# 第一学年

## 第1学期

### 初级汉语口语(2-1)

**Course Syllabus**

**Primary Oral Chinese2-1(Course Code 2091199)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 4 | Toal Course Hours | 64 |
| Lecture Hours | 64 | Experiment Hours |  |
| Programming Hours |  | Other Practical Hours |  |
| Course Instructors: | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Elementary Spoken Chinese I for non-native speakers of Chinese who wish to develop their communicative skills and cultivate their thinking in Chinese. The course provides various opportunities for students to get involved in different occasions in daily life; thus making it possible for students to master basic vocabulary, special expressions and idioms，and communicate accurately and fluently in Chinese .

**2. Course Content**

|  |  |
| --- | --- |
| **Course content** | **Specific learning objectives** |
| Chapter 1 – Chapter 2 Pinyin | A preliminary understanding of Pinyin and pronunciation, master initials and finals. |
| Chapter 3 Tones, Modified tone, Rhotic accent | Master the tones, light tones, Rhotic accent |
| Chapter 4 What’s your name? | Learn to introduce oneself briefly |
| Chapter 5 Which class are you in? | Introduce oneself in real communication  Master interrogative questions and can skillfully use them in daily life. |
| Chapter 6 what time is it now? | Asking about time. |
| Chapter 7 where is the canteen? | Able to answer and ask questions fluently using location words. |
| Chapter 8 How much is it in all? | Be able to use common shopping expressions to answer and ask questions fluently. |
| Comprehensive oral practice |  |
| Chapter 9 What do you want to do? | To commuicate by phone |
| Chapter 10 She is sick. | Master body parts noun; Learn to ask for leave. |
| Task-based classroom teaching. | Master the expression of color. |
| Chapter 11 I like drinking tea. | Express what you like. |
| Chapter 12 What are you doing? | Use the continuous tense. |
| Grammar - Chinese word order  Grammar - sentence composition | Master Chinese word order; Sentence composition; Learn to say sentences in accordance with the rules of Chinese word order. |

**3. Course Material**

Required Text:

1. Guifu Dai et al. Elementary spoken Chinese (3rd edition) [M]. Peking University press, 2016.

Required Reading:

1. Youmei Ren. Deru Meng.Global Chinese [M]. Beijing: Chinese teaching press, 2012.
2. Liping Jiang. HSK standard course [M]. Beijing: Beijing language and culture university publishing house, 2014.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (40%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Final-term exam (60%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

Other Items: other factors, such as class and group participation and puncture, regular attdendance may be used, at the professor’s discretion, to make adjustments to final grades in borderline cases. The instructor will assume that you are well prepared for class each week.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 工程制图

**Course Syllabus**

**Course Name (**0434199**)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 4 | Toal Course Hours | 64+64 |
| Lecture Hours | 64 | Experiment Hours |  |
| Programming Hours |  | Other Practical Hours | 64 |
| Course Instructors: Zhao Junyou | | | |
| Course Website: http://learn.upc.edu.cn/meol/jpk/course/layout/newpage/index.jsp?courseId=11858 | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students will have gained and understanding of engineering drawing knowledge. Specific learning objectives are:

**The Object of the Course**

This course is a practical technology foundation course, mainly studies the principle and method of drawing and reading engineering drawing, develop students’ drawing and reading skills, enhance their space imagination ability and innovation consciousness. Build a good foundation for learning the follow-up courses and graduation design.

**Basic requirement**

This course is built on the knowledge of solid geometry and analytic geometry curriculum.

Space analysis and thinking method must be [caught](http://baike.baidu.com/item/caught) in the learning, the characteristics of the content must be good at summarizing, basic drawing method and rule must be mastered. In the learning process, pay attention to paint, read and think more practice process, must complete the assignment seriously and on time.

After learning this course, one should be able to achieve the following requirements:

(1) To master the basic methods of projection, Familiar with the conversion process from object to figure drawing;

(2) To master the basic skills of reading, Familiar with the conversion process from object to figure reading;

(3) Reading related professional engineering drawing, building a good foundation for learning the follow-up courses;

(4) Through the image thinking and spatial imagination, enhance the comprehensive ability, improve the innovation consciousness.

**2. Course Content**

total hours：64hr.

|  |  |  |
| --- | --- | --- |
| No. | Teaching Schedule AND contents | Lecture hours |
| 1 | 1.1 introduction to the course  1.2 basic concepts of the projection  1.3 projection of a point | 2 |
| 2 | 2.1 projection of lines  （relationship of two lines）  2.2 projection of a plane  （pointes and lines on a plane） | 2 |
| 3 | 3.1 basic solids（polyhedral）  3.2 prism: projection, points on surface, cut by planes, intersection of two prisms  3.3 pyramids: projection, points on surface, cut by planes | 2 |
| 4 | 4.1 Solid with curved surface  4.2 cylinder and the points on surface  4.3 cone and the points on surface  4.4 sphere and the points on surface  4.5 cylinder cut by planes | 2 |
| 5 | 5.1 cone cut by planes; sphere cut by planes | 2 |
| 6 | 6.1 intersection of two cylinders | 2 |
| 7 | Problem solving class | 2 |
| 8 | 1. Drafting standards & Geometric construction | 2 |
| 9 | 9.1 shape analysis for the composite solid  9.2 three views  9.3 making the three views | 2 |
| 10 | Drawing of wooden model | 2 |
| 11 | 11 Axonometric Projection  11.1 Isometric  11.2 Cabinet | 2 |
| 12 | Reading drawings-1 | 2 |
| 13 | Reading drawings-2 | 2 |
| 14 | Dimensioning of composite solids | 2 |
| 15 | 15.1 Representation Of Drawings  15.2 Sectional Views  15.3 Full Sectional Views | 2 |
| 16 | 16.1 Half Sectional Views  16.2 Local Sectional Views | 2 |
| 17 | 17.1 Cross Sections  17.2 Removed And Revolved Cross-Sections  17.3 Other Representations | 2 |
| 18 | Application Of The Methods | 2 |
| 19 | Problem solving class | 2 |
| 20 | Threads (Conventional Representation Of Threads, Designation) | 2 |
| 21 | Fasteners; key joints; pin joints; gears | 2 |
| 22 | 22.1 Contents of the Detail drawings  22.2 selection of views and dimensioning: | 2 |
| 23 | Shaft-sleeve group/ disk-cover group  Surface Quality Ra  Measuring And Drawing Of a Part | 2 |
| 24 | 24.1 selection of views and dimensioning:  fork-frame group , Case-housing group  24.2 size tolerances and geometric tolerances | 2 |
| 25 | Reading detail drawings-1 | 2 |
| 26 | Reading detail drawings-2 | 2 |
| 27 | Contents of assembly drawings  special conventions in assembly drawings | 2 |
| 28 | dimensioning and item numbers on assembly | 2 |
| 29 | Construction Of a Assembly Drawings | 2 |
| 30 | Reading Assembly Drawings-1 | 2 |
| 31 | Reading Assembly Drawings-2 | 2 |
| 32 | Conclusions Of The Course | 2 |
| Total | | 64 |

**3. Course Material**

Required Text:

1. 《ENGINEERING GRAPHICS》, JUNYOU ZHAO , ISBN 978-7-5636-4407-0, CHINA UNIVERSITY OF PETROLEUM PRESS,2014.9
2. 《PROBLEM BOOK FOR ENGINEERING DRAWING》 JUNYOU ZHAO, 2018.9

Required Reading:

1. 《ENGINEERING DRAWING》 A. W. BOUNDY, ISBN 0 07 471043 5(set), KYODO PRINTING CO. (SINGAPORE) PTE LTD, 2004.
2. 《ENGINEERING GRAPHICS》 LIN HU, 978-7-111-17142-3,CHINA MACHINE PRESS, 2009.8

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, in-class activities and quizzes (10%): This component of the final grade is based upon your contribution to the class in the form of attendance, class activities and quizzes. Any number of unannounced quizzes may be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

homework assignments(20%), This component of the final grade is based upon your contribution to the class in the form of homework assignments, students must complete all the homework assignments qualified in time.

Stuty online(10%): This component is based on your study online times and answer neccesary quizzes.

