elasto-plasticity) 4 The formulation of finite element methods for the analysis of heat transfer in solids: conduction, convection, and radiation conditions. 5 The appropriate use of finite element procedures: <ol style="list-style-type: none"> 5.1 Setting up an appropriate model 5.2 Interpreting the results, and assessing the solution error 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 40% 2. Final exam (open book) 60% 		
Pre-request Course	Knowledge of elasticity		
References	[1] O.C.Zienkewicz, The Finite Element Method, 3rd		

Course Introduction

Code	133112	Teaching Hours	18
Course	Cartography & Geomatics		
Key Words	Map basics; Georeferencing; Thematic maps points		
Purpose and Role of the Course	<p>This course examines the types of geographic data, methods of data gathering, storage, manipulation and display. This includes elements of surveying, cartography, aerial photography, GIS and remote sensing.</p> <p>The aim of this course is to develop students' understanding, approach and technical skills in geospatial data acquisition, processing, analysis, management and visualization.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction to course, Map basics and Georeferencing 2. Map Generalization; Relief methods 3. Digital Elevation Models, Symbolisation 4. Thematic maps points, lines and area 5. Map Projections, Map Projection examples; History of geomatics 6. Trends: web mapping 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 40% 2. Final exam (open book) 60% 		
Pre-request Course	Knowledge of basic surveying and cartography		
References	<p>There is NO required text - you can read any library books on Cartography / Mapping / Geomatics</p> <p>The main reference is the online lecture notes, which may be supplemented during the course.</p> <p>[1] ESRI Mapping Center: http://mappingcenter.esri.com/</p> <p>[2] Google maps (and Google earth): http://maps.google.com</p> <p>[3] National Topographic maps: http://maps.nrcan.gc.ca/topo101/index_e.php</p>		

Course Introduction

Code	133207	Teaching Hours	32
Course	GIS-Theory and application		
Key Words	GIS-Theory and application; Geographic Coordinate System; Raster data model		
Purpose and Role of the Course	<p>A geographic Information System (GIS) is a computer system for capturing, storing, querying, analyzing, and displaying geospatial data and GIS is also powerful software to deal with geo-referenced phenomena with digital means, and it's a combination of modern Geography, Computer Science, Mathematics, Surveying Engineering, Computer Graphics and Cartography.</p> <p>The main object of the course is to learn concepts, methods and applications of geographic information system. Students should have some background knowledge on matrix, statistics and software engineering. Upon completion of this course , students will be able to solve basic geographic related information problems by implementation in Principles of GIS. In particular, students will:</p> <ol style="list-style-type: none"> 1. be able to design conceptual frameworks for simple GIS applications. 2. be able to design database schemes for both spatial data and attribute data. 3. be able to design the functionalities of the applications. 4. be able to do some elementary digitizing, editing and data transforming works. 5. be able to develop a GUI and integrate some basic functions into it. 		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction (2Hrs) <ol style="list-style-type: none"> 1.1 What Is a GIS? 1.2 A Brief History of GIS 1.3 Geographically Referenced Data 1.4 GIS Operations 1.5 GIS applications 2. Coordinate systems (2Hrs) <ol style="list-style-type: none"> 2.1 Geographic Coordinate System 2.2 Map Projections 2.3 Commonly Used Map Projections 2.4 Projected Coordinate Systems 2.5 Working with Coordinate Systems in GIS 3. Georelational vector data model (3Hrs) <ol style="list-style-type: none"> 3.1 Georelational data model 3.2 Representation of Simple Features 3.3 Topology 3.4 Nontopological Vector Data 3.5 Data Models for Composite Features 4. Object-based vector data model (3Hrs) <ol style="list-style-type: none"> 4.1 Object-based Data Model 4.2 The Geodatabase Data Model 4.3 Interface 4.4 Topology Rules 4.5 Advantages of the Geodatabase Data Model 		

5. Raster data model (3Hrs)
 - 5.1 Elements of the Raster Data Model
 - 5.2 Types of Raster Data
 - 5.3 Raster Data Structure
 - 5.4 Image Compression
 - 5.5 Data Conversion
 - 5.6 Integration of Raster and Vector Data
6. Data input (2Hrs)
 - 6.1 Existing GIS Data
 - 6.2 Metadata
 - 6.3 Conversion of Existing Data
 - 6.4 Creating New Data
7. Geometric Transformation (2Hrs)
 - 7.1 Geometric Transformation
 - 7.2 Root Mean Square (RMS) Error
 - 7.3 Interpretation of RMS Errors on Digitized Maps
 - 7.4 Resampling of Pixel Values
8. Attribute data input and management (3Hrs)
 - 8.1 Attribute Data in GIS
 - 8.2 The Relational Model
 - 8.3 Attribute Data Entry
 - 8.4 Manipulation of Fields and Attribute Data
9. Data display and cartography (3Hrs)
 - 9.1 Cartographic Symbolization
 - 9.2 Types of Maps
 - 9.3 Typography
 - 9.4 Map Design
 - 9.5 Map Production
10. Data exploration (3Hrs)
 - 10.1 Data Exploration
 - 10.2 Attribute Data Query
 - 10.3 Spatial Data Query
 - 10.4 Raster Data Query
 - 10.5 Geographic Visualization
11. Vector Data analysis (3Hrs)
 - 11.1 Buffering
 - 11.2 Overlay
 - 11.3 Distance Measurement
 - 11.4 Pattern Analysis
 - 11.5 Map Manipulation
12. Raster data analysis (3Hrs)
 - 12.1 Data Analysis Environment
 - 12.2 Local Operations
 - 12.3 Neighborhood Operations

	<p>12.4 Zonal Operations</p> <p>12.5 Physical Distance Measure Operations</p> <p>12.6 Other Raster Data Operations</p> <p>12.7 Comparison of Vector- and Raster-Based Data</p>
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments. Practice hours should be arranged combined with this course after class.
Test and Examination	<p>1. Classroom Participation 10%</p> <p>2. Homework assignments 30%</p> <p>3. Final Exam 60%</p>
Pre-request Course	Knowledge of Surveying, Database Management, and Cartography and Computer Science
References	<p>[1] Kang-tsung Chang, <i>Introduction to Geographic Information Systems</i> (3rd Edition), McGraw-Hill 2005.</p> <p>[2] Ian Heywood, et al <i>An Introduction to Geographical Information Systems</i>, 2.Ed. Prentice Hall.2001</p> <p>[3] Paul A. Longley (Editor), M.F Goodchild et al <i>Geographical Information Systems: Principles, Techniques, Management and Applications</i>, 2.Ed. John Wiley & Sons.2005</p>

Course Introduction

Code	133208	Teaching Hours	60
Course	Durability of concrete materials		
Key Words	Concrete; durability; service life		
Purpose and Role of the Course	<p>The durability of high performance concrete (HPC) is introduced in this course. The relationship between microstructure and durability is representing in the first part. Resistance of freeze-thaw, sulfate, alkali-silicon reaction, acid, fire and reinforced steel corrosion is introduced in the second part.</p> <p>Introduce the topics of durability of high performance concrete. The emphasis is that the durability of high performance concrete is very important to concrete structure and the durability of high performance concrete should be considered in the structure design.</p>		
Main Chapters and Teaching Hours	<p>1 Problems and expectations</p> <p style="padding-left: 20px;">1.1 Random thoughts on the durability of high performance concrete</p> <p style="padding-left: 20px;">1.2 Present problems of durability of high performance concrete</p> <p style="padding-left: 20px;">1.3 Durability of HPC in comparison with conventional concrete</p> <p>2 Microstructure and parameters for durability</p> <p style="padding-left: 20px;">2.1 High-strength concrete microstructural characteristics and related durability aspects</p> <p style="padding-left: 20px;">2.2 Technological methods to increase the impermeability and strength of concrete</p> <p style="padding-left: 20px;">2.3 High performance cements by pressing: physical and engineering performance of pore reduced cement (PRC)</p> <p style="padding-left: 20px;">2.4 The effect of curing on water loss, strength and permeability of high strength concrete</p> <p style="padding-left: 20px;">2.5 Poor durability of high performance concrete with water-cement ratio≤ 0.30?</p> <p style="padding-left: 20px;">2.6 Standardizing test methods for evaluating the special properties of HPC in practical use</p> <p style="padding-left: 20px;">2.7 High performance concrete. The French National Project</p> <p style="padding-left: 20px;">2.8 The influence of cement, pozzolans and silica fume on the cracking tendency of high strength concrete</p> <p style="padding-left: 20px;">2.9 Frost resistance of HPC and role of the microstructure</p> <p style="padding-left: 20px;">2.10 Frost effects on the microstructure of high strength concrete</p> <p style="padding-left: 20px;">2.11 Frost- and deicing salt resistance of high strength concrete</p> <p style="padding-left: 20px;">2.12 Frost resistance of high performance concrete – some theoretical considerations</p> <p style="padding-left: 20px;">2.13 Alkali-silica reaction in high strength concrete</p> <p style="padding-left: 20px;">2.14 The effect of water-cement ratio, sulphonated plasticizer and silica fume on delayed ettringite expansion</p> <p style="padding-left: 20px;">2.15 High performance concrete – resistance against dissolution attack</p> <p style="padding-left: 20px;">2.16 Chemical resistance of high performance concrete against acid</p> <p style="padding-left: 20px;">2.17 Limits of pozzolanic additions with respect to alkalinity and corrosion protection of reinforcement</p> <p style="padding-left: 20px;">2.18 Chloride penetration in high performance concrete exposed to marine environment 194</p> <p style="padding-left: 20px;">2.19 Chloride diffusion coefficients obtained from migration tests of high performance concrete</p> <p style="padding-left: 20px;">2.20 Rebar corrosion in carbonated microconcrete containing silica fume</p>		

	2.21 Fire resistance of high performance concrete
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	1. Homework 40% 2. Final exam (open book) 60%
Pre-request Course	Knowledge of cement microstructure and concrete composition
References	<p>[1] H. Sommer, Durability of High Performance Concrete: Proceedings of the RILEM International Workshop, RILEM Publications, 1995</p> <p>[2] B. Mather, Concrete durability, Cement and Concrete Composites, 26 (2004), No. 1, 3-4.</p> <p>[3] F. P. Glasser, J. Marchand and E. Samson, Durability of concrete -- degradation phenomena involving detrimental chemical reactions, Cement and Concrete Research, 38 (2008), No. 2, 226-246.</p> <p>[4] P. C. Aïcin, The durability characteristics of high performance concrete: A review, Cement and Concrete Composites, 25 (2003), No. 4-5, 409-420.</p> <p>[5] V. L. H. O. Poupard, S. Catinaud and I. Petre-Lazar, Corrosion damage diagnosis of a reinforced concrete beam after 40 years natural exposure in marine environment, Cement and Concrete Research, 36 (2006), No. 3, 504-520.</p>

Course Introduction

Code	133115	Teaching Hours	32
Course	Large-span Spatial Structures		
Key Words	grid structures; reticulated shells; cable truss		
Purpose and Role of the Course	<p>Introduction of several typical kinds of large-span spatial structures, and FEM for these structural systems will be explained. The static and stability capacity calculation method and corresponding concept and characteristics will be taught.</p> <p>Helping masters realize the characteristics, constitution, and mechanical analysis for main structural systems of large-span spatial structures. Understanding basic theories and design principles. The ability of analyzing and studying large spatial structures' problems and construction practicing will be elevated.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction 2. grid structures 3. reticulated shells 4. cable truss and string beam 5. monolayer cable supported glass curtain wall 6. new type of large-space structures 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 40% 2. Final exam (open book) 60% 		
Pre-request Course	Knowledge of steel structures, stability calculation, structural mechanics		
References	The content will be mainly based on lecture notes		

Course Introduction

Code	133116	Teaching Hours	32
Course	Ground Treatment		
Key Words	Deep densification; Drainage consolidation; Replacement methods		
Purpose and Role of the Course	<p>Ground treatment is one technical course in the field of road and railway engineering, which is optional for students. The primary objective of ground treatment includes: improving the strength of soft subgrade, reducing its compressibility and settlements, preventing the liquefaction due to earthquake and et al. In this course, the technique and design principal for various ground treatments are described.</p> <p>Students are expected to grasp the design principal for ground treatment and improve their ability to analyze the ground problems.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction 2. Replacement methods 3. Deep densification 4. Drainage consolidation 5. Chemical consolidation 6. Reinforcement 		
Teach Method	The course is given in the form of class lectures and homework assignments. Students are expected to improve their problem resolving capabilities.		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 40% 2. Final exam (open book) 60% 		
Pre-request Course	Soil Mechanics, Foundation Engineering and Engineering Geology		
References	[1] Lecture notes are given for each lesson.		

Course Introduction

Code	133117	Teaching Hours	18
Course	Testing of civil engineering structures		
Key Words	Loading Equipment; Dynamic Testing; Data Acquisition System		
Purpose and Role of the Course	<p>The major focus on basic knowledge of testing technology of civil engineering structures. Basic technical training is obtained. It will help to study and detection for civil engineering structures in the future.</p> <p>Introduce testing technology of civil engineering structures.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction <ol style="list-style-type: none"> 1.1 Concept of Testing 1.2 methods of Testing of civil engineering structures 2. Loading Equipment and Test Setup <ol style="list-style-type: none"> 2.1 dead loading 2.2 air loading 2.3 mechanical loading 2.4 hydraulic loading 2.5 hydraulic jack 2.6 dynamic loading 3. loading devices <ol style="list-style-type: none"> 3.1 test floor 3.2 horizontal reaction setup 3.3 vertical reaction setup 3.4 transformation beams 3.5 supports and buttress 4. Instrumentation and Data Acquisition System <ol style="list-style-type: none"> 4.1 introduction 4.2 strain measurement 4.3 displacement measurement 4.4 force measurement 4.5 crack detection 4.6 temperature measurements 4.7 dynamic characteristics measurements 4.8 data acquisition system 5. Static Testing <ol style="list-style-type: none"> 5.1 monotonic static load testing 5.2 pseudo-static structural testing 5.3 pseudo-dynamic testing 5.4 testing data interpretation 6. Dynamic Testing <ol style="list-style-type: none"> 6.1 dynamic testing 		

	<p>6.2 dynamic testing of structure properties</p> <p>6.3 dynamic response of structure</p> <p>6.4 shaking table testing</p> <p>6.5 wind tunnel testing</p> <p>6.6 structural fatigue testing</p> <p>6.7 analysis and interpretation of vibratory signal</p>
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	<p>1. Homework 40%</p> <p>2. Final exam (open book) 60%</p>
Pre-request Course	
References	[1] Yao Zhen-gang, Liu zu-hua. Testing of civil engineering structures. Tongji university press. 2008

Course Introduction

Code	133118	Teaching Hours	32
Course	Application principal of geosynthetics in road		
Key Words	Geosynthetics; Filtration and drainage; Protection of subgrade		
Purpose and Role of the Course	<p>Application principal of geosynthetics in road is one optional course in the field of road and railway engineering. In this course, the basic properties of geosynthetics, the principals of reinforcement, filtration and drainage and the design methods are described in detail.</p> <p>Through this course, students are expected to grasp the fundamental application principals of geosynthetics and lay a solid foundation for the design of geosynthetics in road engineering.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction 2. Type and properties of geosynthetics in road 3. Reinforcement principal of geosynthetics 4. Reinforcement design methods of geosynthetics 5. Finite element analysis of reinforced embankment 6. Filtration and drainage of geosynthetics 7. Protection of subgrade 		
Teach Method	<p>The course is given in the form of class lectures focusing on the fundamental theories and concepts. Discussions are made after each chapter and students are required to finish some homework. Students are expected to improve their problem thinking and resolving capabilities.</p>		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 40% 2. Final exam 60% 		
Pre-request Course	Soil Mechanics, Material Mechanics, Elastic and Plastic Mechanics.		
References	[1] Huang X.M. Application principal of geosynthetics in road. China Communication Press.		

Course Introduction

Code	133119	Teaching Hours	32
Course	Application of Smart Materials and Structures in Civil Engineering		
Key Words	civil engineering; smart transducers; smart materials		
Purpose and Role of the Course	<p>The definition and classification of smart materials and structures will be introduced, and several kinds of typically smart transducers relevant to civil engineering will be presented. Finally, application of smart devices in civil engineering will be given.</p> <p>This course aims to introduce the application of the smart materials and structures in civil engineering, bringing deeper and newer understanding of this subject to the students</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction 2. Development and requirements of civil engineering 3. Definition and classification of smart materials and structures 4. Several kinds of typically smart transducers 5. Application of smart devices in Civil Engineering 5. Conclusion 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through reading references and writing reviews.		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 40% 2. Final exam (paper) 60% 		
Pre-request Course			
References	The content will be mainly based on lecture notes		

Course Introduction

Code	133120	Teaching Hours	48
Course	Simulation Analysis of Automobile Aerodynamics		
Key Words	Model Building; Mesh Generation; Computational Fluid Dynamics		
Purpose and Role of the Course	<p>The course is about the basic theory of fluid dynamics and computational fluid dynamics, introduction to FLUNET and simulation analysis of typical fluid flow problems.</p> <p>Through the study of this course, students can use the computational fluid dynamics software FLUENT to simulate typical engineering fluid flow problems based on the correct understanding of the basic concepts and knowledge of fluid mechanics and computational fluid dynamics.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Model Building and Mesh Generation 2. Basic Theory of Fluid Dynamics 3. Basic Theory of Computational Fluid Dynamics 4. Introduction to FLUENT 5. Simulation Analysis of Typical Fluid Flow Problems 6. Simulation Analysis of Multiphase Problems 7. Assignment guidance, presentation and comment 		
Teach Method	The course is given in the form of class lectures and class exercise, and students are expected to further grasp the contents through doing the homework assignments		
Test and Examination	Homework 100%		
Pre-request Course	Simulation of typical fluid flow problems correctly using software FLUENT.		
References	<p>[1] Z. Z. Hang, J. Wang, X. P. Lan, FLUENT, Examples and Application of Simulation Computation of Engineering Fluid, Beijing Institute of Technology Press, Beijing, China, 2004.6.</p> <p>[2] F. J. Wang, Analysis of Computational Fluid Dynamics, The Principle and Application of CFD Software, Tsinghua University Press, Beijing, China, 2004. 9.</p>		

Course Catalogue for International Postgraduates (School of Astronautics)

编号 No.	英文课程名称 Course Title	中文课程名称 Course Title	学时 Hours	学分 Credits	开课季节 Semester	任课教师 Lecturer
153102	Structural Analysis and Optimization	结构分析与优化	50	3	Fall	Huang Hai, Chen Shen-yan
153104	Practice of MSC.Patran/Nastran	Patran/Nastran 软件应用	16	1	Fall	Chen Shen-yan
153105	Aircraft Structural Dynamcis	飞机结构动力学	32	2	Fall	Zhao Libin
153106	Aerodynamics Used in Design of Fight Vehicles	飞行器空气动力学	50	3	Fall	You Hui
153107	Integrated Navigation System	组合导航系统	48	3	Spring	Hu Weiduo
153108	Mordern Control Theory	现代控制理论	48	3	Fall	Hu Weiduo
153110	Fundamentals of Rocket Propulsion	火箭推进基础	48	3	Fall	Liang Guozhu
153111	Combustion Theory	燃烧理论	48	3	Spring	Wang Hai-Xing
153114	Fundamentals and Applications of Finite Element Method	有限元基础及其应用	48	3	Fall	TIAN Ai-mei
153122	Pattern Recognition	模式识别	50	3	Spring	Cao Xiaoguang
153123	Digital Image Processing	数字图像处理	50	3	Spring	Cao Xiaoguang
153124	Visual C++ Programming for Digital Image Processing	VC++图像处理编程	50	3	Fall	Cao Xiaoguang
153141	Orbital Mechanics	轨道力学	48	3	Fall	Hu Weiduo
153142	Ramjet Theory and Technology	冲压发动机原理与技术	48	3	Fall	XU Xu, CHEN Bing
153144	Spacecraft Control	航天器控制	48	3	Spring	HU Weiduo
153117	Introduction of Solid Propellant	固体推进剂概论	48	3	Spring	YUAN Shiwei
153101	Conceptual Design of Launch Vehicle and Spacecraft	运载及空间飞行器概念设计	64	4	Spring	YOU Hui

Course Introduction

Code	153102	Teaching Hours	50
Course	Structural Analysis and Optimization		
Key Words	Optimization; Structural; Analysis		
Purpose and Role of the Course	<p>The structural system is one of the most important sub-systems of a flight vehicle, which provides enough strength and stiffness for the vehicle to work properly, as well as space for other equipments or sub-systems attached together. However, the structural system usually takes a large part of weight, so the advanced structural analysis and design techniques that are crucial for reducing weight are constantly concerned to aerospace structural designers.</p> <p>The purpose of this course is to provide some basic knowledge and methods of structural analysis and optimization. The structural analysis is focused on Finite Element Method (FEM) that nowadays is widely applied in aerospace and civil structural engineering. The course will introduce how the structural responses including deformation, stress distribution, etc. are calculated with on FEM. Based on FEM and combined with mathematical optimum theory, in the course, the structural optimization problems are established, which is to find a design that has the minimum structural weight and satisfied all requirements such as strength and stiffness. Some typical structural optimization methods are then discussed in the course, besides, the FEM analysis software Patran/Nastran is also introduced to the students, which contains some practice course hours to use the software in Lab.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1 Introduction of Structural Analysis and FEM (3 hrs) 2 Establishment of Element for Continuum (6 hrs) 3 Interpolation Functions and Other Elements (4 hrs) 4 FEM Software Practice (12 hrs) 5 Introduction to Structural Optimization (3 hrs) 6 Criterion Methods and Approximation concepts (6 hrs) 7 Algorithms to Seek Optimum (6 hrs) 8 Dual Methods and two level multipoint Approximation (5 hrs) 9 Examples of structural design for practical satellites; 10 Exercises and Discussion (2 hr) 		
Teach Method	<ol style="list-style-type: none"> 1. Lecture 2. Show and practice the FEA software Patran/Nastran 3. Home work and project 		
Test and Examination	<ol style="list-style-type: none"> 1. Submitting a project of structural analysis with Patran/Nastran 20% 2. Writing test for basic concepts and knowledge (30%). 3. Providing a finely report to summarizing the course contents or discuss a special problem selected by students 50% 		
Pre-request Course	<ol style="list-style-type: none"> 1. Theoretical Mechanics; 2. Material Mechanics; 3. Linear Algebra; 		

	4. (Mathematical Programming in the best case).
References	<p>[1] Huang Hai, Modern Structure Design Technology, Lecture material</p> <p>[2]Chen Shenyang, Material for Msc.Patran/Nastran Practice</p> <p>Students need to read 2 or more reference papers in structural optimization, which can be searched by themselves or by teacher.</p>

Course Introduction

Code	153104	Teaching Hours	16
Course	Practice of MSC.Patran/Nastran		
Key Words	Geomtery; post process; finite element modeling		
Purpose and Role of the Course	<p>The universal finite element software Msc.Patran/Nastran will be introduced and practiced in the present course. It has been widely applied in various field of structural analysis and structural design, especially in aeronautics and astronautics engineering. The main purpose of the course is to help student to apply structural analysis related knowledge into solving practical engineering problems. Based on the theory and software practice which has been given in the course of “Structural Analysis and Optimization”, the method of practical engineering structural analysis and optimization which can be solved by Msc.Patran/Nastran will be illustrated through an example of simplified satellite structure design, including finite element modeling techniques, normal mode and static analysis, structural optimization modeling and post-processing of analysis results.</p> <p>Through practice of Msc.Patran/Nastran, students can transfer theoretical knowledge (such as structure mechanics, material mechanics, finite element method, structural analysis and optimization) to practical application. Then, structural analysis problems of practical spacecraft can be solved by this software. Students can understand the structural design process based on analysis tool and have the basic ability in structural analysis and design of spacecraft.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1 Geomtery and finite element modeling 2 Load/Boundary Condition and material definition 3 Finite element properties definition 4 Analysis and post process 5 Introduction of structural optimization technique in Patran/Nastran 6 Structural optimization model definition 		
Teach Method	Lectures and software practice will be combined during the course. Students can establish the satellite model and complete structural analyses under the help of teacher. Students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	<ol style="list-style-type: none"> 1. Practice in classes 40% 2. Homework 60% 		
Pre-request Course	Knowledge of finite element method, and students should have attended the course “Structural Analysis and Optimization”		
References	<ol style="list-style-type: none"> [1] Patran/Nastran Exercise Book – Modeling and Analysis for Spacecraft, Lecture material [2] Msc.Patran reference manual, MSC Company [3] Huang Hai, Modern Structure Design Technology, Lecture material 		

Course Introduction

Code	153105	Teaching Hours	32
Course	Aircraft Structural Dynamcis		
Key Words	Equation of motion; undamped SDOF systems; continuous systems		
Purpose and Role of the Course	<p>In this course, students are introduced to concepts of structural dynamics and the response of engineering structures to time-varying loads. This requires the extension of structural theory to include the effects of the mass and damping and to evaluate the action of various deterministic and random dynamic loads. The main context include: Single-degree-of-freedom systems, Multi-degree-of-freedom systems, continuum systems, the solution methods to dynamics problems and the applications of software in structural dynamics. In addition, some special topics of Aircraft Structural Dynamics Problems will be introduced too.</p> <p>Introduce the basic concepts and theories of engineering structural dynamics. The emphasis is on applications of structural dynamics to describe the dynamics phenomena and solve general structural dynamics problems.</p>		
Main Chapters and Teaching Hours	<p>1-Introduction 2-Single-degree-of-freedom systems; 2.1 Equation of motion of SDOF systems 2.2 Free vibration of undamped SDOF systems 2.3 Free vibration of Damped SDOF systems 2.4 Characterization of SDOF dynamic problems 2.5 Harmonic Loads Of SDOF systems 2.6 Base excitation of SDOF systems 2.7 Periodic loads on SDOF systems 2.8 Impulsive Loading and Convolution Integral 3-Multi-degree-of-freedom systems 3.1 Equation of motion of MDOF systems 3.2 Modal coordinates, modal vibration 3.3 Free vibration of MDOF 3.4 Normalization of modal coordinates 4-Vibration of continuous systems; 4.1 Axial vibration of bar 4.2 Transverse vibration of beam 4.3 vibration of plane 5-Finite Element Method in structural dynamics; 6-Solution Method For Large Eigenproblems 7-Solution of Equilibrium Equations in Dynamic analysis 8-Application of General Softwares in structural dynamics. 9-Special Topics of Aircraft Structural Dynamics Problems</p>		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	<p>1. Assignments 40%</p> <p>2. Final exam (closed book) 60%</p>		
Pre-request Course	Mechanics of Materials;Theoretical mechanics;Linear algebra and matrices		

References	Self-written teaching materials : Aircraft structural dynamics [1] R.W. Clough. Dynamics of Structures [2] Dewey H Hodges Introduction to structural dynamics and aeroelasticity, Cambridge University Press.2002 [3] K.J.Bathe Finite Element Procedures in Engineering Analysis. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.1982
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Course Introduction

Code	153106	Teaching Hours	50
Course	Aerodynamics Used in Design of Fight Vehicles		
Key Words	Fluid Properties; Compressible Flow Field; Airfoil and Wing Aerodynamics		
Purpose and Role of the Course	<p>This course is for graduate students in mechanical engineering and aerospace engineering, including basic fluid mechanic principles, aerodynamic applications on incompressible and compressible flows with Hypersonic flows concerned, and aerodynamic design considerations. Provides a comprehensive review of the basic principle of fluid mechanics, emphasizes aerodynamic applications, and develops the student's understanding of the relative importance of various phenomena.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Fluid Properties 2. Fundamentals of Fluid Mechanics 3. Dynamics of an Incompressible, Inviscid Flow Field 4. Viscous Boundary Layers 5. Characteristic Parameters for Airfoil and Wing Aerodynamics 6. Incompressible Flows around Airfoils of Infinite Span 7. Incompressible Flow about Wings of Finite Span 8. Dynamics of a Compressible Flow Field 9. Compressible, Subsonic Flows and Transonic Flows 10. Two-Dimensional, Supersonic Flows around Thin Airfoils 11. Supersonic Flows over Wings and Airplane Configurations 12. Hypersonic Flows 13. Aerodynamic Design Consideratons 		
Teach Method	<p>The course is given in the form of class lectures, and students are expected to review the contents and set up their own concept frames by comprehensive understanding of aerodynamic principles and data.</p>		
Test and Examination	<p>Final exam (open book) 100%</p>		
Pre-request Course	<p>Knowledge of calculus, basic mechanics</p>		
References	<p>[1] John J. Bertin, Aerodynamics for Engineers, Prentice Hall, 4th edition, 2002</p>		

Course Introduction

Code	153107	Teaching Hours	48
Course	Integrated Navigation System		
Key Words	Navigation and Maps; Satellite constellation; Kalman filter		
Purpose and Role of the Course	<p>This course is designed for graduate students who interested in navigation systems. The course content includes celestial navigation, orbit of GPS, inertial navigation, GPS navigation, Kalman technique, and integrated navigation of GPS and INS, etc.</p> <p>Develop an understanding of navigation. Obtain a detailed knowledge of the navigation problem and its solutions with applications to various problems. And also provides a broad background in aerospace engineering. Introduces essential tools and problem solving techniques and helps produce graduates who can be successful in graduate level work.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction <ol style="list-style-type: none"> 1.1 Navigation and Maps 1.2 Dead reckoning and position fixing 2. Coordinate system and Celestial Navigation 3. Satellite constellation 4. Inertial Navigation, INS, 5. GPS <ol style="list-style-type: none"> 5.1 Principle of GPS 5.2 Example of application 6. Statistics and Estimation and Kalman filter 7. Integrated navigation, i.e. INS + GPS with Kalman filter. 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 50% 2. Project 50% 		
Pre-request Course	Knowledge of advanced calculus, Matlab		
References	<p>[1]Daniel J. Biezad. Integrated Navigation and Guidance System, AIAA,1999(V249.3/E:02)</p> <p>[2]Mohinder S. Grewal,etc. Global positioning system, inertial navigation, and integration, New York: Hohn Wiley, 2001(P228/E:09)</p>		

Course Introduction

Code	153108	Teaching Hours	48																																				
Course	Modern Control Theory																																						
Key Words	control theory; State space method; Nonlinear system																																						
Purpose and Role of the Course	<p>This course is designed for graduate students interested in control systems. The course content includes the basic definitions and methods of modern control theory and their relation to control system modeling, analysis, design and simulation, which are oriented toward engineering practices in industry, etc.</p> <p>Develop an understanding of control theory. Obtain a detailed knowledge of the control engineering problem and its solutions with applications to various problems. And also provides a broad background in aerospace engineering. Introduces essential tools and problem solving techniques and helps produce graduates who can be successful in graduate level work.</p>																																						
Main Chapters and Teaching Hours	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">1. Introduction</td> <td style="width: 20%; text-align: right;">3hrs</td> </tr> <tr> <td>2. Review of classical control theory</td> <td style="text-align: right;">9hrs</td> </tr> <tr> <td> 2.1 Ideas of feedback</td> <td></td> </tr> <tr> <td> 2.2 Model of dynamics system</td> <td></td> </tr> <tr> <td> 2.3 Dynamics response</td> <td></td> </tr> <tr> <td> 2.4 Properties of feedback</td> <td></td> </tr> <tr> <td>3. State space method</td> <td style="text-align: right;">3hrs</td> </tr> <tr> <td>4. Controllability and observability</td> <td style="text-align: right;">3hrs</td> </tr> <tr> <td>5. Linear system design and application</td> <td style="text-align: right;">6hrs</td> </tr> <tr> <td> 5.1 SISO system</td> <td></td> </tr> <tr> <td> 5.2 MIMO system</td> <td></td> </tr> <tr> <td> 5.3 Aerospace application</td> <td></td> </tr> <tr> <td>6. Optimization</td> <td style="text-align: right;">6hrs (optional)</td> </tr> <tr> <td>7. Optimal filter</td> <td style="text-align: right;">6hrs</td> </tr> <tr> <td>8. Identification</td> <td style="text-align: right;">3hrs</td> </tr> <tr> <td>9. Adaptive control</td> <td style="text-align: right;">3hrs</td> </tr> <tr> <td>10. Nonlinear system</td> <td style="text-align: right;">3hrs (optional)</td> </tr> <tr> <td>11. Digital control</td> <td></td> </tr> </table>			1. Introduction	3hrs	2. Review of classical control theory	9hrs	2.1 Ideas of feedback		2.2 Model of dynamics system		2.3 Dynamics response		2.4 Properties of feedback		3. State space method	3hrs	4. Controllability and observability	3hrs	5. Linear system design and application	6hrs	5.1 SISO system		5.2 MIMO system		5.3 Aerospace application		6. Optimization	6hrs (optional)	7. Optimal filter	6hrs	8. Identification	3hrs	9. Adaptive control	3hrs	10. Nonlinear system	3hrs (optional)	11. Digital control	
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Test and Examination	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">1. Homework</td> <td style="width: 35%;">50%</td> </tr> <tr> <td>2. Final exam (half open)</td> <td>50%</td> </tr> </table>			1. Homework	50%	2. Final exam (half open)	50%																																
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2. Final exam (half open)	50%																																						
Pre-request Course	Required: Linear algebra, Differential calculus. Helpful, not required: System and control basics, Modeling and simulation, Matlab																																						
References	Modern control system, R.C. Dorf, R.H. Bishop, 2004																																						

Course Introduction

Code	153110	Teaching Hours	48
Course	Fundamentals of Rocket Propulsion		
Key Words	rocket propulsion; Rocket-Powered Vehicles; Thermodynamic Relations		
Purpose and Role of the Course	<p>The course is devoted mainly to chemical rocket propulsion that uses energy derived from chemical combustion, and the intent is to give an introduction to the subject and a discussion of the basic working principles and the basic design methods. The course firstly covers common theoretical fundamentals of chemical rocket propulsion, and secondly discusses the principal components, working process characteristics, and corresponding design problems of solid and liquid propellant rocket engines respectively.</p> <p>Provide basic knowledge and methods of chemical rocket propulsion for graduate students engaged in aerospace propulsion investigations.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1 Introduction to rocket propulsion <ol style="list-style-type: none"> 1.1 Principle of Jet Propulsion 1.2 Classification of Jet Propulsion 1.3 Applications of Rocket 1.4 History of Rocket Propulsion 1.5 Future Development of Rocket Propulsion 2 Definitions and Basic Parameters <ol style="list-style-type: none"> 2.1 Main Performance Parameters of Thrust Chamber 2.2 Theoretical Values and Actual Values of Thrust Chambers 2.3 Main Engine Parameters 2.4 Energy and Efficiencies of Rocket Engines 3 Flight Performance of Rocket-Powered Vehicles <ol style="list-style-type: none"> 3.1 Gravity-free, Drag-free Flight 3.2 Forces Acting on a Vehicle in the Atmosphere 3.3 Basic Relations of Motion 3.4 Multistage Vehicle 3.5 Space Flight Mission Requirements 4 Nozzle Theory and Thermodynamic Relations <ol style="list-style-type: none"> 4.1 1-D Isentropic Steady Nozzle Flow 4.2 Nozzle performance of ideal rocket 4.3 Nozzle Shape 4.4 Variable Thrust 5 Thermodynamic Performance Analysis of Chemical Rocket Engine <ol style="list-style-type: none"> 5.1 Introduction 5.2 Basic Principles for Thermodynamic Analysis 5.3 Thermodynamic Calculation Procedure 5.4 Results of Thermodynamic Calculations 6 Heat Transfer Analysis in Rocket Engines <ol style="list-style-type: none"> 6.1 Basic concepts 		

	6.2 General steady-state heat-transfer relations
	6.3 Characteristics of Chamber and Nozzle Heat Transfer
	6.4 Heat-Transfer Failures
	6.5 Transient Heat Transfer
7	Solid Rocket Motor Components
	7.1 Introduction
	7.2 Propellant Grain and Grain Configuration
	7.3 Igniters
	7.4 Motor Case
	7.5 Nozzles
8	Solid Propellants and Combustion
	8.1 Introduction
	8.2 Classification and Ingredients of Solid Propellants
	8.3 Formulations of Propellants
	8.4 Propellant Processing
	8.5 Main Properties of Solid Propellants
	8.6 Propellant Grain Stress and Strain
	8.7 Combustion Process of Solid Propellants
	8.8 Propellant Burning Rate
9	Burning Surface Variation of Solid Propellant Grain
	9.1 Piobert's Law
	9.2 Tube Grain Geometric Calculation
	9.3 Star Grain Geometric Calculation
	9.4 Wagon Wheel Grain Design Calculation
	9.5 Slotted Tube Grain Design Calculation
10	Internal Ballistics of Solid Propellant Rocket Motor
	10.1. Introduction
	10.2. Basic Performance Relations
	10.3. Internal ballistic properties
	10.4. Performance parameters
11	Liquid Propellant Rocket Fundamentals
	11.1 Propellants
	11.2 Basic Performance Parameters
	11.3 Propellant Feed System
	11.4 Propellant Tanks
	11.5 Auxiliary Uses of Propellants
	11.6 Performance of Complete Rocket Engine Systems
	11.7 Thrust Vector Control
12	Liquid Propellants and Combustion
	12.1 Propellant Properties and Specifications
	12.2. Liquid Oxidizers
	12.3. Liquid Fuels
	12.4. Liquid Monopropellants
	12.5. Combustion

	<p>12.6. Combustion Instability</p> <p>13 Liquid Propellant Rocket Engine Systems</p> <p>13.1. Thrust Chambers</p> <p>13.2. Starting and Ignition</p> <p>13.3. Gas Pressure Feed System</p> <p>13.4. Turbopump Feed system</p> <p>13.5. Controls</p> <p>13.6. Valves</p> <p>13.7. Engine System Calibration</p> <p>13.8. Rocket Engines with Variable Thrust</p>
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	Homework 100%
Pre-request Course	Basic Knowledge of thermodynamics, fluid dynamics, and heat transfer
References	[1] George P. Sutton and Oscar Biblarz. Rocket Propulsion Elements(7 th edition). John Wiley & Sons, 2001.