Final-term exam (60%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 高等数学(2-1)

**Course Syllabus**

**Calculus (**0911199**)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 11 | Toal Course Hours | 176 |
| Lecture Hours | 176 | Experiment Hours | 0 |
| Programming Hours | 0 | Other Practical Hours | 0 |
| Course Instructors: Ji Fenghui | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students will have the understanding of the theory and application of single variable calculus and multiple variable calculus. Especilly students will

1. Be practiced in the fundamental concepts including limit, derivative and integral;
2. Understand the mean value theorem and their applications;
3. Be practiced in the fundamental theorem of calculus
4. Be practiced in the tests on convergence or divergence of infinite series;
5. Be practiced in power series expansion;
6. Understand curves and surfaces in 3-space together with their equations.
7. Understand multiple integral in different coordinate systems;
8. Understand the classification of multiple integrals and relationships among them.
9. Understand the solutions of ODEs in general and be practiced in sevral cases including separable variable ODEs and linear ODEs.
10. In General, be able to convert the practical problems into the problems in calculus

**2. Course Content**

Calculus is course for postgraduate students majoring in science, engineering, management, economics and so on. The course includes the following contents: single variable differential calculus, [single](app:ds:single) [variable](app:ds:variable) [integral](app:ds:integral) [calculus](app:ds:calculus), vector algebra, coordinate geometry, multivariate function differential calculus, multivariate function integral calculus, infinite series, differential equation and its applications

Chapter 1 Functions, Limits, Continuity

* 1. Functions and elementary property
  2. Limits of Sequences
  3. Limits of Functions
  4. Infinitesimal and infinity
  5. Infinitesimal and infinity
  6. Continuity of Functions
  7. Properties of continuous functions on closed intervals

Chapter 2 Derivatives and Differentials of one - variable functions

2.1 Concepts of Derivatives

2.2 Rules for Funding Derivatives

* 1. Higher-Order Derivatives
  2. Rules of Funding Derivatives of several special functions
  3. Differentials of Functions and Approximations

Chapter 3 Mean Value Theorem for Derivatives and Applications of the Derivatives

3.1 Mean Value Theorem for Derivatives

* 1. L’Hospital’s rule
  2. Taylor’s Theorem and Higher-Order Polynomial Approximation of Functions
  3. Monotonicity and concavity of Functions
  4. Extreme of Functions and the Rules of Finding Maxima and Minima
  5. Arc Differentials, Curvature, Function Graphing

Chapter 4 Indefinite Integral

4.1 The Concepts and Properties of Indefinite Integral

4.2 Method of Integration by substitution

* 1. Integrations by parts

4.4 Integration of several special functions

Chapter 5 Definite Integral and its Applications

* 1. Definition and properties of definite integrals
  2. The Newton-Leibniz formula

5.3 The Calculation of Definite Integral

* 1. Improper Integrals
  2. Applications of Definite Integrals in geometry
  3. Applications of Definite Integrals in Physics

Chapter 6 Differential and Difference Equations

* 1. Conception of Differential Equations
  2. First Order Linear Differential Equations
  3. Second Order Differential Equations by degradation
  4. Second Order Linear Differential Equations
  5. Applications of Differential Equations
  6. Simple Difference Equations and their Applications

Chapter 7 Vector Algebra and Space Analytic Geometry

* 1. Three Dimensional Rectangular Coordinate System
  2. Vectors and Linear Operations
  3. Scalar Product of the Vectors
  4. Vector Product of the Vectors
  5. Surfaces and Equations
  6. Space Curve and Equations
  7. Planes and Equations
  8. Space Line and its Equation
  9. Quadratic Surfaces

Chapter 8 Derivatives for Functions of Two or More Variables

* 1. Limits and Continuity of Multivariable Functions
  2. Partial Derivatives
  3. Total Differentiability
  4. Differentiability of Multivariable Component Functions
  5. Implicit Differentiation
  6. Applications of Differentiability of Multivariable Functions in geometry
  7. Directional Derivatives and Gradients
  8. Maxima and Minima of Multivariable Functions

Chapter 9 Multiple Integrals

* 1. Concepts and Properties of Double Integrals
  2. Double Integrals over Rectangle Coordinate System
  3. Double Integrals in Polar Coordinates
  4. Concepts and Properties of Triple Integrals
  5. Line Integrals with respect to Arc Length
  6. The First Class of Surface Integrals
  7. Applications of Multiple Integrals

Chapter 10 Vector Calculus

10.1 Concepts and Properties of Vector Functions

* 1. Concepts and Calculation of the second class of Linear Integrals
  2. Green’s Theorem and its Application
  3. Concepts and Calculation of the second class of Surface Integrals
  4. Gauss’s Divergence Theorem and Stokes’s Theorem
  5. Introduction to the Vector Field

Chapter 11 Infinite Series

* 1. Concepts and Properties of Infinite Series
  2. Convergence Tests of Infinite Series
  3. Power Series
  4. Power Series Expansion of Functions
  5. Fourier Series
  6. Sine Series and Cosine Series

Chapter 12 Ordinary Differential Equations (Continued)

* 1. Exact Differential Equations and Integrating Factor
  2. Higher-Order Linear Differential Equations and the power series method
  3. Higher-Order Linear Differential Equations with constant coefficients and Euler’s method
  4. System of Differential Equations

**3. Course Material**

Required Text:

Calculus, Dale Varberg eta, Edwin J. Purcell, Steven E. Rigdonm, ISBN：9787111275985机械工业出版社，2009.8.

Required Reading

1. Advanced Mathematics (Fifth Edition)(I, II), Department of Mathematics of Tongji University, ISBN：9787040396638, Higher Education Press, 2002.
2. Thomas‘ Calculus, Finney Weir Giordano, ISBN：9787040144246, Higher Education Press, 2004.7.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (20%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Middle-term exam (20%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

Final-term exam (60%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 程序设计

**Course Syllabus**

**The High-Level Programming Language (0711299)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 3 | Toal Course Hours | 48 |
| Lecture Hours | 32 | Experiment Hours | / |
| Programming Hours | 16 | Other Practical Hours | / |
| Course Instructors: Li Zongmin | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students should be able to:

(1). Master the basic control structure and the basic control sentence of grammar and related norms, with skilled use of language to C sequence, selection and design procedures for the circulation of capacity.

(2).Understand the environment and on the machine, a skilled programming on the machine and the ability to debug procedures.

(3). Master some common algorithms, such as recursive, method, exhaustive, for the most minimum, sort, find, insert, delete and so on, with skilled use of these algorithms ability to solve practical problems .

(4).Understand the structure of the program design and modular design of the basic idea, the necessary programming skills, testing and commissioning procedures skills.

**2. Course Description and Course Content**

**2.1 Course Descripion**

C Programming Language course is a technology basic course to train students the programming design capability. This course mainly introduces the grammar C language, the statement, the control structure and programming design methods. At last, make students be able to use C Language to solve the practice problems.

**2.2 Course Content**

Chapter 1. Overview of C

Chapter 2. Constants, Variables, and Data Types

Chapter 3. Operators and Expressions

Chapter 4. Managing Input and Output Operations

Chapter 5. Decision Making and Branching

Chapter 6. Decision Making and Looping

Chapter 7. Arrays

Chapter 8. Character Arrays and Strings

Chapter 9. User-defined Functions

Chapter 10. Structures and Unions

Chapter 11. Pointers

Chapter 12. File Management in C

Chapter 13. Dynamic Memory Allocation and Linked Lists

Chapter 14. The Preprocessor

Chapter 15. Developing a C Program: Some Guidelines

Appendix I: Bit-level Programming

Appendix II: ASCII Values of Characters

Appendix III: ANSI C Library Functions

Appendix IV: Projects

Appendix V: C99 Features

Bibliography

Index

**3. Course Material**

**Required Text:**

**Required Reading**

1. **Programming in ANSI C**, E Balagurusamy, ISBN: 1259004619, 清华大学出版社，2012
2. The C Programming Language, Brian W. Kernighan / Dennis M. Ritchi, ISBN: 9787111128069, 机械工业出版社, 2004
3. C Programming Language，[Brian W Kernighan](https://book.jd.com/writer/Brian%20W%20Kernighan_1.html), ISBN: 9780131103627, [Prentice Hall, 2 edition](https://book.jd.com/publish/Prentice%20Hall,%202%20edition_1.html), 2001

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (30%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the current class period.

Projects (20%): This component of the final grade is based upon one programming project. Finish the programming tasks, give the score according to the quality of source code and the degree of finishing task.

Final-term exam (50%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview, sickness or visa issue) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

## 第2学期

### 大学计算机

**Course Syllabus**

**The Computer Information (0711399)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 1 | Toal Course Hours | 24 |
| Lecture Hours | 24 | Experiment Hours | / |
| Programming Hours |  | Other Practical Hours | / |
| Course Instructors: Li Zongmin | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

By attending the course, the students can understand the basic concepts and methods in computer science, master the ability of using the computer, and hold computational thinking and information literacy in certain degree. These will be a basis of the further courses involving computer sciences. Specifically, it includes the following three aspects:

(1) cognitively understanding computing systems and methods;

(2) solving and analyzing real-life problems by computer technologies;

(3) correctly catching, evaluating and applying information literacy.

**2. Course Description and Course Content**

**2.1 Course Descripion**

《The Computer Information》is a fundamental course for Non-computer major students of the university, focusing on providing knowledge of computers, capability and quality educations. It is a compulsory course in general education, and can involve both theoretical thinking and practical skills. 《The Computer Information》will apply the so called CDIO teaching idea, which will teach the data abstracting method, data processing, scientific methods and data display capability around scientific computation. It is requested the students to not only master the newly developed and life related technologies in current information society, as well as the basic way of scientific computation. The students need not only get the abilities of Conceive and Design, but also enhancing the Implement and Operate. The objective of the course is make the students to understand the basic concepts and methods in computer science, master the ability of using the computer, and hold computational thinking and information literacy in certain degree. These will be a basis of the further courses involving computer sciences.

**2.2 Course Content**

Chapter 1. An Introduction

Key Points: three kinds of thinking associated with three subjects in science; concepts and foundations of computational thinking

Section 1.1. Overview of computer system

The development, classification and application of computer.

Section 1.2. Data representation

The thinking style of binary system; The arithmetic operation of binary system; How to transform from binary system and other systems.

Section 1.3. Turing machine and von Neumann architecture

The basic theory of Turing machine; The basic architecture and working theory of von Neumann computer

Section 1.4. Science and Computational Science

Main contents: relationship among computational, scientific and experimental science, and three kinds of science correspond to the three kinds of thinking

Section 1.5. Computational Thinking

Main contents: definition, characteristics, essence of computational thinking

Section 1.6. The future of computer

High performance computing, pervasive computing, cloud computing, intelligent computing, biocomputing, and so on.

Chapter 2. Data Acquisition

Key Points: the use of web crawler, construction of word vector

Section 2.1. Representation of data

Section 2.2. Data acquisition from public platform

Main contents: How to extract data from public platform with account or public API

Section 2.3. Constructing word vector from text

Main contents: How to separate words from a bundle of text, and how to use these data correctly

Section 2.4. Data acquisition by web crawler

Main contents: How to get web page from Web with crawler; How to extract data from web page; How to login a system with an account with programming

Section 2.5. Data loading and storing

Main contents: handling of txt, excel and json files

Chapter 3. Foundation of Big Data

Key Points: matrix operation

Section 3.1. Representation of scientific data

Main contents: Basic representation of vector and matrix

Section 3.2. Matrix operation

Main contents: Basic operation with matrix, including select, [concatenate](file:///D:\Program%20Files\Youdao\Dict\7.2.0.0703\resultui\dict\?keyword=concatenate) and so on.

Section 3.3. Data broadcasting

Main contents: How to handle data with different dimension

Chapter 4. Big Data Processing

Key Points: basic operation of big data

Section 4.1. Basic features of big data

Section 4.2. Data collection and statistics

Main contents: How to handle data with basic statistical approach, such as count, sum.

Section 4.3. Data cleaning and transformation

Main contents: How to remove invalid data and how to transform data to a valid datatype.

Section 4.4. Data consolidation and remodeling

Main contents: How to concatenate and join the different data together.

Section 4.5. Data aggregation and grouping

Main contents: How to group data with different features.

Chapter 5. Machine Learning

Key Points: basic methods in machine learning

Section 5.1. Unsupervised Learning Method

Main contents: How to separate unlabeled data; Classification and application of k- nearest neighbor algorithm

Section 5.2. Dimension reduction method

Main contents: How to reduce the dimension of data; PCA dimension reduction method and its application

Section 5.3. Support vector machine

Main contents: The basic theory of support vector machine(SVM); How to classify data with SVM.

Section 5.4. Deep learning

The development and application of deep learning

Chapter 6. Data Display

Key Points: advanced graphics rendering and image processing

Section 6.1. Basic figures

Main contents: histogram, scatter plot, broken line graph, pie chart and radar map rendering

Section 6.2. setting of figures

Main contents: Adding title, axis label, scale and legend

Section 6.3. Advanced figures

Main contents: hot spots, force-directed diagram, 3-D visualization

Section 6.4. Image processing

Main contents: Image rendering, cutting, scaling, grayscale and format conversion

**3. Course Material**

**Required Text:**

**Required Reading**

(1). Teaching material will be written by ourselves.

(2). Chao lemen , Data Science, Tsinghua University Press, 2016.8

(3). Ruoyu Zhang et al, Python Scientific Computation, Tsinghua University Press, 2016. 4

(4). Peter Harrington, Machine Learning in action, People's Posts and Telecommunications Press, 2015.11

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (30%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the current class period.

Projects (20%): This component of the final grade is based upon one programming project. Finish the programming tasks, give the score according to the quality of source code and the degree of finishing task.

Final-term exam (50%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview, sickness or visa issue) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 高等数学（2-2）

**Course Syllabus**

**Calculus (**0911199**)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 11 | Toal Course Hours | 176 |
| Lecture Hours | 176 | Experiment Hours | 0 |
| Programming Hours | 0 | Other Practical Hours | 0 |
| Course Instructors: Ji Fenghui | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students will have the understanding of the theory and application of single variable calculus and multiple variable calculus. Especilly students will

1. Be practiced in the fundamental concepts including limit, derivative and integral;
2. Understand the mean value theorem and their applications;
3. Be practiced in the fundamental theorem of calculus
4. Be practiced in the tests on convergence or divergence of infinite series;
5. Be practiced in power series expansion;
6. Understand curves and surfaces in 3-space together with their equations.
7. Understand multiple integral in different coordinate systems;
8. Understand the classification of multiple integrals and relationships among them.
9. Understand the solutions of ODEs in general and be practiced in sevral cases including separable variable ODEs and linear ODEs.
10. In General, be able to convert the practical problems into the problems in calculus

**2. Course Content**

Calculus is course for postgraduate students majoring in science, engineering, management, economics and so on. The course includes the following contents: single variable differential calculus, [single](app:ds:single) [variable](app:ds:variable) [integral](app:ds:integral) [calculus](app:ds:calculus), vector algebra, coordinate geometry, multivariate function differential calculus, multivariate function integral calculus, infinite series, differential equation and its applications

Chapter 1 Functions, Limits, Continuity

* 1. Functions and elementary property
  2. Limits of Sequences
  3. Limits of Functions
  4. Infinitesimal and infinity
  5. Infinitesimal and infinity
  6. Continuity of Functions
  7. Properties of continuous functions on closed intervals

Chapter 2 Derivatives and Differentials of one - variable functions

2.1 Concepts of Derivatives

2.2 Rules for Funding Derivatives

* 1. Higher-Order Derivatives
  2. Rules of Funding Derivatives of several special functions
  3. Differentials of Functions and Approximations

Chapter 3 Mean Value Theorem for Derivatives and Applications of the Derivatives

3.1 Mean Value Theorem for Derivatives

* 1. L’Hospital’s rule
  2. Taylor’s Theorem and Higher-Order Polynomial Approximation of Functions
  3. Monotonicity and concavity of Functions
  4. Extreme of Functions and the Rules of Finding Maxima and Minima
  5. Arc Differentials, Curvature, Function Graphing

Chapter 4 Indefinite Integral

4.1 The Concepts and Properties of Indefinite Integral

4.2 Method of Integration by substitution

* 1. Integrations by parts

4.4 Integration of several special functions

Chapter 5 Definite Integral and its Applications

* 1. Definition and properties of definite integrals
  2. The Newton-Leibniz formula

5.3 The Calculation of Definite Integral

* 1. Improper Integrals
  2. Applications of Definite Integrals in geometry
  3. Applications of Definite Integrals in Physics

Chapter 6 Differential and Difference Equations

* 1. Conception of Differential Equations
  2. First Order Linear Differential Equations
  3. Second Order Differential Equations by degradation
  4. Second Order Linear Differential Equations
  5. Applications of Differential Equations
  6. Simple Difference Equations and their Applications

Chapter 7 Vector Algebra and Space Analytic Geometry

* 1. Three Dimensional Rectangular Coordinate System
  2. Vectors and Linear Operations
  3. Scalar Product of the Vectors
  4. Vector Product of the Vectors
  5. Surfaces and Equations
  6. Space Curve and Equations
  7. Planes and Equations
  8. Space Line and its Equation
  9. Quadratic Surfaces