Course Introduction

Code	153111	Teaching Hours	48
Course	Combustion Theory		
Key Words	chemical thermodynamics; chemical kinetics; Ignition Processes		
Purpose and Role of the Course	<p>The main content of this course focus on the basic theory concerning the combustion phenomena in rocket engine, such as the chemical thermodynamics, chemical kinetics, ignition process, premixed combustion, diffusion combustion and combustion process in solid and liquid rocket engine.</p> <p>Introduce the topics of basic phenomena and knowledge of combustion in rocket engine. This course will focus on improving the ability of understanding and analyzing problems in combustion process of rocket engine and lay the foundation for various engineering problems.</p>		
Main Chapters and Teaching Hours	<p>Introduction</p> <ul style="list-style-type: none"> 1.1 Combustion phenomena 1.2 The importance of combustion 1.3 Brief introduction to solid rocket engine 1.4 Brief introduction to liquid rocket engine 1.5 History of combustion development <p>2. The chemical thermodynamics and chemical kinetics</p> <ul style="list-style-type: none"> 2.1 Basic concept of chemical thermodynamics 2.2 Basic concept of chemical kinetics 2.3 Effects of parameters on reaction speed <p>3. Basic equations of chemical reactions</p> <ul style="list-style-type: none"> 3.1 Introduction to main parameters in continuous media 3.2 Continuity equation 3.3 Momentum equation 3.4 Energy equation 3.5 Species equation <p>4. Ignition Processes</p> <ul style="list-style-type: none"> 4.1 Classification of combustion phenomena 4.2 Thermal self-ignition 4.3 Unsteady analysis of thermal self-ignition 4.4 Steady analysis of thermal self-ignition 4.5 Positive ignition <p>5. Premixed gas combustion</p> <ul style="list-style-type: none"> 5.1 Combustion Wave 5.2 Combustion of laminar premixed gas 5.3 Flame speed 5.4 Basic equation of laminar flame <p>6. Diffusion combustion</p> <ul style="list-style-type: none"> 6.1 Combustion of gas fuel jet 		

	<p>6.2 Burke-Schumann solution of gas fuel jet combustion</p> <p>6.3 Droplet combustion</p> <p>6.4 Pure evaporation of droplet</p> <p>6.5 Evaporation and diffusion combustion of droplet</p>
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	<p>1. Homework 20%</p> <p>2. Final exam (open book) 80%</p>
Pre-request Course	Knowledge of heat transfer and fluid mechanics
References	<p>Organization by lecture</p> <p>[1] Glassman I. Combustion. Academic Press, 1977</p> <p>[2] Kuo K.K., Principles of Combustion, John Wiley & Sons, 1986</p>

Course Introduction

Code	153114	Teaching Hours	48
Course	Fundamentals and Applications of Finite Element Method		
Key Words	the Finite Element Method; The Direct Stiffness Method; Weighted Residuals		
Purpose and Role of the Course	<p>This course is an elective course for foreign graduate students majoring in aerospace propulsion investigations. The finite element method is a widely used analysis-and-design technique that it is essential for foreign graduate students to have the basic knowledge of the theory and applications of the technique. The followed are included: A general introduction to the finite element method. The concept of a finite element stiffness matrix and associated displacement equation in terms of interpolation functions. Assembly of global equilibrium equations for a structure composed of finite elements . Transformation from element coordinates to global coordinates. The direct stiffness method. Application of boundary conditions. Solution of the resultant constraint equations. Higher order elements. advanced concepts of finite element. Galerkin method. Interpolation functions for general element formulation. Application in solid mechanics and structural dynamics.</p> <p>The finite element method is a widely used analysis-and-design technique that it is essential for foreign graduate students to have a basic knowledge of the theory and applications of the technique.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1 Basic Concepts of the Finite Element Method <ol style="list-style-type: none"> 1.1 Introduction 1.2 How does the Finite Element Method Work? 1.3 A General Procedure for Finite Element Analysis 1.4 Brief History of the Finite Element Method 1.5 Examples of Finite Element Analysis 2 Stiffness Matrices, Spring and Bar Elements <ol style="list-style-type: none"> 2.1 Introduction 2.2 Linear Spring as a Finite Element 2.3 Elastic Bar, Spar / Link / Truss Element 2.4 Strain Energy, Castigliano's First Theorem 2.5 Minimum Potential Energy 2.6 Summary 3 Truss Structures: The Direct Stiffness Method <ol style="list-style-type: none"> 3.1 Introduction 3.2 Nodal Equilibrium Equations 3.3 Element Transformation 3.4 Direct Assembly of Global Stiffness Matrix 3.5 Boundary Conditions. Constraint Forces 3.6 Element Strain and Stress 3 7 Comprehensive Example 3.8 Three—Dimensional Tmsses 3 9 Summary 4 Flexure Elements 		

	<ul style="list-style-type: none"> 4.1 Introduction 4.2 Elementary Beam Theory 4.3 Flexure Element 4.4 Flexure Element Stiffness Matrix 4.5 Element Load Vector 4.6 Work Equivalence for Distributed Loads 4.7 Flexure Element with Axial Loading 4.8 A General Three-Dimensional Beam Element 4.9 Closing Remarks
	<ul style="list-style-type: none"> 5 Method of Weighted Residuals <ul style="list-style-type: none"> 5.1 Introduction 5.2 Method of Weighted Residuals 5.3 The Galerkin Finite Element Method 5.4 Application of Galerkin's Method to Structural Elements 5.5 One-Dimensional Heat Conduction 5.6 Closing Remarks
	<ul style="list-style-type: none"> 6 Interpolation Functions for General Element Formulation <ul style="list-style-type: none"> 6.1 Introduction 6.2 Compatibility and Completeness Requirements 6.3 Polynomial Forms: One-Dimensional Elements 6.4 Polynomial Forms: Geometric Isotropy 6.5 Triangular Elements 6.6 Rectangular Elements 6.7 Three-Dimensional Elements 6.8 Isoparametric Formulation 6.9 Axisymmetric Elements 6.10 Numerical Integration: Gaussian Quadrature 6.11 Closing Remarks
	<ul style="list-style-type: none"> 7 Applications in Solid Mechanics <ul style="list-style-type: none"> 7.1 Introduction 7.2 Plane Stress 7.3 Plane Strain: Rectangular Element 7.4 Isoparametric Formulation of the Plane Quadrilateral Element 7.5 Axisymmetric Stress Analysis 7.6 General Three-Dimensional Stress Elements 7.7 Strain and Stress Computation 7.8 Practical Considerations 7.9 Torsion 7.10 Summary
	<ul style="list-style-type: none"> 8 Structural Dynamics <ul style="list-style-type: none"> 8.1 Introduction 8.2 The Simple Harmonic Oscillator 8.3 Multiple Degrees-of-Freedom Systems 8.4 Bar Elements: Consistent Mass Matrix

	<p>8.5 Beam Elements</p> <p>8.6 Mass Matrix for a General Element: Equations of Motion</p> <p>8.7 Orthogonality of the Principal Modes</p> <p>8.8 Harmonic Response Using Mode Superposition</p> <p>8.9 Energy Dissipation: Structural Damping</p> <p>8.10 Transient Dynamic Response</p> <p>8.11 Bar Element Mass Matrix in Two-Dimensional Truss Structures</p> <p>8.12 Practical Considerations</p> <p>8.13 Summary</p>
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	1. Homework 100%
Pre-request Course	The prerequisites required are statics, dynamics, mechanics of materials, calculus through ordinary differential equations and partial differential equations, elasticity theory and heat transfer is helpful.
References	<p>[1] David V. Hutton, Fundamentals of Finite Element Analysis, Chongqing University Press, 2007</p> <p>[2]O.C. Zienkiewicz, R.L. Taylor and J. Z. Zhu, The finite element method for solid and structural mechanics, World Book Publishing Company, 2008</p> <p>[3]Young W. Kwon, Hyochoong C. Bang, The finite element method using MATLAB, CRC Press, c2000</p>

Course Introduction

Code	153122	Teaching Hours	50
Course	Pattern Recognition		
Key Words	pattern recognition, image classification,		
Purpose and Role of the Course	<p>Compulsory specialty course of pattern recognition and intelligent systems. The major focus is on concepts, principles, methods and algorithms of pattern recognition and image classification, including statistical pattern recognition, syntactical pattern recognition and artificial neural network pattern recognition.</p> <p>Introduce the topics of pattern recognition. The emphasis is on concepts, methods and applications of pattern recognition.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction <ol style="list-style-type: none"> 1.1 Basic Concepts 1.2 Subject Relationships 1.3 Applications 2. Statistical P.R. Concepts <ol style="list-style-type: none"> 2.1 Example 2.2 Basic Concepts 2.3 Research Areas 3. Linear Classifiers <ol style="list-style-type: none"> 3.1 Linear Classifier Concepts 3.2 Minima Distance Classifier 3.3 Fisher Criterion 3.4 Perceptron Criterion 3.5 Minima Wrong Number Criterion 3.6 MSE Criterion 4. Segmented Linear Classifiers <ol style="list-style-type: none"> 4.1 Multi-case P.R. 4.2 Segmented Minima Distance 4.3 Decision Tree 4.4 Nearest Neighbor 4.5 k-Neighbor 5. Bayes Classification <ol style="list-style-type: none"> 5.1 Concepts 5.2 Minimum-error-rate Bayes Decision 5.3 Bayes Classifier 6. Unsupervised Classification <ol style="list-style-type: none"> 6.1 Concepts 6.2 Clustering Principle 6.3 Hierarchical Clustering 6.4 Dynamic Clustering 7. Structural Pattern Recognition 		

	<ul style="list-style-type: none"> 7.1 Structural Methods 7.2 Structural Pattern 7.3 Basic Concepts 7.4 Method Comparison 8. Formal Language and Automaton <ul style="list-style-type: none"> 8.1 Formal Language 8.2 Finite Automaton 8.3 Push-down Automaton 8.4 Others 9. Pattern Recognition by Artificial Neural Network <ul style="list-style-type: none"> 8.1 Introduction 8.2 Network Architecture 8.3 Applications
Teach Method	The course is given in the form of class lectures mainly, and students are expected to do further reading and discussion, homework exercises and survey reading reports to grasp the contents.
Test and Examination	<ul style="list-style-type: none"> 1. Homework 40% 2. Final report 60%
Pre-request Course	Knowledge of basic matrix analysis, probability and statistics.
References	[1] Richard O. Duda, etc., Pattern Classification, China Machine Press, 2rd Ed, 2001

Course Introduction

Code	153123	Teaching Hours	50
Course	Digital Image Processing		
Key Words	Digital Image; Point Operations; Image Compression		
Purpose and Role of the Course	<p>Compulsory specialty course of pattern recognition and intelligent systems. The major focus is on concepts, principles, methods and algorithms of digital images and digital image processing, such as point operations, geometric operations, local operations and total operations, also including image enhancement, image restoration, image segmentation.</p> <p>Introduce the topics of digital image concepts, image operations and applications of digital image processing. The emphasis is on concepts, methods and algorithms.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction: Digital Image Concepts <ol style="list-style-type: none"> 1.1 Image Concepts 1.2 Digital Image Processing 1.3 Relative Subjects 1.4 Conclusion 1.5 Applications 2. Point Operations <ol style="list-style-type: none"> 2.1 Concepts 2.2 Gray-Level Transformation 2.3 Color Transformation 3. Geometric Operations <ol style="list-style-type: none"> 3.1 Concepts 3.2 Simple Transform 3.3 Geometric Distortion 3.4 Geometric Rectification 4. Local Operations <ol style="list-style-type: none"> 4.1 Concepts 4.2 Smoothing 4.3 Edge Detecting 4.4 Sharpening 5. Total Operations <ol style="list-style-type: none"> 5.1 Concepts 5.2 Fourier Transform 5.3 Other Orthogonal Transforms 6. Algebraic Operations <ol style="list-style-type: none"> 6.1 Concepts 6.2 Simple Algebraic Operation 6.3 Image Fusion 6.4 Image Mosaic 7. Image Enhancement <ol style="list-style-type: none"> 7.1 Concepts 		

	<ul style="list-style-type: none"> 7.2 Point Operation 7.3 Local Operation 7.4 Total Operation 7.5 Algebraic Operation 8. Image Compression <ul style="list-style-type: none"> 8.1 Concepts 8.2 Techniques 8.3 Standards 9. Image Restoration <ul style="list-style-type: none"> 9.1 Concepts 9.2 Techniques 10. Image Segmentation <ul style="list-style-type: none"> 10.1 Concepts 10.2 Techniques 11. Binary Image Processing <ul style="list-style-type: none"> 11.1 Introduction 11.2 Properties of Binary Images 11.3 Typical Processing 11.4 Morphology Processing
Teach Method	The course is given in the form of class lectures mainly, and students are expected to do further reading and discussion, homework exercises and survey reading reports to grasp the contents.
Test and Examination	<ul style="list-style-type: none"> 1. Homework 40% 2. Final report 60%
Pre-request Course	Knowledge of basic matrix analysis, probability and statistics, digital signal processing
References	[1] Kenneth R. Castleman, Digital Image Processing, Pearson Education Asia Limited and Tsinghua University Press, 2003

Course Introduction

Code	153124	Teaching Hours	50
Course	Visual C++ Programming for Digital Image Processing		
Key Words	Visual C++ programming; DIB file I/O; Image Memory Access		
Purpose and Role of the Course	<p>Compulsory specialty course of pattern recognition and intelligent systems. The major focus is on concepts, methods and techniques of Visual C++ programming for digital image processing, such as Document/View structure, MFC, DIB I/O, display and handling.</p> <p>Introduce the topics of digital images and digital image processing.. The emphasis is on programming skill of image file I/O, image memory management and image handling.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction: Visual C++ programming <ol style="list-style-type: none"> 1.1 Visual C++ studio 1.2 MFC 1.3 Demo programs 2. Document/View Structure <ol style="list-style-type: none"> 2.1 MFC Documents 2.2 MFC Views 2.3 Document/View relationship 2.4 Programming Practices 3. DIB file I/O <ol style="list-style-type: none"> 2.1 MFC Documents 2.2 MFC Views 2.3 Document/View relationship 2.4 Programming Practices 4. Image Memory Access <ol style="list-style-type: none"> 2.1 Allocate Memory for Images 2.2 Memory Pointers 2.3 Double Loop of image handling 2.4 Programming Practices 5. Point Operations <ol style="list-style-type: none"> 2.1 Invert Gray-Level 2.2 Linear Stretching 2.3 Programming Practices 6. Local Operations <ol style="list-style-type: none"> 2.1 Average Filtering 2.2 Median Filtering 2.3 Programming Practices 7. Comprehensive Practices 		
Teach Method	The course is given in the form of class lectures, discussion and computer practice, and students are expected to do further reading, programming exercises to grasp the contents.		

Test and Examination	1. Final programming exercises 100%
Pre-request Course	Knowledge of C/C++ programming, digital image processing
References	[1] Visual C++ Help

Course Introduction

Code	153141	Teaching Hours	48
Course	Orbital Mechanics		
Key Words	Keplerian Orbits; Orbital Maneuvers; Orbital Maneuvers		
Purpose and Role of the Course	<p>This course is designed for graduate students interested in space systems. The course content includes historical background and equations of motion, two-body orbital mechanics, orbital perturbation, orbital maneuvers, relative motion, interplanetary trajectories, three body problem, etc.</p> <p>Develop an understanding of orbital mechanics. Obtain a detailed knowledge of the orbital problem and its solutions with applications to various problems. And also provides a broad background in aerospace engineering. Introduces essential tools and problem solving techniques and helps produce graduates who can be successful in graduate level work.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Basic Concept Review 2. Keplerian Orbits 3. Position as a Function of Time 4. Orbit in Space 5. Orbital Maneuvers 6. Perturbation 7. Two position and time, Lambert's Problem 8. Relative motion in orbit, Hill C-W Equation 9. Lunar and interplanetary trajectories 10. Ballistic missile propulsion 11. Orbital determination 12. Others special topics 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments. Instructed with Chinese graduate students together.		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 50% 2. Final exam (half open) 50% 		
Pre-request Course	Knowledge of advanced calculus, Matlab.		
References	<p>[1] V.A. Chobotov, Orbital Mechanics, AIAA Education Series, 3rd Ed, 2002</p> <p>[2]M.H. Kaplan, Mordern Spacecraft Dynamics & Control, , 1976</p>		

Course Introduction

Code	153142	Teaching Hours	48
Course	Ramjet Theory and Technology		
Key Words	Ramjet Theory; Aerodynamics; Integrated ramjet		
Purpose and Role of the Course	<p>Ramjet and supersonic combustion ramjet(scramjet) are air-breathing engines which are used for high-speed propulsion. In this course, a historical review of ramjet development is given, and the characteristics of ramjet are analyzed in chapter 1. In chapter 2, the aerodynamics and computational fluid dynamics fundamentals for ramjet study are reviewed firstly, and then, three primary components, inlet, combustor and nozzle are introduced in different chapters respectively, including some basic concepts, design and performance analysis methods. As a whole, different kinds of integrated ramjets are introduced and performance analysis methods are discussed. The fuels and materials used in ramjet are introduced in chapter 7. The issues concerning experimental facilities, process and experimental data post-proceeding methods are discussed in chapter 8. Some conclusions and prospects are discussed in the last part of this course, chapter 9.</p> <p>Introduce the topics of Ramjet/Scramjet, including the inlet, combustor and nozzle. The emphasis is on mechanism and working process of Ramjet/Scramjet. Besides, the design and experimental aspects are also introduced.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction: Ramjet/Scramjet theory and application 2. Aerodynamics and CFD fundamentals for Ramjet/Scramjet 3. Inlet of Ramjet/Scramjet 4. Combustor of Ramjet/Scramjet 5. Nozzle of Ramjet/Scramjet 6. Integrated ramjet 7. Fuel and material for Ramjet/Scramjet 8. Experiment of Ramjet/Scramjet 9. Prospect 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 50% 2. Final exam (open book) 50% 		
Pre-request Course	Knowledge of aerodynamics, fluid mechanics, computational fluid dynamics.		
References	<p>N/A</p> <p>[1]. Ramjet Technology, Applied Physics Laboratory, Johns Hopkins University, 1965~1974. [2]. Scramjet Propulsion, AIAA Education Series, 2001 [3]. Hypersonic Airbreathing Propulsion, AIAA Education Series, 1994.</p>		

Course Introduction

Code	153144	Teaching Hours	48
Course	Spacecraft Control		
Key Words	Orbital Maneuver, Spacecraft Dynamics, Attitude Control		
Purpose and Role of the Course	This course develops topics in spacecraft dynamics and control, provides students with the fundamental knowledge and experience to design a satellite control system, including design and analysis methodologies and tools. It provides a broad background in space engineering.		
Main Chapters and Teaching Hours	<p>Chapter 1 Introduction (6hrs) History Concepts Coordinates</p> <p>Chapter 2 Orbital mechanics (9hrs) Kepler's laws Two body problem Six elements</p> <p>Chapter 3 Orbital maneuver (6hrs) In-plane maneuver Hohmann transfer Lunar and interplanetary travel</p> <p>Chapter 4 Attitude dynamics (9hrs) Rigid body kinematics Attitude dynamics Free rigid body motion</p> <p>Chapter 5 Attitude stabilization and control (9hrs) Dual-spin Stabilization Gravity gradient stabilization 3-axis stabilization</p> <p>Chapter 6 Application of modern control theory(9hrs) Orbit and attitude Linearization Controllability & observability Phase plane control Attitude capture Nutation damping</p>		
Teach Method	Lectures are mostly held by the instructor. The proposed exercises are about the solutions of mathematical and engineering problems.		
Test and Examination	<ol style="list-style-type: none"> 1. Homework and attendance 2. Final exam 		
Pre-request Course			

Course Introduction

Code	153117	Teaching Hours	50
Course	Aerodynamics Used in Design of Fight Vehicles		
Key Words	Solid Propellant, Lower Signature, High Energy Propellant		
Brief Description of the Course	<p>English is the course language. This course consists of two aspect, Lower signature propellants and high energy propellants. For the lower signature propellant, select four countries experts articles public at 2010, they are coming from The USA\UK\GE\FR. Fundamental formulation \signature parameters\experiment conditions\experiment data and dealing will be introduced and discussed on course. NATO energy material safety classification and lower signature parameters classification is also introduced. Another topic is discussing high energy propellant; especially discuss GAP propellant, such as basic formulation\special impulse\grain design.</p>		
Teach Method	<p>The course is given in the form of class lectures mainly, and students are expected to do further reading and discussion, homework exercises and survey reading reports to grasp the contents.</p>		
Test and Examination	<ol style="list-style-type: none"> 1. Homework and attendance 2. Final Report 		

Course Introduction

Code	153101	Teaching Hours	64
Course	Conceptual Design of Launch Vehicle and Spacecraft		
Key Words	Conceptual Design, Launch Vehicle, Spacecraftl		
Purpose and Role of the Course	<p>Conceptual Design of Launch Vehicle and Spacecraft is a compulsory course for foreign graduate students in professional studying. This course mainly includes the dynamics, which is involved with a vehicle of taking off, trajectory flight, orbital insertion and orbital flight, and the calculation of the vehicle mass and its structure and composition design based on a mission requirement. Students are conducted to study the concepts and methods of space vehicle design in a systematic view. Through the course studying, students will have learned the basic specialty knowledge of launch vehicle and spacecraft, set up a theoretic scheme for the vehicle design, and prepared well for subsystems design and the whole system design.</p>		
Main Chapters and Teaching Hours	<p>Launch Vehicle Design</p> <ol style="list-style-type: none"> 1. Chapter 1 Intoduction (2 hrs) 2. Chapter 2 Mission Analysis and Design (2 hrs) 3. Chapter 3 Analysis and Selection of Overall Schemes (2 hrs) 4. Chapter 4 Trajectories (8 hrs) 5. Chapter 5 Determination of Main Design parameters (6 hrs) <p>Text book: Solid Ballistics Missiles Design</p> <ol style="list-style-type: none"> 6. Chapter 2 Mass Model of Solid Ballistic Missile (4 hrs) 7. Chapter 4 Optimization of Trajectory (4 hrs) 8. Chapter 5 Optimization of Overall Parameters (4 hrs) 9. Chapter 7 Re-entry Body Design (4 hrs) <p>Text book: Launch Vehicle Design</p> <ol style="list-style-type: none"> 10 Chapter 6 Configuration and Structural Design (6 hrs) 11 Chapter 7 Checking Computations (6 hrs) 12 Chapter 8 Foreword of Multistage Rocket (6 hrs) 13 Chapter 9 Conceptual Design of Mutistage Rockets (8 hrs) <p>Exam (2 hrs)</p>		
Teach Method	Lecturing and discussing are the method for this course, while a lot of pictures and videos are displayed in class for students		
Test and Examination	<ol style="list-style-type: none"> 1. Homework and attendance 40% 2. Final exam 60% 		
Pre-request Course			

Course Catalogue for International Postgraduates

(School of Instrumentation Science and Opto-electronics Engineering)

编号 No.	英文课程名称 Course Title	中文课程名称 Course Title	学时 Hours	学分 Credits	开课季节 Semester	任课教师 Lecturer
173504	Inertial Navigation Principle	惯性导航原理	48	3	Spring/Fall	Yu Wen-bo
173518	Modern Control Theory and Its Application	现代控制理论及应用	42	3	Spring/Fall	GUO Lei, LEI Xusheng
173519	Rocket Guidance and Control	火箭制导与控制	48	3	Spring/Fall	Yu Wen-bo
173520	Sensors Technology & Application	传感器技术与应用	48	3	Spring/Fall	XING Weiwei
173521	Computer Application Technology in MEMS	计算机辅助设计技术在微机电系统中的应用	48	3	Spring/Fall	Guo Zhanshe
173522	Micro/Nano Processing Technology	微纳米加工技术	32	2	Spring/Fall	Haifeng Dong
173523	Integrated Navigation Technology	组合导航技术	32	2	Spring/Fall	FANG Jiancheng, LIU Baiqi
173524	Design and Fabrication of Microelectromechanical Devices	微机电器件的设计与制造	32	2	Spring/Fall	Haifeng Dong
173802	Image Processing and Analysis	图像处理与分析	48	3	Spring/Fall	Zhu Shi-ping

Course Introduction

Code	173504	Teaching Hours	48
Course	Inertial Navigation Principle		
Key Words	Inertial Navigation; Initial alignment; Integrated navigation preliminary		
Purpose and Role of the Course	This is an essential course in GNC including inertial navigation calculation of platform and strap down type, inertial instrument principle, inertial navigation System error analysis, initial alignment and integrated navigation system preliminary.		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction <ol style="list-style-type: none"> 1.1 Different navigation technology and their feature 1.2 Initial inertial navigation system 2. Platform inertial navigation system <ol style="list-style-type: none"> 2.1 North azimuth inertial navigation system 2.2 Free and wander azimuth inertial navigation system 2.3 Space inertial type system 2.4 Platform control 3. Strap down inertial navigation system <ol style="list-style-type: none"> 3.1 Strap down system composition 3.2 Quaternion theory and application 3.3 Redundancy design in strap down system 4. Gyroscope basic principle <ol style="list-style-type: none"> 4.1 Rigid body dynamics 4.2 Double and single gimbal gyroscope principle 4.3 Gyroscope drift theory 5. Main gyroscope <ol style="list-style-type: none"> 5.1 Liquid float gyroscope 5.2 Static electricity gyroscope 5.3 Flexible gyroscope 5.4 Oscillation gyroscope 5.5 Optical gyroscope 6. Error analysis <ol style="list-style-type: none"> 6.1 Short time and middle time error Analysis 6.2 Error compiling in different channel 6.3 Complete error equation and error develop 7. Initial alignment <ol style="list-style-type: none"> 7.1 Platform inertial navigation system horizontal alignment 7.2 Platform inertial navigation system azimuth compact alignment 7.3 Strap down inertial navigation system initial alignment 8. Integrated navigation preliminary <ol style="list-style-type: none"> 8.1 Kalman filter preliminary 8.2 Integrated navigation system preliminary 		

Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	1. Homework 30% 2. Final exam (open book) 70%
Pre-request Course	Theory of mechanics and automatic control.
References	[1] Yi Guang-qv Inertial Navigation Principle, 1987, Aeronautic Press [2] Yu Bo Inertial Technology, 1994, Beihang Press

Course Introduction

Code	173518	Teaching Hours	42
Course	Modern Control Theory and Its Application		
Key Words	control theory; State space; Lyponuv stability		
Purpose and Role of the Course	<p>With the development of computer technology and the need for science in the field of Aeronautics and Astronautics, modern control theory has made remarkable progress in recent years. It has become a basic course for graduate students. This course introduces the basic theory and technology of modern control theory in the field of Aeronautics and Astronautics, especially in the aspect of navigation and control, which lays the grounding for the students to research on this field. Focusing on the precision instrument and mechanism, measurement technology and opto-electronic engineering, the lectures of this subject include state space definition, solution, controllability and observability, stability analysis, and so on. Through sessions and assignments, students are expected to have an understanding of modern control theory and its application in projects.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction <ol style="list-style-type: none"> 1.1 History of classic control theory 1.2 History of modern control theory 2. State space <ol style="list-style-type: none"> 2.1 Concept for state space 2.2 State space equation construction 2.3 Transfer function 2.4 Composite system 2.5 Linear transformation 3. State space solution <ol style="list-style-type: none"> 3.1 Homogeneous solution for linear time invariant system 3.2 Matrix exponent 3.3. Non-homogeneous solution for linear time invariant system 3.4 State transfer matrix for linear time invariant system 3.5 Solution for linear time variant system 3.6 Solution for linear discrete system 4. Linear system controllability and observability <ol style="list-style-type: none"> 4.1 The controllability of stationary discrete system 4.2 The controllability of stationary continuous system 4.3 The controllability of stationary system 4.4 The controllability and observability of linear time variant system 4.5 The dual relationship between system controllability and observability 4.6 The standard controllability and observability system 5. Lyponuv stability <ol style="list-style-type: none"> 5.1 Basic concept 5.2 The theory of lyponuv stability 5.3 The lyponuv theory in linear system 5.4 The lyponuv theory in nonlinear system 		

	6. State feedback and state observer 6.1 The concept of state feedback 6.2 Pole assignment 6.3 State observer
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through the homework assignments.
Test and Examination	1. Homework 20% 2. Final exam (open book) 80%
Pre-request Course	Knowledge of classic control theory, basic matrix theory, MATLAB
References	[1] Katsuhiko Ogata, Modern Control Engineering , Tsinghua University Press, 2006 [2] P.N. Paraskevopoulos. Modern Control Engineering , New York : Marcel Dekker, 2002

Course Introduction

Code	173519	Teaching Hours	48
Course	Rocket Guidance and Control		
Key Words	Rocket Guidance; Rocket Control; Control system design		
Purpose and Role of the Course	This course introduce ballistic missile and launch Vehicle GNC system, including rocket trajectory theory, missile navigation system, guidance system and attitude control system control system hardware, control system scheme design.		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction <ol style="list-style-type: none"> 1.1 Ballistic missile flight feature 1.2 Basic function of ballistic missile control system 2. Rocket flight dynamics <ol style="list-style-type: none"> 2.1 Some frames and their relation 2.2 Rocket dynamics equation 2.3 Flight trajectory 3. Control system principle <ol style="list-style-type: none"> 3.1 Navigation system 3.2 Guidance system 3.3 Attitude control system 4. Control system hardware <ol style="list-style-type: none"> 4.1 Inertial instrument 4.2 Gyro stabilized platform and IMU 4.3 Roddle 5. Control system design <ol style="list-style-type: none"> 5.1 Guidance system scheme design 5.2 Attitude control system design 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	<ol style="list-style-type: none"> 1. Homework 30% 2. Final exam (open book) 70% 		
Pre-request Course	Theory of mechanics and automatic control.		
References	[1] Xu Yan-wan Design and Analysis on Control System of The Ballistic Missile and Launch Vehicle, 1999, Astronautic Press.		

Course Introduction

Code	183520	Teaching Hours	48
Course	Sensors Technology & Application		
Key Words	Sensors; Mechanical modeling; Circuits of sensors		
Purpose and Role of the Course	<p>Basic concepts & classification & about sensors. Application fields of sensors. Static & dynamic characteristics of sensors. Design & modeling of basic sensing elements of micro-mechanical sensors by analytical method or by simulation. Analysis & Design of signal conditioning circuits in sensors. Some typical physical sensors.</p> <p>Introduce the topics of sensors, transducers, sensing elements, with emphasis on how to choose a sensor product or design a new sensor according to application requirements.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1 Introduction <ol style="list-style-type: none"> 1.1 What is sensors 1.2 Classification of sensors <ol style="list-style-type: none"> 1.2.1 By working principle <ol style="list-style-type: none"> 1.2.1.1 Physical sensors 1.2.1.2 Chemical sensors 1.2.1.3 Biological sensors 1.2.2 By measurand 1.2.3 Micro-sensors 1.3 Some basic concepts <ol style="list-style-type: none"> 1.3.1 Measurand, Masurement, Result of a measurement 1.3.2 Meter, Instrument, Transmitter 2 Application fields of Sensors <ol style="list-style-type: none"> 2.1 Industry application 2.2 Automobile application 2.3 Military application 2.4 Home application 3 Characteristic of sensors <ol style="list-style-type: none"> 3.1 General description of sensor function 3.2 Static characteristic of sensors 3.3 Dynamic characteristic of sensors <ol style="list-style-type: none"> 3.3.1 Description of dynamic characteristics <ol style="list-style-type: none"> 3.3.1.1 Differential equation 3.3.1.2 State equation 3.3.2 Specifications of dynamic characteristics <ol style="list-style-type: none"> 3.3.2.1 Time domain 3.3.2.2 Frequency domain 4 Mechanical modeling of micro-sensors <ol style="list-style-type: none"> 4.1 Stress and Strain <ol style="list-style-type: none"> 4.1.1 Stress 4.1.2 Strain 		

	<ul style="list-style-type: none"> 4.1.3 Hooke's Law 4.1.4 General relations between stress and strain 4.2 Basic mechanics of beam and diaphragm structures 4.3 Resonant sensors 4.4 Vibratory gyroscopes 5 Some typical physical sensors <ul style="list-style-type: none"> 5.1 Piezoresistive pressure sensors 5.2 The CMF 5.3 Resonant pressure sensors 6 Circuits of sensors <ul style="list-style-type: none"> 6.1 Analysis of basic signal amplifier 6.2 Weak signal detecting technology 6.3 Circuits for electrostatic driving and capacitive sensing 6.4 Application of microprocessors in sensors 6.5 The smart sensors 7 Other problems in design of sensors <ul style="list-style-type: none"> 7.1 Error analysis and synthesis in design of sensing structures and signal conditioning circuits 7.2 Simulation and CAD tools
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	<ul style="list-style-type: none"> 1. Designing homework 40% 2. Final exam (open book) 60%
Pre-request Course	Basic knowledge of sensors, measurement technology, and basic analog circuits. Better with the knowledge of elastic mechanics, error theory, embedded systems, MCUs or DSPs.
References	<ul style="list-style-type: none"> [1] M. Elwenspoek, R. Wiegerink, Mechanical Microsensors, Springer-Verlag Berlin Heidelberg New York, 2001 [2] Jon Wilson, Sensor Technology HANDBOOK, Elsevier (Electronics version)

Course Introduction

Code	173521	Teaching Hours	48
Course	Computer Application Technology in MEMS		
Key Words	fabrication process; application prospect; MEMS device		
Purpose and Role of the Course	<p>This course is mainly carried for foreign students whose specialities are connected with MEMS (Microelectromechanical Systems, MEMS). By listening to this class, the students must have general understanding of MEMS, basic MEMS fabrication process, some kinds of typical MEMS device, FEM (Finite Element Method) simulation technology, lithography mask design method and the usage of the corresponding software such as Ansys and L-edit. This course is good to help the students finish their dissertations on MEMS.</p>		
Main Chapters and Teaching Hours	<p>This course is divided into five portions:</p> <ol style="list-style-type: none"> 1. Introduction of MEMS. Including the development of MEMS, application prospect of MEMS device (4 periods); 2. Introduction of MEMS fabrication process and the corresponding working principle (12 periods); 3. Introduction of the FEM (Finite Element Method, Mainly on the analysis software-Ansys) and its application in MEMS. Including operation of this software(20 periods); 4. Design method and rule of MEMS device(4 periods); <p>Application of L-edit software and its operation(8periods)</p>		
Teach Method	<p>This class is mainly proceeded on by the combination of explanation in class, software training (Including FEM software Ansys and L-edit) and the engineering application introduction. Firstly, through the explanation in class, the students may obtain the general understanding of MEMS (Micro-electromechanical System). Then, by teaching the students using the corresponding software and the students operate the software themselves under the help of the teacher, the students can adroitly operation the software and can do many simulations on MEMS devices. Then, by combining the software and the engineering application, the students can master the course more deeply.</p>		
Test and Examination	<ol style="list-style-type: none"> 1. Attending condition of the class40%; 2. Technical report of the course 60% 		
Pre-request Course	<ol style="list-style-type: none"> 1. Basic understanding of finite element method; 2. Material mechanics; 3. Microelectromechanical System. 		
References	<ol style="list-style-type: none"> 1. An introduction to microelectromechanical system engineering. Nadim Maluf and Kirt Williams.2004 2. Ansys software help files; 3. L-edit handbook 		

Course Introduction

Code	173522	Teaching Hours	32
Course	Micro/Nano Processing Technology		
Key Words	Lithography; Subtractive technology; Wet etching		
Purpose and Role of the Course	<p>This course introduces the theory and technology of micro/nano fabrication. Lectures focus on basic processing techniques such as diffusion, oxidation, photolithography, chemical vapor deposition, and more. Through sessions and assignments, students are expected to gain an understanding of these processing techniques, and how they are applied in concert to device fabrication.</p> <p>The goal of this course is to explore the world of mirco/nano fabrication process. The students are expected to learn the mechanism of commonly used equipments, the basic conceptions and models of the micro/nano processing. In the end of the course, the students are trained to design simple micro/nano device fabrication process.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1 Lithography <ol style="list-style-type: none"> 1.1 Introduction 1.2 Photolithography overview 1.3 Photolithograhay resolution enhancement technology 1.4 Next generation lithography 1.5 Emxaples 2 Additive technology <ol style="list-style-type: none"> 2.1 diffusion tech 2.2 oxidation of silicon 2.3 chemical vapor deposition 2.4 sputtering and lift-off 2.5 evaporation 3 Subtractive technology <ol style="list-style-type: none"> 3.1 Dry etching <ol style="list-style-type: none"> 3.1.1 Plasmas etching 3.1.2 Physical/Chemical etching 3.1.3 Deep reactive ion etching 3.1.4 Vapor-phase etching without plasma 3.1.5 Example: SCREAM process 3.2 Wet etching <ol style="list-style-type: none"> 3.2.1 Isotropic etching 3.2.2 Anisotropic etching 3.2.3 Etch-stop techniques 3.2.4 Example: surface micromaching 4 LIGA and Micromolding <ol style="list-style-type: none"> 4.1 Introduction 4.2 LIGA and LIGA-like process steps 4.3 Example: Electromagnetic Micromoter 5 Packaging 		

	<ul style="list-style-type: none"> 5.1 Introduction 5.2 Packaging in IC vs. Micromachined devices 5.3 Dicing 5.4 Cavity sealing and bonding 5.5 Multi-chip packaging 5.6 Micro-nano assembly
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments
Test and Examination	<ul style="list-style-type: none"> 1. Homework 40% 2. Final exam (open book) 60%
Pre-request Course	Permission of instructor.
References	[1] M. Madou, Fundamentals of Microfabrication, CRC Press, second edition, 2002

Course Introduction

Code	173523	Teaching Hours	32
Course	Integrated Navigation Technology		
Key Words	integrated navigation; kalman filter; Optimal estimation		
Purpose and Role of the Course	<p>The course is a compulsory course of precision instrument and mechanism discipline. Navigation is the key technology of aircraft and spacecraft, and Integrated Navigation is the direction of the navigation technology. Firstly, the basic concept, working theory, characteristic and the current progress of integrated navigation system are introduced in this course. Secondly, optimal filter, initial alignment of SINS, in-flight alignment of SINS is introduced in detail. At last, the application of optimal filter in SINS/GPS, SINS/CNS and SINS/GPS/CNS is introduced.</p> <p>Introduce the theory, method and technology of integrated navigation system. The emphasis is on optimal estimation method of SINS/GPS/CNS integrated navigation system.</p>		
Main Chapters and Teaching Hours	<p>Introduction</p> <ul style="list-style-type: none"> 1.1 Object of the course 1.2 Concept of integrated navigation and kalman filter 1.3 Development of kalman filter <p>2. Optimal estimation methods</p> <ul style="list-style-type: none"> 2.1 Concept of optimal estimation 2.2 Least Squares estimation 2.3 Weighted least squares estimation 2.4 Recursive least squares estimation <p>3. Theory of kalman filter</p> <ul style="list-style-type: none"> 2.1 Kalman filter and optimal estimation 2.3 Kalman filter Equations of continuous system 2.4 Kalman filter Equations of discrete system 2.5 Extend Kalman filter 2.6 Application of Kalman filter 2.7 Observability analysis of Kalman filter <p>4. Fault tolerant theory of integrated navigation</p> <ul style="list-style-type: none"> 4.1 Introduction of tolerant theory of integrated navigation 4.2 Federal kalman filter <p>5. Kalman filter application in integrated navigation sytem</p> <ul style="list-style-type: none"> 5.1 Introduction of Kalman filter application 5.2 Mode of integrated navigation system 5.3 Error model of SINS 5.4 Kalman filter application in initial alignment of SINS 5.5 Kalman filter application in SINS/GPS 5.6 Kalman filter application in SINS/GPS/CNS 		
Teach Method	<p>The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.</p>		

Test and Examination	1. Homework 30% 2. Final exam (open book) 70%
Pre-request Course	Theory of inertial navigation system and theory of random process.
References	[1] QIN Yong-yuan, Theory of Kalman Filter and Integrated Navigation[M], 1998, North-West University Press.