Chapter 8 Derivatives for Functions of Two or More Variables

* 1. Limits and Continuity of Multivariable Functions
  2. Partial Derivatives
  3. Total Differentiability
  4. Differentiability of Multivariable Component Functions
  5. Implicit Differentiation
  6. Applications of Differentiability of Multivariable Functions in geometry
  7. Directional Derivatives and Gradients
  8. Maxima and Minima of Multivariable Functions

Chapter 9 Multiple Integrals

* 1. Concepts and Properties of Double Integrals
  2. Double Integrals over Rectangle Coordinate System
  3. Double Integrals in Polar Coordinates
  4. Concepts and Properties of Triple Integrals
  5. Line Integrals with respect to Arc Length
  6. The First Class of Surface Integrals
  7. Applications of Multiple Integrals

Chapter 10 Vector Calculus

10.1 Concepts and Properties of Vector Functions

* 1. Concepts and Calculation of the second class of Linear Integrals
  2. Green’s Theorem and its Application
  3. Concepts and Calculation of the second class of Surface Integrals
  4. Gauss’s Divergence Theorem and Stokes’s Theorem
  5. Introduction to the Vector Field

Chapter 11 Infinite Series

* 1. Concepts and Properties of Infinite Series
  2. Convergence Tests of Infinite Series
  3. Power Series
  4. Power Series Expansion of Functions
  5. Fourier Series
  6. Sine Series and Cosine Series

Chapter 12 Ordinary Differential Equations (Continued)

* 1. Exact Differential Equations and Integrating Factor
  2. Higher-Order Linear Differential Equations and the power series method
  3. Higher-Order Linear Differential Equations with constant coefficients and Euler’s method
  4. System of Differential Equations

**3. Course Material**

Required Text:

Calculus, Dale Varberg eta, Edwin J. Purcell, Steven E. Rigdonm, ISBN：9787111275985机械工业出版社，2009.8.

Required Reading

1. Advanced Mathematics (Fifth Edition)(I, II), Department of Mathematics of Tongji University, ISBN：9787040396638, Higher Education Press, 2002.
2. Thomas‘ Calculus, Finney Weir Giordano, ISBN：9787040144246, Higher Education Press, 2004.7.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (20%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Middle-term exam (20%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

Final-term exam (60%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 大学物理(2-1)

**Course Syllabus**

**University Physics (0931199)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 4 | Toal Course Hours | 64 |
| Lecture Hours | 64 | Experiment Hours | / |
| Programming Hours | / | Other Practical Hours | / |
| Course Instructors: Dongpeng, Yanjie Tian | | | |
| Course Website: http://tcpe.upc.edu.cn:8085/ | | | |

**1. Objectives and Learning Outcomes**

This course is designed for the postgraduate students of various engineering majors. Based on the math fundation of advanced mathematics, this course introduces basic concepts, theorems and laws of classical physics and modern physics, as well as the methods of studying physics problems. Frontier progress of different fields of physics will also be introduced in this course in order to attract students by fostering their interests in physics. This course aims to improve student's ability of thinking and spirits of innovation.

Upon sucessful completion of the course, students should:

(1) understand the concepts of kinematics and be able to describe motions by using the concepts;

(2) understand the Newton’s three laws and be able to apply them to analyze motions under the action of different forces;

(3) understand the concepts of work, kinetic energy and potential energy and be able to apply the CWE theorem, work-energy principle and law of conservation of mechanical energy to solve dynamics problems;

(4) understand the concepts of momentum and impluse and be able apply impluse-momentum theorem to solve dynamics problems;

(5) understand the parameters describing oscillations and waves, be able to analyze the simple harmonic motion and sinusoidal waves, grasp the features of energy of waves, and understand the applications of waves such as Doppler effect and shock wave;

(6) understand the concepts of thermdynamics and be able to apply the 1st and 2nd law of thermodynamics to analyze different thermodynamics problems of gases.

**2. Course Content**

**Preludes**

**Chapter 1 Physics and Fundamental knowledge for learning physics**

Emphasis and Difficulties: Unit Conversions; Dimensional Analysis; Significant Figures

1.1 What’s physics?

1.2 How physics is developed?

1.3 Fundamental knowledge for learning physics

1.3.1 Measurement Standards and Units

1.3.2 Units of Convenience and Unit Conversions

1.3.3 Dimensional Analysis

1.3.4 Estimates and Orders of Magnitude

1.3.5 Accuracy and Significant Figures

**Chapter 2 An Introduction to Vector Analysis and Calculus**

Emphasis and Difficulties: Vector Addition and Subtraction; Scalar Product and Vector Product of Two Vectors; Mathematical operation of Vectors in Cartesian Form

2.1 Scalar and Vector Quantities

2.2 Mathematics of vectors

2.2.1Multiplication of a Vector by a Scalar

2.2.2 Vector Addition and Subtraction

2.2.3 Scalar Product and Vector Product of Two Vectors

2.3 Expression of vectors and their mathematical operation in Cartesian form

2.4 Variation of a vector

2.5 Vector calculus

**Kinematics**

**Chapter 3 Rectilinear Motion**

Emphasis and Difficulties: Displacement and Distance; Velocity and Speed; Acceleration; Motion of Freely Falling Objects

3.1 Position Vector, Displacement and Distance

3.2 Velocity and Speed

3.3 Acceleration

3.4 Rectilinear Motion with a Constant Acceleration

3.5 Freely Falling Motion

**Chapter 4 Motion in Two or Three Dimension**s

Emphasis and Difficulties: Projetile Motion; Circle Motion; Relative Velocity

4.1 Postion and Velocity Vectors

4.2 The Acceleration Vector

4.3 Projetile Motion

4.4 Circle Motion

4.5 Relative Velocity

**Dynamics**

**Chapter 5 Newton’s Laws of Motion**

Emphasis and Difficulties: Newton’s three laws and their application

5.1 Newton’s Laws

5.2 Forces in Nature

5.3 Applications of Newton’s Laws

5.3.1 Free-Body Diagrams

5.3.2 Application of Newton’s First Law: Particles in Equilibrium

5.3.3 Application of Newton’s Second Law: Dynamics of Particles

5.3.4 Dynamics of Circular Motion

5.4 Inertia Reference Frame and Noninertial Reference Frame

**Chapter 6 Work, Energy and the CWE Theorem**

Emphasis and Difficulties: Concepts of Work and Energy, the CWE Theorem

6.1 Work and Power

6.2 Conservative and Nonconservative Forces, Potential Energy

6.3 Kinetic Energy and the CWE Theorem

6.4 Work-Energy Principle, the Law of Conservation of Mechanical Energy

**Chapter 7 Momentum, Impulse, and Collisions**

Emphasis and Difficulties: Impulse-Momentum Theorem, Conservation of Momentum, Collision

7.1 Momentum, Impluse, and Impulse-Momentum Theorem

7.2 Conservation of Momentum

7.3 Collision

7.4 Rocket Motion

**Oscillation and Waves**

**Chapter 8 Oscillation**

Emphasis and Difficulties: Simple Harmonic Oscillation, Simple Pendulum, Resonace

8.1 Simple Harmonic Oscillation

8.2 A Vertically Oriented Spring

8.3 How to Determine If An Oscillation Motion is Simple Harmonic Oscillation

8.4 Simple Pendulum

8.5 Dampled Oscillation

8.6 Forced Oscillation and Resonace

**CHAPTER 9 Waves**

Emphasis and Difficulties: Definition of Waves, Description of a Wave, Wave Superposition and Interference, Doppler Effect, Shock Wave

9.1 Types of Mechanical Waves

9.2 Wave Equation and Speed of Waves

9.3 Description of a Wave

9.4 Energy and Power in Waves

9.5 Wave Superposition and Interference

9.6 Standing Waves

9.7 Applications of Mechanical Waves

9.7.1 Doppler Effect

9.7.2 Shock Waves

**Thermodynamics**

**Chapter 10 Thermal Properties of Matter** Emphasis and Difficulties: Concepts of Thermal Systems, Phases of Matter, Equation of State of Gases

10.1 Temperature and Thermal Equilibrium

10.1.1 Basic Concepts of Thermal Systems

10.1.2 Zeroth Law of Thermodynamics

10.1.3 Thermal Contact

10.1.4 Thermometers and Temperature Scales

10.2 Thermal Expansion

10.3 Phases of Matter

10.3 Equation of State of Gases

**Chapter 11 The First Law of Thermodynamics**

Emphasis and Difficulties: Work Done During Volume Changes, The First Law of Thermodynamics

11.1 Thermodymanic Systems

11.2 Work Done During Volume Changes

11.3 Paths Between Thermodynamic States

11.4 Kinds of Thermodynamics Processes

11.5 Internal Energy and The First Law of Thermodynamics

**Chapter 12 The Second Law of Thermodynamics**

Emphasis and Difficulties: Internal-Combustion Engines, The Second Law of Thermodynamics, Carnot Cycle, Entropy

12.1 Directions of Thermodynamic Processes

12.2 Heat Engines

12.3 Internal-Combustion Engines

12.4 The Second Law of Thermodynamics

12.5 Carnot Cycle

12.6 Entropy

**3. Course Material**

Required Text:

1. University Physics (Note Book) by Tian Yanjie and Dong Peng
2. University Physics , Ronald Lane Reese, ISBN:0-534-24655-9, China Machine Press, 2002

Required Reading

1. Fundamentals of Physics, Halliday, 10th Edition.
2. University Physics, Hugh D. Young, 13th Edition.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (20%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes will be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Middle-term exam (20%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

Final-term exam (60%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time. Students being absent for more than 10 times will be disqualified from final exam.

Assignments: In both the professional and academic world, you must meet the deadlines.

### 大学物理实验(2-1)

**Course Syllabus**

**Physics experiment (0941199/0941299)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | **2** | Toal Course Hours | 48 |
| Lecture Hours | 4 | Experiment Hours | 44 |
| Programming Hours | / | Other Practical Hours | / |
| Course Instructors: Center of physics experiment | | | |
| Course Website: http://tcpe.upc.edu.cn/LearningWeb/ | | | |

**1. Objectives and Learning Outcomes**

Upon successful completion of the course, students should be able to:

1) Study knowledge of physics experiment, experiment method and experimental skills；

2) Understand the basic ways and the main process of scientific experiment；

3) Be engaged in the basic training of scientific experiment, cultivate the science spirit, improve the quality of scientific experiments, lay a good experimental foundation for the follow-up courses and the future work;

4) Cultivate and improve the ability of scientific experiment and the quality of engaged in scientific experiment;

5) Cultivate their innovative spirit and ability, specific should achieve the following basic requirements.

**2. Course Description and Course Content**

**2.1 Course Descripion**

After students entering the university, college physics experiment is a beginning of students studying systemically experimental methods and experimental skills training, is the important foundation of students accepting scientific experiment training.

1) Introduce the history of physics experiment and application model of physical experiment in engineering and technology appropriately, make the students understand the importance of scientific experiments, clear position, function and task of experiment class. Make students form good experimental habits, cherish the public property, abide by the safety regime, establish a good study style.

2) Make the students master the basis theory of error and uncertainty, own certain ability of processing data including: the basic concept of measurement, error and uncertainty; the evaluation of directly measuring results; uncertainty propagation of indirect measurement; The list and drawing of process etc.

3) Based on observing the experimental phenomenon, make the students master further the basic knowledge of the physics experiment, basic methods and basic skills, deepen the understanding of physics principle. Focus on cultivating the students' ability of scientific experiments, including self-study ability, hands-on practice ability, thinking judgment ability, writing ability, simple design ability, innovation ability etc., improve the quality of the students to engage in scientific experiments. By setting up a certain number of modern physics, applied and comprehensive experiments, causes the student to understand modern physics concepts, understand the physics experiment technology, improve the ability of comprehensive experiment.

**2.2 Course Content**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Serial Number | Experiment Title | Content | Number one group | Class hours | Class Type | Remarks |
| 1 | Primary knowledge of experiment | The essential procedure and requirement of Physics experiment . The basic concept about measurement ,error, uncertainty, significant digit ；Uncertainty assessment of direct and indirect measurement’s result；tabulation method、graphing method;data processed by computer；the method of building experience formulas；Basic measuring methods in physics experiment. | Two classes | 4 | Theory Course |  |
| 2 | The measuremet of the specific rotation and concentration of liquid | To understand the basic concept,the produce and test methods of polarized light. To make out of the material optical properties and to master the principel and the method for measuring the rotation rate of the liquid. To understand the principle of polarimeter and measure the concentration of a optical solution by using the polarimeter. | 5 Groups | 3 | Basic |  |
| 3 | Magnetic field distribution measurement of carrying-current circular coil and Helmholtz coil | Understand the basic principle of hall effect, to master the principle and method of using hall effect to measure the magnetic induction intensity of carrying-current circular coil and Helmholtz coil. Validating the principle of magnetic field superposition.learn about the magnetic field distribution rule on the axis of coils. | 5 Groups | 3 | Basic |  |
| 4 | The liquid surface tension coefficient measurement | To study the principle and method of measuring tiny force by using the interface tensiometer. To measure of the surface tension of the liquid. | 5 Groups | 3 | Basic |  |
| 5 | Frank-Hertz Experiment | Measure the first excited potential of argon atom, to prove the existence of atomic energy level, and deepen the comprehension to quantization concepts. Deepen the comprehension to thermal electron emission. Learn the design methods of combining the micro process of electron-atom collision with macroscopic quantities. Know how to measure very weak current. | 5 Groups | 3 | Basic |  |
| 6 | Measuring Planck's Constant via Photoelectric Effect | Know the basic experimental method to verify Einstein's photoelectric equation. Study the basic experimental technology of obtaining monochromatic light, measuring Planck's constant etc. | 5 Groups | 3 | Basic |  |
| 7 | Millikan’s Oil Drop | Studying the design idea of measuring electron charge ，learning about the motion of electrons in gravity and electric field，determining the electron charge. | 5 Groups | 3 | Basic |  |
| 8 | Resistance  Measurement by Voltammetry | Designing experimental program based on the given apparatus, measuring the resistance by voltammetry under the condition of high precision | 5 Groups | 3 | Basic |  |
| 9 | Measuring oil viscosity by falling-ball method | According to Stokes formula, design the experimental procedure, and then use falling-ball method to measure oil’s viscosity. | 5 Groups | 3 | Basic |  |
| 10 | Adjustment and application of spectrometer. | To understand the basic structure and working principle of spectrometer, know how to adjust and application of spectrometer. Learn to use spectrometer measure angle, understand the basic principles of symmetry measurement method to eliminate eccentric error. Observe the grating diffraction phenomenon, understand the basic principle and main characteristics of grating diffraction. Master the methods of measuring grating constant by using grating diffraction. | 5 Groups | 3 | Basic |  |
| 11 | Measuring specific heat capacity of oil by electrothermal method | To realize the characteristics and function of designing experiment, and study the primary methods of designing procedure. Understand the functions and designing ideas of the adiabatic calorimeter and master its application. Know about heat equivalent of work and Joul’s law. Be clear the experimental principle and method. Understand the main factors influencing system errors, and learn to reduce or eliminate the system errors by symmetric method. | 5 Groups | 3 | Basic |  |
| 12 | Voltage-current characteristic of electric element | Understand the system error induced by the ampere meter in connection and outside connection. Learn the method to correctly select the metering circuit to reduce the system error. Understand the linear and nonlinear voltage-ampere characteristic of electric element. Grasp the principle and the method to measure the voltage-ampere characteristic of electric element. | 5 Groups | 3 | Basic |  |
| 13 | Measuring resistance by using the dc bridge | understand the characteristics of the bridge circuit and the basic ideas of the comparative, balance and compensation method, grasp the basic principle of the measuring methods of bridge. Master the principle and method of measuring middle resistance of a conductor by using direct current (dc) wheatstone bridge. Understand the principle and method of low resistance by using the dc double bridge, and then measure the resistivity of a conductor by using double bridge. To understand the sensitivity of bridge and the factors influence it, and learn how to measure it. Understand the main causes of measurement errors of the bridge and learn to how to analyze. | 5 Groups | 3 | Basic |  |
| 14 | Designing and making digital thermometer with thermistor | To realize the characteristics and function of designing experiment, and study the primary methods of designing procedure. Understand the basic structure and function of the digital multimeter and learn how to use it. Know the pinciple and method of measuring resistance by an unbalnaced bridge or by substitute method. Understand temperature characteristics of the thermistor and learn how to measure it. Finally, combine a thermistor with an un balanced bridge to design and make a digital thermometer which has measurement range of 0~50oC. | 5 Groups | 3 | Basic |  |
| 15 | Conservation of momentum law | Grasping the experimental method of validating Physical Laws. Learning about the construction, function and operation method of air track. Learning about the principle of photoelectrical timing system. Grasping the measuring method of velocity on the air track.Understanding the principle of conservation of momentum law，learning about how to validate the law of conservation of momentum by the experiment. | 5 Groups | 3 | Basic |  |
| 16 | Newton’s second law | Grasping the experimental method of validating Physical Laws. Learning about the construction, function and operation method of air track. Learning about the principle of photoelectrical timing system. Grasping the measuring method of velocity and acceleration on the air track. Understanding the Newton’s second law, validating the formular of F=ma by the experiment. | 5 Groups | 3 | Basic |  |
| 17 | The measurement of magnetic field distribution in the solenoid | Understand the basic principle of hall effect, to master the principle and method of using hall effect to measure the magnetic induction intensity. Understand the working characteristic of hall element, comprehend the physical meaning of the hall element sensitivity and output characteristic. Grasp the distribution law of the long straight solenoid magnetic field, learn to use the hall element measuring magnetic induction intensity distribution inside the solenoid. Gauging and plotting the distribution curves of axis magnetic induction intensity correctly. Learn the generation mechanism of various side effects and the resulting systemic errors. Catch the symmetry measurement to eliminate or reduce the systemic errors. | 5 Groups | 3 | Basic |  |
| 18 | The principle and use of digital oscilloscope | Learning about the basic construction, function, principle of the oscilloscope. Studying the adjustment method and how to operate oscilloscope. Learning how to measure the amplitude, frequency of the continuous signal by the cursor method using oscilloscope , how to display the Lissajous figur. | 5 Groups | 3 | Basic |  |
| 19 | The measurement of the simulated refrigerator refrigeration parameters | Learn the basic structure and the refrigeration principle of refrigerators and other small refrigerating installation. Measure the refrigeration parameters of the simulated refrigerator. Deepen the understanding of thermal basic knowledge, cultivating the ability of integrating theory with practice. | 5 Groups | 3 | Basic |  |
| 20 | Study on the transient state of RC series circuit | To realize the advantage of the application of the data acquisition to the physical experiment via investigating the charging and discharging process of the RC electric circuit by using the method of compute data acquisition. Observe the change law of the voltage and current during the process of the transient state of RC series circuit and better understand the property of the capacitor. Measure the time constant and half-life period of the RC electric circuit and calculate the capacity of the unknown capacitor according to the known resistance value. | 5 Groups | 3 | Basic |  |
| 21 | Study on the gas-discharge plasma | Get to know the characteristics of the gas-discharge plasma. Measure some basic parameters of plasma by using the plasma diagnostic technique. | 5 Groups | 3 | Basic |  |
| 22 | The solar cell characteristics research | To Measure the volt-ampere characteristic curve of solar cells under the condition of no light and to get the experience formula of the relationship between voltage and current. To measure the output characteristics of solar cell under light and to determine some characteristic parameters such as the short circuit current,maximum output power and fill factor. To measure the relationship between the short circuit current and the relative light intensity, and to measure the relationship between the opencircuit voltage and the relative light intensity. | 5 Groups | 3 | Basic |  |
| 23 | Study on light polarization | To observe light polarization phenomenon, understand the principle of polarization, and master the methods of how to produce polarized light and check it. Verify Malus’s Law. Learn how to find and measure Brewster's angle, and further calculate the refractive index of the glass. | 5 Groups | 3 | Basic |  |
| 24 | Laser hologram photography | Learn the technique of holography and the method of the reconstruction. Know the main characteristic of the hologram photography. | 5 Groups | 3 | Basic |  |