Course Introduction

Code	173524	Teaching Hours	32
Course	Design and Fabrication of Microelectromechanical Devices		
Key Words	MEMS fabrication; Mechanical transducers; Feedback systems		
Purpose and Role of the Course	<p>This course is an introduction to microsystem design. Topics covered include: material properties, microfabrication technologies, structural behavior, sensing methods, , microscale transport, noise, and amplifiers feedback systems. Student teams design microsystems (sensors, actuators, and sensing/control systems) of a variety of types, (e.g., inertial sensors, optical MEMS) to meet a set of performance specifications (e.g., sensitivity, signal-to-noise) using a realistic microfabrication process. There is an emphasis on modeling and simulation in the design process.</p> <p>The goal of this course is to explore the world of microelectromechanical devices and systems ("MEMS"). This requires an awareness of material properties, fabrication technologies, basic structural mechanics, sensing and actuation principles, circuit and system issues, packaging, calibration, and testing. We will cover this through a combination of lectures, case studies, individual homework assignments, a take-home design problem, and design projects carried out in teams.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1 Introduction to MEMS 2 MEMS fabrication <ol style="list-style-type: none"> 2.1 Bulk process 2.2 Surface process 2.3 Bonding process 2.4 Other process 3 Mechanical transducers <ol style="list-style-type: none"> 3.1 Introduction 3.2 Basic mechanics 3.3 Mechanical properties of materials 3.4 Mechanical sensors 3.5 Mechanical actuators 4 Feedback systems <ol style="list-style-type: none"> 4.1 Introduction 4.2 Basic feedback concepts 4.3 Feedback in linear systems 4.4 Feedback in Nonlinear systems 4.5 Resonators and Oscillators 5 Noise <ol style="list-style-type: none"> 5.1 Introduction 5.2 The Interference Problem 5.3 Characterization of signals 5.4 Noise Sources 5.5 Drift 6 Fluids <ol style="list-style-type: none"> 6.1 Basic fluid concepts 		

	6.2 Incompressible Laminar flow 6.3 Squeezed film damping 7 Case studies 7.1 Packaging 7.2 Power MEMS case study, Micro gas turbine 7.3 Optical MEMS case study, Electrostatic projection displays 7.4 BioMEMS case study, DNA amplification 7.5 Inertial case study, Tunneling accelerometer
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	1. Homework 40% 2. Final exam (open book) 60%
Pre-request Course	Although it's not necessary, prior micro/nano fabrication curriculum is desirable.
References	[1] Stephen D. Senturies, Microsystem design, Kluwer Academic Publishers, third printing, 2001 [2] Micromachined Transducer Sourcebook, Gregory T.A. Kovacs, McGraw-Hill, 1998

Course Introduction

Code	173802	Teaching Hours	48
Course	Image Processing and Analysis		
Key Words	Digital image; Mathematical morphology; Image segmentation		
Purpose and Role of the Course	<p>This course is designed for the graduate students with the majors of “Measuring and Testing Technologies and Instruments”, “Precision Instrument and Machinery”, “Optical Engineering”.</p> <p>Introduce the topics of the theories and algorithms of digitized image and its properties, data structures for image analysis, image preprocessing, image restoration, image segmentation, shape representation and description, object recognition, image analysis, mathematical morphology.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction 2. Digital image fundamentals 3. Data structures for image analysis 4. Image preprocessing 5. Image segmentation 6. Shape representation and description 7. Object recognition 8. Image analysis 9. Mathematical morphology 		
Teach Method	The course is given in part by the form of class lectures, and part by doing assignments and projects by the students.		
Test and Examination	<ol style="list-style-type: none"> 1. Final exam 50% 2. Project 50% 		
Pre-request Course	Knowledge of basic matrix theory and analysis, signal processing, advanced mathematics, computer science.		
References	<p>[1] Rafael C. Gonzalez, Richard E. Woods. Digital Image Processing (Second Edition). Beijing, China Publishing House of Electronics Industry, 2002.</p> <p>[2] Milan Sonka, Vaclav Hlavac, Roger Boyle. Image Processing, Analysis, and Machine Vision (Second Edition). Beijing, Posts & Telecommunications Press, 2002.</p>		

Common Courses Catalogue for International Postgraduates (International School)

编号 No.	英文课程名称 Course Title	中文课程名称 Course Title	学时 Hours	学分 Credits	开课季节 Semester	任课教师 Lecturer
253100	Chinese 1	汉语 1	64	2	Spring/Fall	
253102	Chinese 2	汉语 2	64	1	Spring/Fall	
253103	Introduction to China	中国概况	20	1	Spring/Fall	SUN Yan
253201	Theory of Matrix	矩阵理论	54	3	Fall	ZHAO Di
253202	Numerical Analysis	数值分析	48	3	Spring/Fall	XU Yuanming
253203	Differential Equations and Dynamical Systems	微分方程和动力系统	48	3	Spring	LU Qishao
253204	Fractals and Wavelets	分形与小波分析	48	3	Fall	WANG Haihui
253206	Probability and Statistics in Engineering	概率统计（工程）	42	3	Fall	ZHENG Zheng XU Huaping
253501	C Language	C 语言	48	3	Fall	Li Xin
253502	MATALAB Programming	Matlab 程序设计	32	2	Fall	Sun Bing
253503	Computer Networking and Applications	计算机网络及应用技术	48	3	Fall	
253516	Space Environment, Orbit and Spacecraft Systems	空间环境、轨道与卫星系统	48	3	Fall	YOU Hui
253517	Space Technology and Space Economy	航天技术与太空经济	18	1	Spring	HE Weiliang
253518	Aerospace Materials and Processes	航空航天材料及工艺	32	2	Fall	ZHANG Yanhua
253519	Introduction to Advanced Manufacturing Technology	现代制造技术概论	32	2	Fall	QIAO Lihong
253522	Finite Element Method in Engineering	有限元法在工程中的应用	48	3	Fall	CUI Deyu
253523	Introduction to Space Flight	宇航概论	18	1	Spring	HE Weiliang
253801	Advanced Chinese	高级汉语	48		Fall	BAI Wei
253802	Scientific Literature Retrieval	科技文献检索与利用	20	1	Spring/Fall	DU Weichun
253804	Scientific Thesis Writing	科技论文写作	18	1	Spring	HU Jian

Course Introduction

Code	253100	Teaching Hours	64
Course	Chinese (level-1)		
Key Words	Chinese Phonetics, Chinese Vocabulary, Chinese Grammar, Chinese Character		
Purpose and Role of the Course	Chinese (Level-1) will focus on students' ability of speaking and listening, as well as their communication competence in Chinese. Students will have the elementary ability of listening, speaking, reading and writing in Chinese after learning and this course will meet students' basic demands of living and studying in China. Furthermore, traditional Chinese culture will also be introduced to develop their interest and confidence in learning Chinese and other subjects.		
Main Chapters and Teaching Hours	<p>Chapter 1: Let me introduce</p> <p>Chapter 2: Let me introduce my sister</p> <p>Chapter 3: I live in Foreign Students' Dormitory</p> <p>Chapter 4: Go shopping</p> <p>Chapter 5: How to go to the library</p> <p>Chapter 6: What time is it now?</p> <p>Chapter 7: When</p> <p>Chapter 8: Hello, is that Ali ?</p> <p>Chapter 9: Transportation</p> <p>Chapter 10: In the bank</p> <p>Chapter 11: In the restaurant</p> <p>Chapter 12: Services in daily life</p>		
Teach Method	The course will be introduced with many examples and special words and sentences which used everyday. Teachers will arrange classes in listening, speaking, reading and writing.		
Test and Examination	Attendance for the classes: 10% Mid-exam: 30% Final exam: 60%		
Pre-request Course	None		
References	<p>(1) Conversational Chinese 301, Kang Yuhua and Lai Siping, Beijing Language and Culture University Press</p> <p>(2) Learning Chinese Characters From Ms. Zhang, 2005.</p>		

Course Introduction

Code	253102	Teaching Hours	64
Course	Chinese (level-2)		
Key Words	Chinese Phonetics, Chinese Vocabulary, Chinese Grammar, Chinese Character		
Purpose and Role of the Course	Chinese (Level-2) will focus on the systematical knowledge of Chinese phonetic alphabet, vocabulary, grammar and Chinese character, and make students understand the exact meaning of a sentence according to the pronunciation, intonation, and tones, make Students speak Chinese with an smooth and natural accent, make students express themselves in an appropriate way in daily life and make students develop their skills to knowing the meaning by the glyphs, pronounce according to the forms, and understand the meaning in different language context.		
Main Chapters and Teaching Hours	<p>Chapter 1: Let me introduce</p> <p>Chapter 2: I would like to rent an apartment</p> <p>Chapter 3: See the doctor in the hospital</p> <p>Chapter 4: I'm going to buy some clothes</p> <p>Chapter 5: Visit a friend(1) Welcome to my home</p> <p>Chapter 6: I'm going to travel</p> <p>Chapter 7: Visit a friend(2) I don't know if you like this taste</p> <p>Chapter 8: What kind of sports do you prefer?</p> <p>Chapter 9: How about the weather there?</p> <p>Chapter10: I'll go back to my country.</p>		
Teach Method	The course will be introduced with many examples and special words and sentences which used everyday. Teachers will arrange classes in listening, speaking, reading and writing.		
Test and Examination	Attendance for the classes: 10% Mid-exam: 30% Final exam: 60%		
Pre-request Course	Chinese (Level-1)		
References	<p>(3) Conversational Chinese 301, Kang Yuhua and Lai Siping, Beijing Language and Culture University Press</p> <p>(4) Learning Chinese Characters From Ms. Zhang, 2005.</p>		

Course Introduction

Code	253103	Teaching Hours	18
Course	Introduction to China		
Key Words	History of China, Culture of China, Education of China, Foreign Policy of China		
Purpose and Role of the Course	<p>This course is a required course for degree students and is designed to provide some necessary, basic and important information about China to foreign students who are studying in China . the course covers the topics of Territory, Geographic Features , Nationality, Population and its Policy, History, Religions, Education, Politics, Foreign Policy, Reform and Opening to Outside World about China and etc.</p> <ol style="list-style-type: none"> a. To familiarize foreign students with China and living environment b. To help foreign students to know more about Chinese c. To provide foreign students with necessary knowledge and information to understand Chinese society d. To promote the friendship between China and all countries in world 		
Main Chapters and Teaching Hours	It covers the topics of Territory, Geographic Features , Nationality, Population and its Policy, History, Religions, Education, Politics, Foreign Policy, Reform and Opening to Outside World about China.		
Teach Method	To present above topics for eight times and focus on paper for two times.		
Test and Examination	1. Attendance of Course 50% 2. Discussion on class 20% 3. Paper 30%		
Pre-request Course	An ability to take course in English		
References	[1]Outline of China Ocean Publishing House 2007		

Course Introduction

Code	253201	Teaching Hours	54
Course	Theory of Matrix		
Key Words	Vector spaces, Eigen-values, Diagonalizable Matrices, Singular Value Decomposition		
Purpose and Role of the Course	<p>Matrix theory is a graduate course. Matrices have been introduced here as a handy tool for solving systems of linear equations, but their utility goes far beyond this initial application. They have also many applications in other disciplines, such as statistics, economics, engineering, physics, biology, and business. Matrix theory is more exciting now than at almost any time in the past. Largely due to the computer revolution, matrix theory has risen to a role of prominence in the mathematical curriculum.</p> <p>Graduate Students are asked to solve similar problems or explain the basic concepts. The study of matrix theory instills habits of thought that are essential for a proper understanding of many areas of pure and applied mathematics.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Matrix Algebra and Proofs of facts 2. Vector spaces Subspaces (Basis and dimension; Change of basis; Row space and column) 3. Linear mappings and matrices 4. Inner product spaces (Orthogonal subspaces ; Gram-Schmidt Process ; orthogonalization) 5. Eigenvalues and eigenvectors (Similar matrices ; Diagonalization; Characteristic Polynomial; Cayley theorem) 6. Rank Factorization and The singular value decomposition (Positive definite matrices; Hermitian Matrices; Normal matrices; Spectral theorem; The pseudo-inverse The Penrose conditions) 		
Teach Method	The students are provided with some examples and “proofs of facts” in the classroom , then they should prove some conclusions or explain the basic concepts		
Test and Examination	Written exam (90%) + Assignment(10%)		
Pre-request Course	The prerequisite is a good course in advanced calculus with some knowledge of linear algebra.		
References	<p>[1] Steven J. Leon, Linear Algebra with Applications (Seventh Edition), 2006</p> <p>[2] Horn, Roger A. and Charles R. Johnson, Matrix Analysis , 1987</p> <p>[3] J. Franklin., Matrix Theory , 1968</p>		

Course Introduction

Code	253202	Teaching Hours	48
Course	Numerical Analysis		
Key Words	1. Ordinary Differential Equations, Numerical Methods, Curve Fitting and Function Approximation		
Purpose and Role of the Course	<p>Numerical analysis is concerned with methods for generating numerical answers when analytical procedures are either computational difficult or nonexistent. The primary purpose of this course is to produce intelligent users of the practical methods of numerical analysis.</p> <p>Much emphasis is put on practical techniques or assessing whether a method works successfully. Most of teaching sections that present new methods proceed in the following order:</p> <ol style="list-style-type: none"> 1. the mathematical basis for each method. 2. a pseudo-program describing the algorithm for the method. 3. numerical examples illustrating how the method generates numbers. 4. practical considerations of implementation. 5. deferred proofs and derivations, and more sophisticated error analyses. <p>Upon introducing students the principles, methods, techniques and tools for numerical analysis, students will:</p> <ol style="list-style-type: none"> 1. possess a sound intuitive grasp of the mathematical basis for each method. 2. possess an understanding of how the method proceeds when it is working well. 3. possess an awareness of the conditions under which the method can fail. 4. possess the ability to recognize failure from the progression of the method. 		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 2. Computers, Errors, and Algorithms <ul style="list-style-type: none"> Introduction What Is a Numerical Method? Avoiding Roundoff Error Errors, Accuracy, and Tests for Closeness Iterative Algorithms 3. Numerical Methods for Finding Roots and Solving Equations <ul style="list-style-type: none"> Introduction Solving Equations and Finding Roots Methods for Finding Roots of $f(x)$ Practical Considerations: Convergence Rate and Accuracy Analytic Discussion of Convergence Rates (Optional) Finding Roots of Real Polynomial; Bairstom's Method 4. Solving Linear Systems Exactly Using Direct Methods <ul style="list-style-type: none"> Introduction Introduction to Linear Systems; Triangular Systems Factorization Methods for Solving $Ax=b$ Solving Linear Systems Using Gaussian Elimination 5. Solving Linear and Nonlinear Systems Using Fixed Precision Arithmetic <ul style="list-style-type: none"> Introduction 		

	<p>Minimizing the Effects of Roundoff Recognizing an Ill-Coefficient Matrix Assessing and Improving the Accuracy of a Solution Solving $Ax=B$ on Computer Iterative Methods for Solving Linear System Solving Nonlinear Systems of Equations</p> <p>6. Curve Fitting and Function Approximation Introduction Fitting Curve to Discrete Data Fitting Two-Parameter Curves to Monotone, Convex Data Fitting Curve That Are Linear in n Parameters; Polynomial Fitting Polynomial and Rational Function Approximation of $f(x)$</p> <p>7. Interpolation Introduction The Unique Interpolating Polynomial for $P_k, P_{k+1}, \dots, P_{k+m}$ Divided Differences and the Recursive Form of $P_{k,k+m}(x)$ Practical Strategies for Polynomial Interpolation Interpolation Using Piecewise Cubic Splines</p> <p>8. Numerical Methods for Differentiation and Integration Introduction Formulas for $f'(x)$; Richardson's Formula Approximation Formulas for kth Derivatives Introduction to Numerical Integration (Quadrature) Composite Rules and Romberg Integration Gauss Quadrature Discontinuities and Improper Integrals</p> <p>9. Numerical Methods for Ordinary Differential Equations Introduction Introduction to Solving the Initial Value Problem (IVP) Self-Starting Methods: Taylor and Runge-Kutta Multistep Methods (Predictor-Corrector Strategies) First –Order System and nth-Order IVPs Boundary Value Problems</p>
Teach Method	<p>The course will be introduced with examples and illustrations from each chapter. In this course, lecture, example demonstration and practice will be arranged alternatively. The course has one final exam, which is designed to complete hand writing answers for given problems.</p>
Test and Examination	<p>1 classroom participation and recitations 20% 2 Exam 80% Closed form paper examination with hand writing answers.</p>
Pre-request Course	

References	[1] Melvin J. Maron. Numerical Analysis: A practical Approach. Macmillan Publishing Co., Inc. New York. Collier Macmillan Publishers London 1982
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Course Introduction

Code	253203	Teaching Hours	48
Course	Differential Equations and Dynamical Systems		
Key Words	Differential equations, Dynamical systems, Qualitative analysis, Stability		
Purpose and Role of the Course	<p>Differential equations are widely applied in almost every field of sciences and technology, and consist of an important part of mathematics. Except solving differential equations analytically or numerically, the qualitative analysis of differential equations has become more and more frequent due to the current diverse interests and requirements of nonlinear and large-scale problems and developed in the recent study of differential equations.</p> <p>This course covers topics necessary for clear understanding the basic knowledge of the qualitative (that is, geometrical) theory of ordinary differential equations based on the idea of dynamical systems. The primary goal is describe the qualitative dynamical behavior of the solution set of a given system of differential equations rather than the analytical or approximate expressions of the solutions.</p> <p>To begin with, a general study on the solution structure and stability of linear systems of ordinary differential equations is presented in Chapter 1. Hence, some fundamental concepts and theorems about solutions of ordinary differential equations are introduced in Chapter 2. Chapter 3 is devoted to the study of local dynamical behavior of dynamical systems. As an intuitive and preliminary impression, equilibrium points and limit cycles in two dimensional systems are emphasized. Chapter 4 deals with the Lyapunov stability theory of nonlinear systems. It ends briefly with a short introduction about global analysis, bifurcations and chaos in nonlinear systems in Chapter 5.</p> <p>This course is primarily established for postgraduate students working in the fields of mechanics, electronics, control, mechanical structural vibrations, dynamics of aircrafts and space vehicles, robotics, and others. It is necessary to grasp something about computer software packages in advance, such as MATLAB, and the combination of qualitative analysis and numerical simulation in assignments is encouraged.</p> <p>Upon introducing the principles and methods for differential equations and dynamical systems, students will learn the following knowledge and skills:</p> <ol style="list-style-type: none"> 1. the general properties, solving methods and stability criteria for linear ordinary differential equations; 2. the concepts and methods for qualitative analysis of nonlinear ordinary differential equations. 3. the ability to implement qualitative analysis in applications, combining the use of computer softwares. 		
Main Chapters and Teaching Hours	<p>1 Linear systems of ordinary differential equations (10 hrs.)</p> <ol style="list-style-type: none"> 1.1 Uncoupled or diagonalized linear systems 1.2 Exponential of linear operators 1.3 The fundamental theorem for linear systems 1.4 Two dimensional linear systems 1.5 General linear systems 1.6 Stability theorems of linear systems 		