**3. Course Material**

Required Text:

1. Experiment Tutorial In Physics, Offset Printing Textbook，China University of Petroleum Press, 2008

Required Reading

1. Experimental College Physics, Yingli WU and Pingzhou Li, ISBN: 9787560642901,

Xidian University Press, 2016.

2) Introductory Physics Experiment for undergraduatea, Fu Hao and Zhixiong Li, ISBN: 9787030514073, Science Press, 2017.

3) College Physical Experiment，Li Shuguang, Zhang Yaping, Zhu Haifeng. ISBN：9787030556516, Science Press (in Chinese）.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

|  |  |  |
| --- | --- | --- |
| Grading | Evaluation | Percentage |
| Basic theory | 10% |
| Experimental operation | 40% |
| Experimental report | 40% |
| Course work | 10% |

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.and complete all the required experimental projects .

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

## 夏季小学期

### 工程测绘

**Course Syllabus**

**Engineering Surveying (0494499)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 1 | Toal Course Hours | 16 |
| Lecture Hours | / | Experiment Hours | / |
| Programming Hours | / | Other Practical Hours | 16 |
| Course Instructors: | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

(1) Master method and steps of engineering mapping.

(2) Master the usage and mapping skills of common mapping tools and instruments.

(3) Master the surveying method of standard parts and common parts.

(4) Understand the mechanical process and the desire of assembling technics.

(5) Master the basic drawing skills of parts and assembly sketch maps and detailed drawings.

(6) Equip students with the abilities to understand, draw and check detailed drawings. Equip students with the ability to refer to “Machine Design Handbook” and other related materials.

(7) Equip students with the preliminary ability to improve the product design.

**2. Course Description and Course Content**

**2.1 Course Descripion**

This course is a basic technical course for most majors like automation and machinery manufacturing professional. The aim of this course is to further consolidate the knowledge of engineering drawing, to improve their drawing skills and abilities. Mechanical mapping is combined with related curriculum organically to enhance the students' comprehensive abilities in the practical work, and lay a good foundation for later course design, graduation design and mechanical engineering design works.

Course content: familiar with engineering surveying method and steps, master the basic skills of drawing parts sketch map and assembly sketch map, grasp mapping method for standard parts and special parts, be familiar with the usage of common mapping tools and instruments, understand the requirements of the parts processing and assembly processing, improve the ability of drawing, checking and engineering design.

**2.2 Course Content**

Chapter 1 Introduction

1.1 Course intrduction

1.2 Teaching object

1.3 Study method

Chapter 2 Method and Steps of Engineering Surveying

2.1 Engineering surveying steps

2.2 Disassembling methods and points for attention

2.3 Drawing the assembly schematic drawing

2.4 Mapping tools usage

Chapter 3 Method and Steps to Map Parts

3.1 Method and steps to map typical parts

3.2 Mapping thread

3.3 Mapping straight toothed spur gear

3.4 Mapping curved surface

Chapter 4 Mapping the Typical Assembly

4.1 Method and steps to map typical assembly

4.2 Collate and check surveying drawings, finish assembly drawings.

4.3 Separate detailed drawings from assembly drawing and check all drawings

4.4 Products improvement design and discussion

Chapter 5 Summary

Make a summary of the lesson, collate and check all drawings and make a test or an reply.

**3. Course Material**

**Required Text:**

1. Sun Peixian, Yuan Baomin, Engineering Surveying Instruction, China University of Petroleum Print, 2008.

**Required Reading**

1. Li Chengxian, Machine Surveying, Northwestern Polytechnical University Press.

2. Drawing Teaching and Research Group , Engineering Surveying CAI , China University of Petroleum.

3. Exhibition room for assembly mapping.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (20%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Projects (40%): This component of the final grade is based upon one simulation project, using the simulation method to solve the production problem in a petroleum reservoir. Presentation of the project is required, which should include the brief introduction of the reservoir, the simulation model, the results and analysis, and conclution.

Final-term exam (40%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview, sickness or visa issue) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

# 第二学年

## 第3学期

### 中国概况（2-1）

**Course Syllabus**

**Survey of China (2-1) (201920201004429)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 3 | Toal Course Hours | 48 |
| Lecture Hours | 48 | Experiment Hours | / |
| Programming Hours |  | Other Practical Hours | / |
| Course Instructor:Li Hongbing | | | |
| Course Website: | | | |

1. **Objectives and Learning Outcomes**

Upon successful completion of the course, students should be able to:

1. Know the main characteristics of China’s geographical environment and its influence over China’s agricultural civilization;
2. Know briefly the different developmental stages in China’s history; in addition, they should be able to briefly describe the main reasons for the rise and fall of ancient China;
3. Understand the main strands of traditional Chinese thinking, with particular emphasis on Confucianism and Daoism;
4. Understand China’s contribution to the world in terms of science and technology;
5. Explain the early stages of cultural communication between China and the West; moreover, they should be able to explain the influence of western civilization on contemporary China;
6. Know and judge China’s past, present and future with justice, impartiality, objectivity and friendliness.
7. **Course Description and Course Content**
   1. **Course Descripion**

This course is designed for undergraduate students majoring in Oil and Gas Engineering, Electrical Engineering, Civil Engineering and Mechanical Engineering. The course aims to improve students’ general understanding of China’s social development, history and culture. Together, we will explore the inheritance and innovation of Chinese traditional thinking as well as China’s contribution to human civilization. Chinese modernization will also be touched upon. The teaching goal of the course is to equip students with the analytical tools necessary to understand and convey China’s history and culture, as well as describe the unique charm of its civilization. Students should emerge with a comprehensive knowledge of various aspects of China in the past, present and future.