	<p>2 Fundamental concepts and theorems of ordinary differential equations (4hrs.)</p> <p>2.1 Introduction to ordinary differential equations</p> <p>2.2 The fundamental existence and uniqueness theorem</p> <p>2.3 Dependence of solutions on initial conditions and parameters</p> <p>2.4 The concepts of Stability of motion</p> <p>3 Qualitative theory of nonlinear systems of ordinary differential equations (20hrs.)</p> <p>3.1 Flows defined by differential equations</p> <p>3.2 Linearization</p> <p>3.3 The invariant manifolds</p> <p>3.4 Hyperbolic equilibrium points, the Hartman-Grobman theorem</p> <p>3.5 Nonhyperbolic equilibrium points</p> <p>3.6 Limit sets and attractors</p> <p>3.7 Periodic orbits, limit cycles and separatrix cycles</p> <p>3.8 The Poincare map</p> <p>3.9 The Poincare-Bendixon theory</p> <p>4 Stability analysis of nonlinear systems (6 hrs.)</p> <p>4.1 Preliminaries</p> <p>4.2 Lyapunov's second method</p> <p>4.3 Linearization method</p> <p>5 Bifurcations and chaos (6 hrs)</p> <p>5.1 Structural stability</p> <p>5.2 Bifurcations</p> <p>5.3 Chaos</p>
Teach Method	The course will be given mainly by lectures, in which basic theory and example demonstration will be arranged, as well as more practice through assignments.
Test and Examination	1. Assignments 30% 2. Final exam 70%
Pre-request Course	The prerequisites for studying this course include advanced calculus, linear algebra, numerical methods, and some introductory knowledge on ordinary differential equations.
References	<p>[1] Perko L., 1991, Differential Equations and Dynamical Systems, New York: Springer-Verlag.</p> <p>[2] Miller R.K., Michel A.N., 1982, Ordinary Differential Equations, New York: Academic Press.</p> <p>[3] Hale J.K., 1969, Ordinary Differential Equations, New York: McGraw-Hill.</p> <p>[4] Drazin P.G., 1992, Nonlinear systems, Cambridge: Cambridge Univ. Press.</p>

Course Introduction

Code	253204	Teaching Hours	48
Course	Fractals and Wavelets		
Key Words			
Purpose and Role of the Course	<p>The aim of this two-term course is to cover the interactions existing between applied mathematics, namely applied and computational harmonic analysis, fractals, etc. and statistics and signal processing. Matlab will be the scientific programming language for this course.</p> <p>Introduce the topics fractal and wavelet. The emphasis is on applications of fractal and wavelet to engineering problems and the ability to formulate such problems within the framework of fractal and wavelet.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Iterated function system IFS <ol style="list-style-type: none"> (1.1) Fractal space (1.2) Compress mapping and Iterated function system (1.3) Agglomeration IFS, the collage theorem ,IFS with Parameter 2. Measure and dimension <ol style="list-style-type: none"> (2.1) Hausdorff measure and dimension (2.2) Fractal dimension 3. Fractal interpolation <ol style="list-style-type: none"> (3.1) Fractal interpolation function (3.2) Fractal interpolation principle (3.3) Fractal interpolation method (3.4) Fractal dimension of fractal interpolation function 4. Application of fractal subject <ol style="list-style-type: none"> (4.1) Brief introduction of Fractal image processing (4.2)Fractal image processing (4.3)Transforms of image matrix (4.4)The life game 5. Basic knowledge <ol style="list-style-type: none"> (5.1) Function space (5.2) Basis, frame (5.3) Fourier series and fourier integral (5.4) Windowed Fourier transform 6. Definition and property of wavelet transform <ol style="list-style-type: none"> (6.1) Continuous wavelet transform (6.2) Discrete transform <ol style="list-style-type: none"> (6.3) Binary wavelet transform 7. Orthogonal wavelet transform <ol style="list-style-type: none"> (7.1) The definition and examples of orthogonal wavelet transform (7.2) Construct multi-scale analysis of orthogonal wavelets (7.3) Mallat algorithms 8. Compact-supported wavelet 		

	<p>(8.1) Construction for compact-supported wavelet</p> <p>(8.2) The properties of h_n and g_n</p> <p>(8.3) Method for constructing scaling function from conjugate filters</p> <p>(8.4) Construction for compact-supported orthogonal scaling functions</p> <p>(8.5) Daubechies wavelet</p> <p>9. Brief introduction to binary wavelet transform</p> <p>(9.1) Orthogonal wavelet transform in $L^2(\mathbb{R}^2)$ space</p> <p>(9.2) Mallat algorithms of binary orthogonal wavelet transform</p> <p>10. The applications of wavelet analysis in other subjects</p> <p>(10.1) The application in one dimensional signal analysis.</p> <p>(10.2) The application in two dimensional signal analysis(image).</p>
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.
Test and Examination	1. Homework 40% 2. Final exam (open book) 60%
Pre-request Course	Knowledge of basic Linear algebra, Real analysis, continuous and discrete time signal and systems analysis, Fourier transforms
References	<p>[1] Stephane Mallat, "A Wavelet Tour of Signal Processing" Second edition, Academic Press (required)</p> <p>[2] Stephane Jaffard, Yves Meyer and Robert Ryan, "Wavelets: Tools for Science and Technology" SIAM, Philadelphia (optional)</p> <p>[3] Yves Meyer, "Wavelets and Operators", Cambridge University Press (optional)</p> <p>[4] Ingrid Daubechies, " Ten Lectures on Wavelets", SIAM, Philadelphia (optional)</p> <p>[5] Michael F. Barnsky, Lyman. P. Hurd, "Fractal Image Compression", Ak Peters, Ltd, Wellesley, Massachusetts, 1992.</p>

Course Introduction

Code	253206	Teaching Hours	42
Course	Probability and Statistics in Engineering		
Key Words			
Purpose and Role of the Course	<p>Engineering applications of probability theory. Problems on events, independence, random variables, probability distribution and density functions, expectations, and characteristic functions. Dependence, correlation, and regression; multi-variate Gaussian distribution.</p> <p>Introduce the topics of probability, statistics, and random variables. The emphasis is on applications of probability to engineering problems and the ability to formulate such problems within the framework of probability theory.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction: Probability <ol style="list-style-type: none"> 1.1 Concept of probability and probability spaces 1.2 Elementary probability theory 1.3 Conditional probability and Bayes' theorem 2. Repeated Trials <ol style="list-style-type: none"> 2.1 Combined experiments 2.2 Bernoulli trials 2.3 Poisson theorem 3. Random Variables and Distribution <ol style="list-style-type: none"> 3.1 Discrete and continuous random variables (binomial, Poisson, Gaussian...) 3.2 Functions of random variables 3.3 Joint and marginal distributions 3.4 Independence 4. Expectation <ol style="list-style-type: none"> 4.1 Mean, variance and covariance 4.2 Conditional distribution and conditional expectation 4.3 Least squares estimation for Gaussian random vectors 5. Limit theorems <ol style="list-style-type: none"> 5.1 Laws of large numbers 5.2 Central limit theorem 6. Statistics <ol style="list-style-type: none"> 6.1 Parameter estimation 6.2 Hypothesis testing 		
Teach Method	<p>The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.</p>		

Test and Examination	1. Homework 40% 2. Final exam (open book) 60%
Pre-request Course	Knowledge of basic matrix analysis, continuous and discrete time signal and systems analysis, Fourier transforms
References	[1] A. Papoulis, Probability, Random Variables, and Stochastic Processes, McGraw-Hill Press, 3rd Ed, 1991 [2] Jay L. Devore, Probability and Statistics for Engineering and the Sciences, 5th Ed., Beijing : Higher Education Press, 2004

Course Introduction

Code	253501	Teaching Hours	48									
Course	C Language											
Key Words												
Purpose and Role of the Course	<p>This course provides students with a comprehensive study of the C programming language. Classroom lectures stress the strengths of C, which provide programmers with the means of writing efficient, maintainable, and portable code.</p> <p>Students who complete this course will:</p> <p>Gain a working knowledge of C programming</p> <ol style="list-style-type: none"> 1 Learn how to write modular, efficient and readable C programs 2 Utilize pointers to efficiently solve problems 3 Use functions from the portable C library. 											
Main Chapters and Teaching Hours	<p>An overview of the C programming language , The C Library ,Variables and Constants, Data Types, Storage Classes, Sequence, Decision, Control Flow and Program Loops, Case, Functions and Recursion, Pointers and Arrays, String Manipulations, Structures and Unions, Handling File I/O , Pre-processor Directives , Bitwise Operators , Introduction to Object Oriented Programming with basic knowledge of C++ and Java</p>											
Teach Method	<p>We will have several quizzes throughout the semester. They will take place during the last half of class.</p> <p>There will be homework assignments every week. In addition, there will be a final exam . The final exam and all quizzes are all Closed Book and Closed Notes.</p>											
Test and Examination	<p>Final grade is calculated according to the following schedule</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10px;">1</td> <td style="width: 100px;">Assignments</td> <td style="width: 100px;">30%</td> </tr> <tr> <td>2</td> <td>Quizzes</td> <td>20%</td> </tr> <tr> <td>3</td> <td>Final exam</td> <td>50 %</td> </tr> </table>			1	Assignments	30%	2	Quizzes	20%	3	Final exam	50 %
1	Assignments	30%										
2	Quizzes	20%										
3	Final exam	50 %										
Pre-request Course	<ol style="list-style-type: none"> 1 Familiarity with computer use is required. 2 You need to have a C compiler to do the Assignments in the course 											
References	<p>[1] Programming in C by Stephen Kochan</p> <p>[2] C Programming: A Modern Approach, Second Edition by K. N. King</p> <p>[3] The C Programming Language by Brian W. Kernighan and Dennis M. Ritchie</p>											

Course Introduction

Code	253502	Teaching Hours	32
Course	MATLAB Programming		
Key Words			
Purpose and Role of the Course	<p>MATLAB was originally developed to be a "MATrix LABoratory" written to provide easy access to matrix software developed by the LINPACK and EISPACK projects. MATLAB provides a very extensive library of predefined functions to make technical programming tasks easier and more efficient. Now, MATLAB has become a standard tool for many working in science or engineering fields.</p> <p>This is a 32-hours course to introduce MATLAB programming. In the course, the basic conceptions, Matrix operations, build-in functions of MATLAB, writing and running MATLAB program (M-files), MATLAB functions, function functions, data file Input/Output, two-dimensional and three-dimensional plotting, mathematics calculation, Handles graphics and Graphical User Interfaces will be gently introduced to students. The main focus of the subject will be acquiring MATLAB programming experience.</p> <p>The objective of this course is: students will be able to solve basic numerical computational problems by implementation in MATLAB. In particular, students will:</p> <ol style="list-style-type: none"> 1 Be able to use MATLAB interactive computational environment to solve simple calculation problem. 2 Be able to write, run and debug MATLAB program (M-file). 3 Be able to divide a large problem into a set of easier sub-problems and to implement MATLAB function or function functions to solve it. 4 Be able to plot two-dimensional or three-dimensional graphics using MATLAB graphic system for data visualization. 5 Be able to create a simple GUI. 		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1 An overview of MATLAB <ol style="list-style-type: none"> 1.1 The development of MATLAB 1.2 The Advantages of MATLAB 1.3 The Disadvantages of MATLAB 1.4 The working environment of MATLAB 1.5 The basic functions of MATLAB 2 The basic programming of MATLAB <ol style="list-style-type: none"> 2.1 M-files 2.2 Keywords and variables 2.3 Data files 3 Matrix and array <ol style="list-style-type: none"> 3.1 Array and vector 3.2 Array and matrix operations 3.3 Solving functions 3.4 Relational & logical operators 4 Program design and control flow <ol style="list-style-type: none"> 4.1 Top-down design technique 		

	4.2 Flow-control 4.3 Loop statements 5 User-defined functions 5.1 Function type 5.2 Call-by-value schema 5.3 The recursion 5.4 Preseving data between calls 5.5 Function functions 6 Input and output 6.1 Text files processing 6.2 Data files processing 6.3 File position and status functions 7 Graphics processing 7.1 Two-dimensional graphics 7.2 Three-dimensional graphics 7.3 Four- dimensional graphics 7.4 Basic graphics 7.5 High-level graphics 8 Graphical user interface 8.1 GUIDE 8.2 Setting properties for GUI components 8.3 Programming the GUI M-file 9 Matlab applications 9.1 Digital signal processing 9.2 Image processing						
Teach Method	<p>The course will be a mix of lecture, and lab as students are introduced to both the MATLAB interactive computational environment, programming language and the mechanics of how to actually write code. Homework will be assigned after each lecture.</p> <p>Lectures are the primary vehicle for introducing and motivating new material, some of which is not in the book. In the classroom, we will arrange lecture, example demos and practice alternatively.</p> <p>The course has one final report, which is designed to complete a project in MATLAB.</p>						
Test and Examination	<table> <tr> <td>1 classroom participation and recitations</td> <td>10%</td> </tr> <tr> <td>2 Homeworks</td> <td>30%</td> </tr> <tr> <td>3 Project</td> <td>60%</td> </tr> </table>	1 classroom participation and recitations	10%	2 Homeworks	30%	3 Project	60%
1 classroom participation and recitations	10%						
2 Homeworks	30%						
3 Project	60%						
Pre-request Course	None						
References	[1] Stephen J. Chapman, <i>MATLAB Programming for Engineers</i> , 2 nd Ed., Beijing: Science Press, 2003.						

Course Introduction

Code	253503	Teaching Hours	48
Course	Computer Networking and Applications		
Key Words	LANs, WANs, NICs, topologies, packets, OSI, TCP/IP		
Purpose and Role of the Course	<p>This training course combines notes, hands-on procedures, multimedia presentations, video files, and review questions to teach the essentials of computer networking. The course is designed to be completed in sequence, from beginning to end.</p> <p>The objective of this course is to introduce the students to the principles of computer based networking and familiarize them with the hardware devices used in the implementation of networks and the way they are connected. Presenting the most commonly used network architectures and operating systems.</p>		
Main Chapters and Teaching Hours	<p>Basic principles of computer-based networking, LANs and WANs, designs for connecting computers, understanding of the different network topologies that connect computers, Network interface cards (NICs), overview of wireless-network technology, the role of access methods in putting data on a network cable, the concept of packets as the basic building blocks of network data communications, Ethernet network architecture Token Ring network architecture, AppleTalk architecture, introduction to network operating systems, Novell's network operating systems, Microsoft Windows NT, lesser-known operating systems, including AppleTalk, Unix, overview of the issues and problems involved in implementing a multivendor network, Open Systems Interconnection (OSI) reference model, The IEEE 802.x Standard, device drivers and how they relate to the OSI protocols and their function in a networking environment, TCP/IP protocol and its relationship to the OSI reference model, NetWare Protocols, Network Basic Input/Output System (NetBIOS), Elements of Network Connectivity, hardware used to expand networks devices that allow to extend a LAN.</p>		
Teach Method	Presentation of course notes, hands-on procedures, multimedia presentations, video files, and review questions to teach the essentials of computer networking.		
Test and Examination	This course's assessment is based on a multiple choice test.		
Pre-request Course	One two hours test at the end of the course.		
References	[1] Networking Essentials Plus, an e-book. (a copy is provided by lecturer).		

Course Introduction

Code	253516	Teaching Hours	48
Course	Space Environment, Orbit and Spacecraft Systems		
Key Words			
Purpose and Role of the Course	<p>“Space Environment, Orbits and Spacecraft Systems” course consists of three parts: the first part is space environment ; the second part is the basic knowledge of orbital dynamics; the third part is the main part which concerns the whole spacecraft (mainly satellite) big systems including space segment and ground segment.</p> <p>For the space environment, atmosphere and outer space are the fields where spacecrafts must fly through or in side. Since space environment is a complicated subject and includes astronomy, astrophysics, cosmogony etc., our course describes the construction of atmosphere and outer space as well as some phenomena which would affect spacecrafts.</p> <p>For a spacecraft with given applied task, it is important to understand what kind of orbit is required, i.e., to select basic parameters of operational orbit, to choose launch window, to plan the steps of orbit maneuver. Orbit selection is often referred to application design. The orbit parameters decides operational mode of spacecraft and its ground track, region of accessibility, lifetime of spacecraft, propellant required and so on. In addition the orbit parameters have significant influences on subsystems of the payload, structure, electrical power, thermal control, telecommunication, and attitude control. The mass of propellant (fuel) consumed for orbit maneuver is also a mater to consider in spacecraft design. Therefore the orbit design (mission design) determines the overall performances of spacecraft in great extent.</p> <p>Spacecraft is flight vehicle that runs round the Earth (artificial satellite, manned spacecraft, space station) or flies to other celestial bodies (Moon probe, Mars probe etc.). But this course only deals with spacecraft round the Earth. Since space environment is a complicated science and includes astronomy, astrophysics, cosmogony etc., our course just describes some phenomena which would affect spacecraft.</p> <p>The following contents are the foundation of understanding the next stage special courses of satellite applications: configurations of satellites, satellite bus (platform) and payload, as well as launch vehicles; applied satellites having their various ways of orbit insertion with their different missions; organization and deployment of launch complex; facilities concerned with satellites at complex; satellite and launch vehicle combined operation; separation method of satellite and launch vehicle; launching process of launch vehicle; functions of launch site and the relationship of satellite.</p> <p>Applied satellites mainly include remote sensing satellites, communication satellites, meteorological satellites, and scientific satellites. There is a main tendency for satellites to develop moonlets (small and micro-satellite). It is useful for students to know the development of satellites and future tendency in satellite science and technology, which are presented in this course. It costs some lectures to introduce the satellites of USA, Europe, Russia, Japan, India, and so on. And it costs much more time to introduce Chinese satellites, such as DFH, FY, HY, CBERs, and so on.</p> <p>Space Environment, Orbits and Spacecraft Systems are very important for engineers. This</p>		