**2.2 Course Content**

Chapter 1 Introduction to Chinese Culture

* 1. General introduction to China
  2. The elements of Chinese culture
  3. Base of culture: Yin Yang and Tai Chi
  4. Chinese medicine: magical or witchcraft?
  5. Kong Fu: strenghthen body and soul
  6. Food: regionalvariations,styles and characteristics

1.7 China’s Political System and basic policies of China in the present age

1.8 Differences between Chinese and foreigners?

Chapter 2 The Geographical Environment and Agriculture in China

2.1 Where is China on the map?

2.2 The main characteristics of China’s geographical environment

2.3 Continental monsoon climate in China

2.4 The influence of geographical environment over China’s agricultural civilization

Chapter 3 China’s Origins and Early History

3.1 Pan Gu separates the sky from the earth

3.2 Nv Wa made men and Nv Wa mended the sky

3.3 Yellow Emperor and Emperor Yan

3.4 An historical outline

3.5 Chinese dynasties and four great inventions

Chapter 4 Zodiac Culture and Traditional festivals in China

4.1 A case in cafe: different nations, different cultures

4.2 The origin of Chinese zodiac: what’s yours？

4.3 Tradtional festivals and celebrations in China

Chapter 5 Chinese Cuisine and Tea Culture

5.1 What do you know about Chinese cuisine?

5.2 Eight regional cuisines in China

5.3 China: the home of tea

Chapter 6 Sports and Recreation

6.1 Brief introduction to Chinese martial arts

6.2 Sorts of Kung Fu

6.3 Masters of Kung Fu: who’s your favorite?

6.4 What is real Chinese Kung Fu?

6.5 Tai Ji is going to the world

Chapter 7 Confucianism and Taoism

7.1 What do you know about Confucius?What is the essence of Confucianism?

7.2 Confucius’ philosophy of education

7.3 The Analects of Confucius

7.4 Five Golden Rules

7.5 Lao Zi of Taoism: Naturalness and Non-action

Chapter 8 Traditional Chinese Medicine

8.1 Huo Tuo: Originator of Surgery

8.2 Li Shizhen: The Compendium of Materia Medica

8.3 Comparison between Western medicine and TCM

Chapter 9 Traditional Gardens and Architecture

9.1 The classical Gardens of Suzhou: styles and features

9.2 The Forbidden City: home of emperors for 500 years

9.3 Garden of Gardens: Yuan Ming Yuan: lesson from the ruin of it by foreigners

Chapter 10 Awareness and Collision between China and the West

10.1 Marco Polo and his book *The Travels of Marco Polo*

10.2 Ming and Qing Emperors’s promotion of the Western culture spreading in China

10.3 Inflence of Western civilization on contemporary China

**3. Course Material**

**Required Reading**

1. China Panorama, GUO Peng &CHENG Long, Higher Education Press, 2014
2. Talk about China in English, ZHONG Xi, LI Zhaoping, Shanghai Science Press, 2008
3. A Panorama of Chinese Culture, LI Yunchuan, Press of Dalian Institute of

Technology, 2008

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (30%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Final-term exam (70%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview, sickness or visa issue) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 大学物理(2-2)

**Course Syllabus**

**University Physics (2-2) (0931299)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 3.5 | Toal Course Hours | 56 |
| Lecture Hours | 54 | Experiment Hours | 2 |
| Programming Hours | / | Other Practical Hours | / |
| Course Instructors: Yanjie Tian, Peng Dong | | | |
| Course Website: http://tcpe.upc.edu.cn:8085/ | | | |

**1. Objectives and Learning Outcomes**

This course is designed for the postgraduate students of various engineering majors. Based on the math fundation of advanced mathematics, this course introduces basic concepts, theorems and laws of classical physics and modern physics, as well as the methods of studying physics problems. Frontier progress of different fields of physics will also be introduced in this course in order to attract students by fostering their interests in physics. This course aims to improve student's ability of thinking and spirits of innovation.

Upon sucessful completion of the course, students should:

(1) Understand the concept and basic principles of electric charge, electrical forces, the electric field and their related applications;

(2) Understand the concept and basic principles of electric potential energy and the electric potential and their related applications;

(3) Understand the concept and basic principles of capacitors and its related applications;

(4) Understand the concept and basic principles of magnetic forces and magnetic field produced by steady current and their related applications;

(5) Understand the concept and basic principles of electric potential energy and the electric potential and their related applications;

(6) Understand the concept and basic principles of electromagnetic induction and its related applications;

(7) Understand the concept and basic principles of modern physics and frontier of physics knowledge.

**2. Course Content**

Chapter 13 Electrical force and electrical Field

Emphasis and Difficulties: Coulomb’s force law, the Electric Field

13.1 Discovery of electrification

13.2 Electric charges, Charge quantization

13.3 Polarization and induction

13.4 Electrical Forces,Coulomb’s force law

13.5 The electric field of pointlike charge distributions

13.6 Electric field lines

13.7 The electric field of continuous distributions of charges

13.8 Electric flux

13.9 Gauss’s law for electric fields

Chapter 14 Electrical potential and Electrical potential energy

14.1 Electrical potential energy

14.2 The electric potential of pointlike charges

14.3 The electric potential of continuous charge distributions of finite and infinite size

14.4 Equipotential volumes and surfaces

14.5 The relationship between the electric potential and the electric field, the electric potential and electric field of a dipole

14.6 Lightning rods

Chapter 15 Capacitor and capacitance

15.1 Capacitors and capacitance

15.2 Combinations of capacitors

15.3 Energy Stored in a capacitor

Chapter 16 Magnetic Forces and magnetic field

16.1 Magnet and magnetic field

16.2 Magnetic Force on a moving charge

16.3 Magnetic forces on currents

16.4 The Biot-Savart law

16.5 Forces of parallel currents on each other and the definition of the Ampere

16.6 Gauss’s law for the magnetic field

16.7 Magnetic poles and current loops

16.8. Magnetic field

16.9. Ampere’s law

16.10 The displacement current and the Ampere-Maxwell law

Chapter 17 Electromagnetic Induction

17.1 Faraday’s law of electromagnetic induction

17.2 Lenz’s law

17.3 An ac generator

17.4 Summary of the Maxwell Equations of electromagnetism

17.5 Self-inductance

17.6 Mutual inductance

17.7 Energy stored in a magnetic field

Chapter 18 Physical optics

18.1 Existence of light waves

18.2 Concept of Interference

18.3 Young’s double slit experiment

18.4 Thin-film interference

18.5 Single slit diffraction

18.6 Diffraction by a circular aperture

18.7 Resolution

18.8 Multiple slits: the diffraction grating

18.9 Resolution and angular dispersion of a diffraction grating

18.10 Polarrized light

18.11 Malus’s law

18.12 Polarization by Reflection: Brewster’s law

18.13 Polarization by double refraction and scattering

Chapter 19 Modern Physics

19.1 The Planck Quantum Hypothesis

19.2 The Photoelectric Effect

19.3 The Bohr Model of a Hydrogenic Atom

19.4 Particle-Waves and the Wavefunction

19.5 The Heisenberg Uncertainty Principles

19.6 The Schrodingger Equation

**3. Course Material**

Required Text:

1. University Physics (Note Book) by Tian Yanjie and Dong Peng
2. University Physics , Ronald Lane Reese, ISBN:0-534-24655-9, China Machine Press, 2002

Required Reading

1. Fundamentals of Physics, Halliday, 10th Edition.
2. University Physics, Hugh D. Young, 13th Edition.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (20%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes will be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Middle-term exam (20%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

Final-term exam (60%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time. Students being absent for more than 10 times will be disqualified from final exam.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 大学物理实验(2-2)

**Course Syllabus**

**Physics experiment (0941199/0941299)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | **2** | Toal Course Hours | 48 |
| Lecture Hours | 4 | Experiment Hours | 44 |
| Programming Hours | / | Other Practical Hours | / |
| Course Instructors: Center of physics experiment | | | |
| Course Website: http://tcpe.upc.edu.cn/LearningWeb/ | | | |

**1. Objectives and Learning Outcomes**

Upon successful completion of the course, students should be able to:

1) Study knowledge of physics experiment, experiment method and experimental skills；

2) Understand the basic ways and the main process of scientific experiment；

3) Be engaged in the basic training of scientific experiment, cultivate the science spirit, improve the quality of scientific experiments, lay a good experimental foundation for the follow-up courses and the future work;

4) Cultivate and improve the ability of scientific experiment and the quality of engaged in scientific experiment;

5) Cultivate their innovative spirit and ability, specific should achieve the following basic requirements.