	<p>course introduces fundamental knowledge to students for their future use, so the objective of this course is:</p> <p>Upon completion of this course, students will be able to command the basic concept of applied satellites and their special orbits, launch vehicles, ground stations and the space environment surrounding satellites. . In particular, students will:</p> <ol style="list-style-type: none"> 1. Be able to understand the theory of Kepler orbit and the basic laws of spacecraft orbital motion, orbit perturbation and the effect of some perturbing forces, orbit maneuver and control. 2. Be able to understand the typical components and structures of a satellite as well as a complex of ground station. These basic concepts are very important to the next stage study. 3. Know well about the development of applied satellites with their payloads and the trends of applied satellites, as well as the moonlets (small satellites). 4. Understand the launch vehicle, launch complex and the procedure of orbit insertion.
<p style="text-align: center;">Main Chapters and Teaching Hours</p>	<p>Chapter 1. Space Environment --- 6 hrs.</p> <ol style="list-style-type: none"> 1.1 Introduction 1.2 Earth's Atmosphere 1.3 Outer Space 1.4 Solar System 1.5 Effects on Spacecrafts <p>Chapter 2. Orbit Dynamics --- 9 hrs.</p> <ol style="list-style-type: none"> 2.1 Introduction 2.2 Kepler,s First Law 2.3 Kepler,s Second Law 2.4 Kepler,s Third Law 2.5 Orbital Elements 2.6 Apogee and Perigee Heights 2.7 Orbital Perturbations 2.8 Inclined Orbits 2.9 Sun Synchronous Orbit 2.10 Stationary Orbit <p>Chapter 3. Satellite Platform (Bus) --- 6 hrs.</p> <ol style="list-style-type: none"> 3.1 Introduction 3.2 Configuration of Satellites 3.3 Orbital Control and Propulsion Subsystem 3.4 Attitude Control and Devices 3.5 Power Support Subsystem 3.6 Thermal Defense Subsystem 3.7 TT&C and OBDH/CDH Subsystem <p>Chapter 4. Satellite Application and Payloads --- 6 hrs.</p> <ol style="list-style-type: none"> 4.1 Introduction 4.2 Remote Sensing Satellite 4.3 Communication Satellite

	<p>4.4 Meteorological Satellite</p> <p>4.5 Scientific and Testing Satellites</p> <p>Chapter 5. Ground Stations --- 3 hrs.</p> <p>5.1 Introduction</p> <p>5.2 Ground Station of Remote Sensing and Meteorological Satellites</p> <p>5.3 Ground Station of Communication Satellite</p> <p>5.4 Ground Station of Scientific and Testing Satellites</p> <p>Chapter 6. Launch Vehicles --- 6 hrs.</p> <p>6.1 Introduction</p> <p>6.2 Trajectory and Flight Program</p> <p>6.3 Configuration of Launch Vehicles</p> <p>6.4 Propulsion Subsystem</p> <p>6.5 Guidance Subsystem</p> <p>6.6 Firing and Connection-Separation Devices</p> <p>6.7 Adapting with Satellite(s)</p> <p>Chapter 7. Launch Complex --- 3 hrs.</p> <p>7.1 Introduction</p> <p>7.2 Survey of a Typical Launch Complex</p> <p>7.3 Combined Operations of SC/LV</p> <p>7.4 Typical Launching Procedure</p> <p>Chapter 8. Chinese Spacecrafts --- 6 hrs.</p> <p>8.1 Satellites</p> <p>8.2 Manned Space Flight</p> <p>8.3 Lunar Exploration</p> <p>8.4 New Series of Launch Vehicle</p> <p>Final Examination --- 3 hrs.</p>						
Teach Method	<p>The course will be a mix of lecture, discussion and visiting exhibition rooms.</p> <p>Lectures are the primary vehicle for introducing and motivating new material, some of which is not in the book. Homework will be assigned after lecture.</p> <p>In the classroom, we will arrange lecture and problem discussion.</p> <p>The course has one final exam, which is designed to complete some questions.</p>						
Test and Examination	<p>Your grade will be computed based upon your final exam, your home work grade, and your participation. The weighting on these factors as follows:</p> <table> <tr> <td>1. classroom participation</td> <td>20%</td> </tr> <tr> <td>2. Home works</td> <td>30%</td> </tr> <tr> <td>3. Exam</td> <td>50%</td> </tr> </table>	1. classroom participation	20%	2. Home works	30%	3. Exam	50%
1. classroom participation	20%						
2. Home works	30%						
3. Exam	50%						
Pre-request Course							
References	<p>The textbooks for the course are:</p> <p>[1] 253403 Lecture Note (written by He Linshu)</p> <p>[2] Launch Vehicles Design (written by He Linshu)</p> <p>[3] LM-3B USER’S MANUAL (Using google to find)</p> <p>[4] XICHANG SATELLITE LAUNCH CENTER USER’S MANUAL (Using google to find)</p>						

Course Introduction

Code	253517	Teaching Hours	18
Course	Space Technology and Space Economy		
Key Words	Space flight, Space technology, Space law		
Purpose and Role of the Course	This course introduces some issues related to space, such as space law, space project management,. The object of this course is to provide a general introduction to some issues related to space, bring up students' interesting in learning space technology.		
Main Chapters and Teaching Hours	<p>The content of this course includes:</p> <ol style="list-style-type: none"> 1. Space and society 2. Principles of international space law 3. Introduction to space biology 4. Environment control & life support system 5. Overview of satellite application 6. Management of space project 7. Space future <p>These content are arranged in 6 lectures (including final examination).</p>		
Teach Method	Lecture by teacher.		
Test and Examination	Examination in the last lecture for 2 hours.		
Pre-request Course			
References	[1] Key to Space. Edited by A. Houston and M. Rycroft. Issued by International Space University in 2003.		

Course Introduction

Code	253518	Teaching Hours	32
Course	Aerospace Materials and Processes		
Key Words			
Purpose and Role of the Course	<p>The course will cover the broader aspects of aerospace materials as well as details of manufacturing processes including forming, joining and surface technology. Course topics will provide students the knowledge required to produce designs of aerospace components with appropriate material and process specifications.</p> <ol style="list-style-type: none"> 1. Understand the properties of aerospace materials, in particular the material anisotropy and how they relate to directional properties. 2. A familiarity with manufacturing processes common to the aerospace industry. 3. A practical understanding of the relationship between properties and performance of aerospace materials and applications in various aerospace components or structures. 		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction to Aerospace Materials and Process (2 hrs) 2. Fundamental of Materials (10 hrs) <ol style="list-style-type: none"> 2.1 Structure of Materials 2.2 Mechanical Properties of Materials 2.3 Physical Properties 2.4 Metal Phase Diagrams 2.5 Metal Heat Treatment 3. Aerospace Materials (8 hrs) <ol style="list-style-type: none"> 3.1 Metal Alloys 3.2 Ceramics 3.3 Polymers 3.4 Composites 4. Manufacturing Process Specifications to the Aerospace Industry (10 hrs) <ol style="list-style-type: none"> 4.1 Forming 4.2 Joining 4.3 Surface Treatment 4.4 Inspection 5. Design Application (2 hrs) 		
Teach Method	Lecture and discussion		
Test and Examination	Graded Homeworks(30%), Final exam (70%) Comprehensive exam		
Pre-request Course			
References	<p>[1] William D. Callister, Jr. Materials science and engineering, An introduction, John Willey & Sons, Inc.</p> <p>[2] Serope Kalpakjian. Manufacturing Engineering and Technology. Addison Wesley Publishing Company.</p>		

Course Introduction

Code	253519	Teaching Hours	32
Course	Introduction to Advanced Manufacturing Technology		
Key Words			
Purpose and Role of the Course	<p>Various topics in computers in manufacturing, product design and manufacturing, computer-aided design (CAD) and computer-aided manufacturing (CAM), rapid prototyping, virtual engineering, numerical control, agile manufacturing, environmentally conscious design, intelligent manufacturing, as well as some elective cutting edge technologies in manufacturing such as nanotechnology and micro-machining will be discussed.</p> <p>Introduce the topics of modern advanced manufacturing technology, with a special focus on computer applications in product design and manufacturing.</p>		
Main Chapters and Teaching Hours	<p>Computers in Manufacturing</p> <ul style="list-style-type: none"> ● Production Systems ● Computer-aided Technologies ● Internet and network-based Manufacturing <p>Product Design and Manufacturing</p> <ul style="list-style-type: none"> ● Principles of CAD ● CAD Software ● Components of CAM Systems ● CAD/CAM Technologies Trends <p>Virtual Engineering</p> <ul style="list-style-type: none"> ● Components of Virtual Engineering ● Applications of Virtual Engineering ● Related Technologies <p>Rapid Prototyping and Manufacturing (RP&M)</p> <ul style="list-style-type: none"> ● Specific RP&M ● Applications of RP&M <p>Environmentally Conscious Design and Manufacturing</p> <ul style="list-style-type: none"> ● Basic Principles ● Green Design and Manufacturing <p>Agile Manufacturing and Lean Production</p> <ul style="list-style-type: none"> ● Manufacturing Strategies ● How to be Agile ● How to be Lean <p>Intelligent Manufacturing</p> <ul style="list-style-type: none"> ● Manufacturing Knowledge ● Knowledge-based Engineering <p>Discussions and Presentations:</p> <p style="padding-left: 20px;">Concurrent Engineering -- Design for Manufacturing Logistics and manufacturing/Supply Chain Management Nanotechnology/Micro-machining</p>		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	1. Attendance and performance 10% 2. Homework 50% 3. Final course report 40%		

Pre-request Course	Knowledge of basic mechanical engineering, such as basic knowledge in product design, manufacturing, etc.
References	<p>[1] James A. Regh and Henry W. Kraebber, <u>Computer-Integrated Manufacturing</u>, Prentice-Hall Inc., 2001. (English reprint: <u>计算机集成制造</u>, 机械工业出版社, 2003) .</p> <p>[2] K. Lee, <u>Principles of CAD/CAM/CAE Systems</u>, Addison-Wesley, 1999.</p> <p>[3] Nanua Singh, <u>Systems Approach to Computer-Integrated Design and Manufacturing</u>, John Wiley & Sons, 1996.</p> <p>[4]唐一平, <u>先进制造技术</u>, 机械工业出版社, 2004。</p>

Course Introduction

Code	253522	Teaching Hours	48
Course	Finite Element Method in Engineering		
Key Words	Discretization of Problems; Finite elements; Structure Analysis; Field Analysis; Heat Transfer; Variational and Virtual Work Principles		
Purpose and Role of the Course	<p>It is a course for the graduate students whose research orientation is relative to the structure analysis in solid mechanics and the analysis of field problems (such as heat transfer, irrotational flow, electrostatic and magneto static fields, etc).</p> <p>The objective of this course is to present the basic knowledge about finite element method (FEM) and be able to build on a solid foundation for structure analysis. At present, the FEM represents a most general analysis tool and can be used in practically all fields of engineering analysis.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction to Finite Element Method 2. General Procedure of Finite Element Method 3. Formulation of Isoparametric Finite Element Matrices 4. Analysis of Solids of Revolution 5. Analysis of Three – Dimensional Problems 6. Finite Element Analysis for Plates and Shells 7. Formulation of the Element Characteristic Matrices and Vectors for field Problems 8. Heat Transfer Analysis 		
Teach Method	Lecture		
Test and Examination	Problems and/or Mini - Projects Open Examination at the End of Term		
Pre-request Course	It is aimed at engineering and science graduate students with no previous knowledge of the FEM, but with the foundation of mathematics and field.		
References	<ol style="list-style-type: none"> [1] O. C. Zienkiewicz. The Finite Element Method. 4th edition, McGraw-Hill, London, 1989. [2] K. J. BATHE. The Finite Element in Engineering. 3rd edition, Butterworth - Heinemann, 1999. [3] O. C. Zienkiewicz and P. L. Taylor. The Finite Element Method. 5th edition, Butterworth - Heinemann, 2000. [4] S.S. RAO. The Finite Element Method in Engineering. Butterworth-Heinemann, 1999. [5] O. C. Zienkiewicz and P. L. Taylor. The Finite Element Method. 5th edition, Butterworth - Heinemann, 2000. 		

Course Introduction

Code	253523	Teaching Hours	18
Course	Introduction to Space Flight		
Key Words	Aerospace, Space flight, Space technology		
Purpose and Role of the Course	<p>This course introduces how to enter and flight in space, hw to work in space, and how to use space resource.</p> <p>The object of this course is to provide a general introduction to space flight, bring up students' interesting in learning space technology.</p>		
Main Chapters and Teaching Hours	<p>The content of this course includes:</p> <ol style="list-style-type: none"> 1. Origin and development of space flight. 2. Space environment. 3. Launch vehicle. 4. Satellite orbit. 5. Satellite design. 6. Satellite application. 7. Manned space flight. 8. Deep space exploration. <p>These content are arranged in 6 lectures (including final examination).</p>		
Teach Method	Lecture		
Test and Examination	Examination in the last lecture for 2 hours.		
Pre-request Course	It is aimed at engineering and science graduate students with no previous knowledge of the FEM, but with the foundation of mathematics and field.		
References	<p>[1] Kang-tsung Chang, <i>Introduction to Geographic Information Systems</i> (3rd Edition), McGraw-Hill 2005 , www.mhhe.com/changgis3e</p> <p>[2] Key to Space. Edited by A. Houston and M. Rycroft. Issued by International Space University in 2003.</p>		

Course Introduction

Code	253801	Teaching Hours	48
Course	Advanced Chinese		
Key Words			
Purpose and Role of the Course	<p>Not only learning oral Chinese language but also Chinese characters, Chinese custom and traditions. Students can appreciate the Chinese culture, value and manners, communicate with Chinese people and make the life in Beijing happy.</p> <p>Study to pronounce properly and write words and simple sentences. Learning how to write Chinese characters. Translating English words and short sentences into Chinese characters. Translating Chinese sentences into English, vice versa.</p>		
Main Chapters and Teaching Hours			
Teach Method	<p>The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments. The course will be introduced with many examples and especially words and sentences which used everyday. Teachers will arrange classes in listening, speaking, reading and writing.</p> <p>The course has one final exam, which is designed to test the students' language skill.</p>		
Test and Examination	1. Presence 10% 2. Final exam 90%		
Pre-request Course	Knowledge of basic Chinese, willing to improve Chinese language continuously		
References	<p>[1] Learning Chinese Characters from MS. Zhang (A), 1st Ed, 2005</p> <p>[2] New Approaches to Learning Chinese, Beijing, Sinolingua Press, 1st Ed, 2001</p>		

Course Introduction

Code	253802	Teaching Hours	20
Course	Scientific Literature Retrieval		
Key Words	LIBRARY / Information Retrieval		
Purpose and Role of the Course	To teach students to get to know what are the possible information resources available for them to do research and where to find them to meet their information needs.		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction: a variety of information resources, printed material and non-print material 2. library services , library collections, 3. library catalogs 4. key database services 5. Internet resources 		<p>4hrs</p> <p>2hrs</p> <p>4hrs</p> <p>8hrs</p> <p>2hrs</p>
Teach Method	Teaching in Classroom & Practices in Library		
Test and Examination	Submit one retrieval paper for examination		
Pre-request Course			
References	[1] "Information Retrieval"		

Course Introduction

Code	253804	Teaching Hours	18
Course	Scientific Thesis Writing		
Key Words			
Purpose and Role of the Course	<p>The WAP course is compulsory to international PhD students and open to graduate students who need to develop their intercultural communicative competence in an increasingly English dominated academic environment and pursue an international research career, to participate in academic exchange programs or international conferences, to publish in international journals or volumes where English is the medium of communication.</p>		
Main Chapters and Teaching Hours	<ul style="list-style-type: none"> ◆ Unit I Introduction to Academic writing <ul style="list-style-type: none"> - Understanding Academic writing (paragraph structure & Topic sentence) - Averile Coxhead's 570 Academic Word List ◆ Unit 2 Quotation, Paraphrase, and Summary <ul style="list-style-type: none"> - Quotations - Paraphrase - How to write summaries - Assignment I: summary essay ◆ Unit 3 Research Proposal: Overview <ul style="list-style-type: none"> - Understanding research proposals - Reading sample research proposal and Workshop - Assignment IV: writing a thesis proposal ◆ Unit 4 Title and Literature Review <ul style="list-style-type: none"> - Research topic selection - Search for the books and articles you might find useful for your topic - Summarize the previous research - Give examples of previous research; Evaluate any previous research ◆ Unit 5 Method and communication of Results <ul style="list-style-type: none"> - Describe your proposed research methodology - Describe your time frame; Describe how you intend to do this in the time available - Describe you resources; describe how you intend to do your research with the available resources. - A description of how the research findings will be used and/or communicated to others. - Writing exercise: analyze the moves of the method section. ◆ Unit 6 Abstracts <ul style="list-style-type: none"> - Title - Moves in an abstract - Workshop: a sample report - Writing exercise: Write the abstract of another sample report ◆ Unit 7 Presentations <ul style="list-style-type: none"> - Research Proposals 		

	- Conference papers
Teach Method	The course is given in the form of class lectures plus learner-centered tasks, and students are expected to further grasp the contents through reading sample articles and doing the homework assignments.
Test and Examination	1. Homework 10% 2. Final report 60% 3. In-class exercises 20% 4. Attendance 10%
Pre-request Course	Knowledge of basic writing, competence in writing correct sentences and paragraphs.
References	[1] Behrens, Laurence and Leonard J. Rosen. <i>A Sequence for Academic Writing</i> . Longman: 2002. [2] Theodore A. Sherman & Simon S. Johnson, <i>Modern Technical Writing</i> , Prentice-Hall [3] www.uefap.co.uk [4] www.writing.eng.vt.edu

Course Catalogue for International Postgraduates

(School of Chemistry and Environment)

编号 No.	英文课程名称 Course Title	中文课程名称 Course Title	学时 Hours	学分 Credits	开课季节 Semester	任课教师 Lecturer
273401	Nanoscience and technology	纳米科学与技术	48	3	Spring	Guo Lin
273402	Preparation and Characterization of Nanomaterials	纳米材料的制备及表征	48	3	Spring	Li Lidong
273403	Structural Chemistry	结构化学	48	3	Spring	Li Lidong
273404	Spectroscopy	波谱学	32	2	Spring	ZHENG Yongmei
273405	Nanomaterials Chemistry	纳米材料化学	48	3	Fall	Guo Lin
273406	Advanced Inorganic Chemistry	高等无机化学	48	3	Spring/Fall	Zheng Yongmei
273407	Environmental Chemistry	环境化学	48	3	Spring/Fall	Xiaomin LI
273408	Environmental Biotechnology	环境生物技术	48	3	Spring/Fall	LIANG Dawei
273409	Advanced Water Treatment Engineering	高等水处理工程学	48	3	Spring/Fall	LIANG Dawei
273410	Air Pollution Prevention and Control Principle	空气污染防控原理	48	3	Spring/Fall	SUN Yifei
273411	Waste Treatment and Recycling	固体废物处理处置与资源化工程	48	3	Spring/Fall	SUN Yifei
273412	Contaminated Land Remediation	污染土地修复	32	2	Spring/Fall	LI Xiaomin

Course Introduction

Code	273401	Teaching Hours	48
Course	Nanoscience and technology		
Key Words	Nanoscience; nanomaterials; Microstructure analysis		
Purpose and Role of the Course	<p>《Nanoscience and nanotechnology》 is a elective course for the foreign graduate students. This course is well balanced providing a comprehensive coverage of research activities from around the world on a particular topic starting from a basic background to complete scientific and technological details including most recent research developments in the nano-field.</p> <p>Nanoscience and Nanotechnology is a specialized direction course for the foreign graduate students. This course covers the various preparation methods of nano-materials and the basic characterization techniques including IR, UV, XRD, TEM, SEM, etc. Meanwhile, it also covers the hot topic of nanoscience and nanotechnology, such as carbon nanomaterials and solar cell. By the studies, the students will learn the basics of nanoscience and nanotechnology, and get ready for the future research in this field.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1. Introduction to nanoscience and nanomaterials</p> <p>Chapter 2. Applications in nanotechnology</p> <p>Chapter 3. Preparation Methods of nanomaterials</p> <p>Chapter 4. Characterization methods of nanomaterials</p> <p>Chapter 5. Microstructure analysis of nanomaterials</p> <p>Chapter 6. Carbon nanomaterials</p> <p>Chapter 7. Solar cell with nanomaterials</p>		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	Total: 100, Final exam (open-book): 75%; mid-term report: 20%; Attendance: 5%		
Pre-request Course	Knowledge of basic inorganic chemistry		
References	<ol style="list-style-type: none"> 1. Characterization of nanophase materials, editor by, Zhonglin Wang, Wiley –VCH, 2000. 2. Nanosurface chemistry, edited by Morton Rosoff, Long Island University Brooklyn, New York. 2002. 		

Course Introduction

Code	273402	Teaching Hours	48
Course	Preparation & Characterization of Nanomaterials		
Key Words	Raman scattering; nanotechnology; microstructure determination		
Purpose and Role of the Course	<p>《Preparation and Characterization of Nanomaterials》 is a elective course for the foreign graduate students. This course covers the various preparation methods of nano-materials and the basic characterization techniques including XRD, TEM, SEM, XPS and etc. By the studies, the students will learn the basics of nanoscience and nanotechnology, and get ready for the future research in this field.</p> <p>It is an introduction course to the nano research area. By the studies, the students will learn the basics of preparation and characterization methods of nanomaterials and get ready for the future research in this field.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1. Introduction to the nanoscience (2 credit hours)</p> <p>Chapter 2. Various applications in nanotechnology (6 credit hours)</p> <p>Chapter 3. Preparation Methods of nanomaterials (12 credit hours)</p> <p>Chapter 4. XRD (4 credit hours)</p> <p>Chapter 5. XPS (6 credit hours)</p> <p>Chapter 6. Raman scattering (6 credit hours)</p> <p>Chapter 7. TEM and SEM (6 credit hours)</p> <p>Chapter 8. Application of Synchrotron Radiation Technology in the microstructure determination of nanomaterials (6 credit hours)</p>		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	Total: 100, Final exam (open book): 75%; mid-term report: 20%; Attendance: 5%		
Pre-request Course	Knowledge of basic inorganic chemistry		
References	<p>Characterization of nanophase materials, editor by, Zhonglin Wang, Wiley-VCH, 2000.</p> <p>Nanosurface chemistry, edited by Morton Rosoff, Long Island University Brooklyn, New York. 2002.</p>		

Course Introduction

Code	273403	Teaching Hours	48
Course	Structural Chemistry		
Key Words	quantum chemistry; molecular structures; Molecular symmetry		
Purpose and Role of the Course	<p>This course is an elective course for foreign graduate students. The course will cover the topics including: basics of quantum chemistry, atom structures, and chemistry bonding theory, description of crystal structure-symmetry, point and space groups, structures and properties of metals, structure chemistry of ionic compounds, structure analysis.</p> <p>The course objectives are to introduce participants to different experimental and theoretical methods for determination and analysis of three-dimensional structures of important molecules. The application of these methods in the study on relationships between molecular structure and reaction activity are dealt with in detail.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Basics of quantum chemistry 2. Atom structures 3. Bonding theory and molecular structures 4. Molecular symmetry 5. Crystal structures and point and space groups 6. Structures and properties of metals, structure chemistry of ionic compounds, structure analysis. 		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	Homework assignment 20% Final exam (open book): 70% Tutorial participation: 10%		
Pre-request Course	Knowledge of basic inorganic chemistry and bonding theory.		
References	[1] Structural Methods in Inorganic Chemistry, E.A.V. Ebsworth, D.W.H. Rankin and S.Cradock, 2nd edition, CRC Press: Boca Raton, 1991.		

Course Introduction

Code	273404	Teaching Hours	32
Course	Spectroscopy		
Key Words	Spectroscopy development; Mass spectrum; spectroscopy		
Purpose and Role of the Course	<p>With the development of electronics and computer scientific technology, spectroscopy makes great progress nowadays. Spectroscopy is an important means to measure the compound structure and analyze its component, by means of the four spectroscopic techniques such as Ultraviolet, Infrared, Nuclear Magnetic Resonance and Mass Spectrometry.</p> <p>The main object of this course is to learn the basic concepts, methods and applications of spectroscopy. This course also includes some innovative assignment via various routes that gives students more opportunities to learn.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction 2. Review of spectroscopy development 3. Theory of spectroscopy 4. Ultraviolet spectrum and its analysis 5. Infrared spectrum and its analysis 6. Nuclear magnetic resonance spectrum and its analysis 7. Mass spectrum and its analysis 8. Combination of four spectrum analysis and application 		
Teach Method	Lectures will be presented mainly by blackboard and PPT.		
Test and Examination	<ol style="list-style-type: none"> 1. Final Open-book Exam: 60% 2. Assignments: 30% 3. Attendance: 10% 		
Pre-request Course	Knowledge of inorganic chemistry and instrument analysis		
References	<p>[1] Lambert J B et al. 1988. Organic Structural Spectroscopy. New Jersey: Prentice Hall. Upper Saddle River.</p> <p>[2] Williams D H, Fleming I. 1995. Spectroscopic methods in organic chemistry. Berkshire: McGraw-Hill Book Co.</p> <p>[3] Joseph B Lambert, Herbert F Shruell, David A Lightner, et al. 1998. Organic structural spectroscopy. New Jersey: Prentice-Hall Inc.</p>		

Course Introduction

Code	273405	Teaching Hours	48
Course	Nanomaterials Chemistry		
Key Words	Nanostructure; Nanomaterials; Magnetism		
Purpose and Role of the Course	<p>Nanomaterials Chemistry is a specialized direction course for the foreign graduate students. It is an important course in micro/nano-technology, providing basic support for a further study. It aims at making the students mastering the optic, electric, magnetic and catalytic properties of nanomaterials, understanding various chemical synthesizing and characterizing methods for nanomaterials.</p> <p>It aims at making the students mastering the optic, electric, magnetic and catalytic properties of nanomaterials, understanding various chemical synthesizing and characterizing methods for nanomaterials.</p>		
Main Chapters and Teaching Hours	<p>Chapter 1. Nanomaterial and Nanostructure</p> <p>Chapter 2. Chemical syntheses of inorganic nanomaterials</p> <p>Chapter 3. Semiconductor Nanomaterials</p> <p>Chapter 4. Optical and electrochemical properties of nanocrystals</p> <p>Chapter 5. Magnetism</p> <p>Chapter 6. Catalytic properties of nanocrystals</p> <p>Chapter 7. Applications of nanocrystals</p>		
Teach Method	The course is given in the form of class lectures, and students are expected to further grasp the contents through doing the homework assignments.		
Test and Examination	Total: 100, Final exam (open book): 75%; mid-term report: 20%; Attendance: 5%		
Pre-request Course	Knowledge of basic inorganic chemistry		
References	<p>Characterization of nanophase materials, editor by, Zhonglin Wang, Wiley –VCH, 2000.</p> <p>Nanosurface chemistry, edited by Morton Rosoff, Long Island University Brooklyn, New York. 2002.</p>		

Course Introduction

Code	273406	Teaching Hours	48
Course	Advanced Inorganic Chemistry		
Key Words	Atomic Structure; Bonding Models; Solid State		
Purpose and Role of the Course	<p>This course is a core course for foreign graduate students who major in inorganic chemistry. The course covers an introduction to inorganic chemistry, atomic structure and trends in the periodic chart, valence bond, solid-state chemistry, and coordination chemistry etc.</p> <p>The main object of this course is to learn the periodic chart and other very important inorganic theories. This course also includes some innovative assignment via various routes that gives students more opportunities to learn.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1、 Introduction to Inorganic Chemistry 2、 Atomic Structure 3、 Periodic Trends 4、 Symmetry and Group Theory 5、 Bonding Models 6、 Complex Ions and Coordination Compounds 7、 Solid State 8、 Organometallic Chemistry 		
Teach Method	Lectures will be presented mainly by blackboard and PPT.		
Test and Examination	<ol style="list-style-type: none"> 1. Final Open-book Exam: 60% 2. Assignments: 30% 3. Attendance: 10% 		
Pre-request Course	Knowledge of inorganic chemistry and structural chemistry		
References	<ol style="list-style-type: none"> 1、 Inorganic Chemistry, 2nd Edition by Gary L. Miessler and Donald A. Tarr. 2、 Essentials of Inorganic Chemistry 2 by D.M.P. Mingos and Molecular 3、 Symmetry and Group Theory by Robert L. Carter. 		

Course Introduction

Code	273407	Teaching Hours	48
Course	Environmental Chemistry		
Key Words	Environmental pollutants; Migration and transformation; Toxicology		
Purpose and Role of the Course	<p>It is the major core course for students in the discipline of environmental science and engineering, with the focus on introducing the transportation and transformation of chemical pollutants in environment and their effect on organism and ecology.</p> <p>The goal of the course is to provide the prospective students a relatively thorough understanding of the characteristics, related reactions of the pollutants, their effect on animal and human being and the chemical theory and techniques to solve environmental problems.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Environmental science, technology and chemistry (2 hours) <ol style="list-style-type: none"> 1.1 Introduction of environmental problems 1.2 Introduction of environmental chemistry 1.3 Advances in environmental chemistry 1.4 Main contents and requirements of the course 2. Fundamentals of chemistry and chemical analysis (4 hours) <ol style="list-style-type: none"> 2.1 Fundamental of chemistry 2.2 Analysis of water and wastewater 2.3 Analysis of wastes and solids 2.4 Analysis of air and gas 2.5 analysis of biological materials 3. Atmospheric environmental chemistry (14 hours) <ol style="list-style-type: none"> 3.1 Migration of atmospheric pollutants 3.2 Photolysis 3.3 Free radicals in the atmosphere 3.4 Reactions of nitrogen oxides 3.5 Reactions of hydrocarbon 3.6 Photochemical smog 3.7 Fate of sulfur oxides 3.8 Acid precipitation 3.9 Particulates in the atmosphere 3.10 Formation and destruction of greenhouse gas 3.11 Ozone layer destruction 4. Aquatic environmental chemistry (16 hours) <ol style="list-style-type: none"> 4.1 Characteristics of natural water and pollutants in water 4.2 Inorganic pollutants in water 4.3 Dissolution and precipitation 4.4 Oxidation-reduction 4.5 Complexation 		

	<p>4.6 Organic pollutants in water</p> <p>4.7 Modelling of water system</p> <p>5. Soil environmental analysis (6 hours)</p> <p>5.1 Characteristics of soil</p> <p>5.2 Fates of pollutants in soil-plants system</p> <p>5.3 Soil contamination and remediation</p> <p>6. Toxicological chemistry (6 hours)</p> <p>6.1 Introduction to toxicology and toxicological chemistry</p> <p>6.2 Transportation of pollutants in organisms</p> <p>6.3 Bioaccumulation and magnification</p> <p>6.4 Conversion of pollutants</p> <p>6.5 Toxicity of pollutants</p>
Teach Method	All the contents will be taught in class, together with case discussion. And the students are expected to complete the pre-reading contents and assignments after class. Finally, a course report is requested.
Test and Examination	In class 20%; Homework 30%, Final Exam 50%
Pre-request Course	Knowledge of inorganic chemistry and physical chemistry
References	<p>[1] Ronald A. Bailey, Herbert M. Clark, et.al., Chemistry of the Environment, Academic Press, 2005</p> <p>[2] Thomas G. Spiro, William M. Stigliani, Chemistry of the Environment (Second Edition), Qinghua University press, 2003.</p>

Course Introduction

Code	273408	Teaching Hours	48
Course	Environmental Biotechnology		
Key Words	Microbiology; Aerobic biofilm process; Nitrification		
Purpose and Role of the Course	<p>Environmental Biotechnology is a graduate-level course in curricula that exploit microbiological processes for environmental quality control. This module will introduce the fundamental principles and practical applications of microbiological processes to improve environmental quality. This module not only includes the traditional environmental treatment technologies, such as activated sludge processes and anaerobic digestion, remain mainstays today. At the same time, some new technologies are introduced to address the contemporary problems as well, such as detoxification of hazardous chemicals, bioremediation and bio-filtration of drinking water, etc.</p> <p>The main object of this course is to help the students major in environmental engineering or related disciplines understand the principles of environmental biotechnologies, which is essential to analyze and solve the real problems involved in the environmental engineering.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Basics of microbiology 2. Stoichiometry, Bacterial Energetics and Microbial Kinetics 3. Reactors 4. The activated sludge process 5. Lagoons and Wetland system 6. Aerobic biofilm process 7. Nitrification 8. Denitrification 9. Phosphorus removal 10. Anaerobic treatment technology 11. Detoxification of hazardous chemicals 12. Bioremediation 		
Teach Method	Lectures will be presented mainly by blackboard and PPT.		
Test and Examination	<ol style="list-style-type: none"> 1. Final Open-book Exam: 60% 2. Assignments: 30% 3. Attendance: 10% 		
Pre-request Course	Knowledge of environmental chemistry and water treatment		
References	[1] Bruce E. Rittmann, Perry L. McCarty, Environmental Biotechnology: Principles and Applications, 2004		

Course Introduction

Code	273409	Teaching Hours	48
Course	Advanced Water Treatment Engineering		
Key Words	Management Strategies; Chemical Oxidation and Reduction; Filtration		
Purpose and Role of the Course	<p>Shortage of available water resource is a common problem in many regions of the world. One important measure to solve the problem is to use treated wastewater for non-drinking purposes. Centralized wastewater treatment and reuse often needs large investment and sophisticated management and maintenance systems, which may be unaffordable in less developed countries, and even developed countries need to reduce the cost of wastewater reuse. This module includes the traditional treatment technologies and the developed technologies today.</p> <p>The main object of this course is to help the students major in environmental engineering or related disciplines understand the principles of water treatment field, which is essential to analyze and solve the real problems involved in the environmental engineering.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction. 2. Physical, Chemical and Microbiological Quality. 3. Water Quality Management Strategies. 4. Fundamentals of Chemical Reactions and Reactor Analysis. 5. Introduction to Separation Processes and Mass Transfer. 6. Chemical Oxidation and Reduction. 7. Coagulation, Mixing, and Flocculation. 8. Filtration 9. Adsorption. 10. Ion Exchange. 		
Teach Method	Lectures will be presented mainly by blackboard, PPT and discussions.		
Test and Examination	<ol style="list-style-type: none"> 1. Report: 50% 2. Presentation: 40% 3. Attendance: 10% 		
Pre-request Course	Knowledge of environmental chemistry, environmental biotechnology		
References	[1] MWH, Water Treatment: Principles and Design, Wiley, 2005		

Course Introduction

Code	273410	Teaching Hours	48
Course	Air Pollution Prevention and Control Principle		
Key Words	Air Pollution; Concentration Models; Emission Estimates		
Purpose and Role of the Course	<p>This is one of the fundamental courses for engineering graduate students in environmental science and engineering. Through various teaching procedures, students will grasp the traditional theories and the latest developments in the technology of air pollution control; be familiar with the most often used equipments and their recent development; especially understand how to clean and make use of air pollution after special discussion about it. During the course we will emphasize on the principles and characteristics of purifying equipments used in air pollution control.</p> <p>The main object of this course is to help the students major in environmental engineering or related disciplines understand the principles of air pollution control field, which is essential to analyze and solve the real problems involved in the environmental engineering.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction to Air Pollution control 2. Air Pollution Effects 3. Air Pollution Measurements, Emission Estimates 4. Air Pollutant Concentration Models 5. General Ideas in Air Pollution Control 6. Control of Primary Particulates 7. Control of Volatile Organic Compounds (VOCs) 8. Control of Sulfur Oxides and Nitrogen Oxides 9. The Motor vehicle Problem 10. Air Pollutants and Global Climate 		
Teach Method	Lectures will be presented mainly by blackboard, PPT and discussions.		
Test and Examination	<ol style="list-style-type: none"> 1. Report: 50% 2. Presentation: 40% 3. Attendance: 10% 		
Pre-request Course	Knowledge of environmental chemistry		
References	[1] Noel de Nevers, Air Pollution Control Engineering (2 nd edition), Mcgraw-Hill, 1999		

Course Introduction

Code	273411	Teaching Hours	32
Course	Waste Management		
Key Words	Classification, Hazardous wastes, Disposal, Recycle, Life Cycle Assessment		
Purpose and Role of the Course	<p>The field of solid wastes is an important branch of Environmental Science and technology. These years, it is difficult to build the facilities. The lack of disposal capability is an important cause of solid wastes pollution. Accompany with the spreading of “3R” (Reduce, Reuse, Recycle) theory in the world, human beings become to the importance of resources. Therefore, the technology of wastes recycling is an important branch of environment engineering.</p> <p>The main object of this course is to help the students major in environmental engineering or related disciplines understand the principles, the methods and the main equipments used in solid wastes field; grasp the technologies in the world, which is essential to analyze and solve the real problems involved in the environmental engineering.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Solid wastes 2. Current situation and rules for waste treatment 3. Wastes treatment and disposal 4. Wastes pollution control 5. Resource recycling and sustainable development 6. Solid wastes application as resource 7. Wastes recycling technology and principle 8. Evaluation of waste recycling system 		
Teach Method	Lectures will be presented mainly by blackboard, PPT and discussions.		
Test and Examination	<ol style="list-style-type: none"> 1. Report: 50% 2. Presentation: 40% 3. Attendance: 10% 		
Pre-request Course	Knowledge of environmental engineering		
References	<p>[1] Paul T. Williams, Waste Treatment and Disposal, Wiley, 2005</p> <p>[2] EOLLS Texts, Buekens et al., UNESCO</p> <p>[3] Handbook of Pollution Control and Waste Minimization, Abbas Ghassemi, Marcel Dekker</p>		

Course Introduction

Code	273412	Teaching Hours	32
Course	Contaminated Land Remediation		
Key Words	Migration and transportation of contaminants; Bio-remediation; phytoremediation		
Purpose and Role of the Course	<p>During the course, the remediation technologies of contaminated land are introduced. The course is carried out with teaching lectures, essays and discussions. The main topics include migration mechanisms of contaminants in soil, remediation technologies, such as physical, chemical and bio-remediation technologies, and its application.</p> <p>The main object of this course is to learn the basic concepts, methods and applications of land remediation. This course also introduces some novel technologies, let students know the tendency of this field in the world.</p>		
Main Chapters and Teaching Hours	<ol style="list-style-type: none"> 1. Introduction 2. Migration and transportation of contaminants 3. Physical remediation 4. Chemical remediation 5. Bio-remediation 6. Phytoremediation 7. Industrial applications of the remediation technologies 		
Teach Method	Lectures will be presented mainly by blackboard, PPT and discussions.		
Test and Examination	<ol style="list-style-type: none"> 1. Report: 50% 2. Presentation: 40% 3. Attendance: 10% 		
Pre-request Course	Knowledge of environmental chemistry		
References	<p>[1] R. E. Hester, 'Contaminated Land and its Reclamation', University of Birmingham, UK , ISBN 0 85404 230 X , January 1997</p> <p>[2] C. Paul Nathanail, R. Paul Bardos, 'Reclamation of Contaminated Land (Modules in Environmental Science)', Published by Wiley Blackwell, ISBN: 0471985619, April 2004</p> <p>[3]'Stabilisation/Solidification Treatment and Remediation Advances in S/S for Waste and Contaminated Land Proceedings of Th', edited by Abir Al Tabbaa & Julia A Stegemann, Published by Taylor & Francis, ISBN: 041537460X, April 2005.</p>		