**2. Course Description and Course Content**

**2.1 Course Descripion**

After students entering the university, college physics experiment is a beginning of students studying systemically experimental methods and experimental skills training, is the important foundation of students accepting scientific experiment training.

1) Introduce the history of physics experiment and application model of physical experiment in engineering and technology appropriately, make the students understand the importance of scientific experiments, clear position, function and task of experiment class. Make students form good experimental habits, cherish the public property, abide by the safety regime, establish a good study style.

2) Make the students master the basis theory of error and uncertainty, own certain ability of processing data including: the basic concept of measurement, error and uncertainty; the evaluation of directly measuring results; uncertainty propagation of indirect measurement; The list and drawing of process etc.

3) Based on observing the experimental phenomenon, make the students master further the basic knowledge of the physics experiment, basic methods and basic skills, deepen the understanding of physics principle. Focus on cultivating the students' ability of scientific experiments, including self-study ability, hands-on practice ability, thinking judgment ability, writing ability, simple design ability, innovation ability etc., improve the quality of the students to engage in scientific experiments. By setting up a certain number of modern physics, applied and comprehensive experiments, causes the student to understand modern physics concepts, understand the physics experiment technology, improve the ability of comprehensive experiment.

**2.2 Course Content**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Serial Number | Experiment Title | Content | Number one group | Class hours | Class Type | Remarks |
| 1 | Primary knowledge of experiment | The essential procedure and requirement of Physics experiment . The basic concept about measurement ,error, uncertainty, significant digit ；Uncertainty assessment of direct and indirect measurement’s result；tabulation method、graphing method;data processed by computer；the method of building experience formulas；Basic measuring methods in physics experiment. | Two classes | 4 | Theory Course |  |
| 2 | The measuremet of the specific rotation and concentration of liquid | To understand the basic concept,the produce and test methods of polarized light. To make out of the material optical properties and to master the principel and the method for measuring the rotation rate of the liquid. To understand the principle of polarimeter and measure the concentration of a optical solution by using the polarimeter. | 5 Groups | 3 | Basic |  |
| 3 | Magnetic field distribution measurement of carrying-current circular coil and Helmholtz coil | Understand the basic principle of hall effect, to master the principle and method of using hall effect to measure the magnetic induction intensity of carrying-current circular coil and Helmholtz coil. Validating the principle of magnetic field superposition.learn about the magnetic field distribution rule on the axis of coils. | 5 Groups | 3 | Basic |  |
| 4 | The liquid surface tension coefficient measurement | To study the principle and method of measuring tiny force by using the interface tensiometer. To measure of the surface tension of the liquid. | 5 Groups | 3 | Basic |  |
| 5 | Frank-Hertz Experiment | Measure the first excited potential of argon atom, to prove the existence of atomic energy level, and deepen the comprehension to quantization concepts. Deepen the comprehension to thermal electron emission. Learn the design methods of combining the micro process of electron-atom collision with macroscopic quantities. Know how to measure very weak current. | 5 Groups | 3 | Basic |  |
| 6 | Measuring Planck's Constant via Photoelectric Effect | Know the basic experimental method to verify Einstein's photoelectric equation. Study the basic experimental technology of obtaining monochromatic light, measuring Planck's constant etc. | 5 Groups | 3 | Basic |  |
| 7 | Millikan’s Oil Drop | Studying the design idea of measuring electron charge ，learning about the motion of electrons in gravity and electric field，determining the electron charge. | 5 Groups | 3 | Basic |  |
| 8 | Resistance  Measurement by Voltammetry | Designing experimental program based on the given apparatus, measuring the resistance by voltammetry under the condition of high precision | 5 Groups | 3 | Basic |  |
| 9 | Measuring oil viscosity by falling-ball method | According to Stokes formula, design the experimental procedure, and then use falling-ball method to measure oil’s viscosity. | 5 Groups | 3 | Basic |  |
| 10 | Adjustment and application of spectrometer. | To understand the basic structure and working principle of spectrometer, know how to adjust and application of spectrometer. Learn to use spectrometer measure angle, understand the basic principles of symmetry measurement method to eliminate eccentric error. Observe the grating diffraction phenomenon, understand the basic principle and main characteristics of grating diffraction. Master the methods of measuring grating constant by using grating diffraction. | 5 Groups | 3 | Basic |  |
| 11 | Measuring specific heat capacity of oil by electrothermal method | To realize the characteristics and function of designing experiment, and study the primary methods of designing procedure. Understand the functions and designing ideas of the adiabatic calorimeter and master its application. Know about heat equivalent of work and Joul’s law. Be clear the experimental principle and method. Understand the main factors influencing system errors, and learn to reduce or eliminate the system errors by symmetric method. | 5 Groups | 3 | Basic |  |
| 12 | Voltage-current characteristic of electric element | Understand the system error induced by the ampere meter in connection and outside connection. Learn the method to correctly select the metering circuit to reduce the system error. Understand the linear and nonlinear voltage-ampere characteristic of electric element. Grasp the principle and the method to measure the voltage-ampere characteristic of electric element. | 5 Groups | 3 | Basic |  |
| 13 | Measuring resistance by using the dc bridge | understand the characteristics of the bridge circuit and the basic ideas of the comparative, balance and compensation method, grasp the basic principle of the measuring methods of bridge. Master the principle and method of measuring middle resistance of a conductor by using direct current (dc) wheatstone bridge. Understand the principle and method of low resistance by using the dc double bridge, and then measure the resistivity of a conductor by using double bridge. To understand the sensitivity of bridge and the factors influence it, and learn how to measure it. Understand the main causes of measurement errors of the bridge and learn to how to analyze. | 5 Groups | 3 | Basic |  |
| 14 | Designing and making digital thermometer with thermistor | To realize the characteristics and function of designing experiment, and study the primary methods of designing procedure. Understand the basic structure and function of the digital multimeter and learn how to use it. Know the pinciple and method of measuring resistance by an unbalnaced bridge or by substitute method. Understand temperature characteristics of the thermistor and learn how to measure it. Finally, combine a thermistor with an un balanced bridge to design and make a digital thermometer which has measurement range of 0~50oC. | 5 Groups | 3 | Basic |  |
| 15 | Conservation of momentum law | Grasping the experimental method of validating Physical Laws. Learning about the construction, function and operation method of air track. Learning about the principle of photoelectrical timing system. Grasping the measuring method of velocity on the air track.Understanding the principle of conservation of momentum law，learning about how to validate the law of conservation of momentum by the experiment. | 5 Groups | 3 | Basic |  |
| 16 | Newton’s second law | Grasping the experimental method of validating Physical Laws. Learning about the construction, function and operation method of air track. Learning about the principle of photoelectrical timing system. Grasping the measuring method of velocity and acceleration on the air track. Understanding the Newton’s second law, validating the formular of F=ma by the experiment. | 5 Groups | 3 | Basic |  |
| 17 | The measurement of magnetic field distribution in the solenoid | Understand the basic principle of hall effect, to master the principle and method of using hall effect to measure the magnetic induction intensity. Understand the working characteristic of hall element, comprehend the physical meaning of the hall element sensitivity and output characteristic. Grasp the distribution law of the long straight solenoid magnetic field, learn to use the hall element measuring magnetic induction intensity distribution inside the solenoid. Gauging and plotting the distribution curves of axis magnetic induction intensity correctly. Learn the generation mechanism of various side effects and the resulting systemic errors. Catch the symmetry measurement to eliminate or reduce the systemic errors. | 5 Groups | 3 | Basic |  |
| 18 | The principle and use of digital oscilloscope | Learning about the basic construction, function, principle of the oscilloscope. Studying the adjustment method and how to operate oscilloscope. Learning how to measure the amplitude, frequency of the continuous signal by the cursor method using oscilloscope , how to display the Lissajous figur. | 5 Groups | 3 | Basic |  |
| 19 | The measurement of the simulated refrigerator refrigeration parameters | Learn the basic structure and the refrigeration principle of refrigerators and other small refrigerating installation. Measure the refrigeration parameters of the simulated refrigerator. Deepen the understanding of thermal basic knowledge, cultivating the ability of integrating theory with practice. | 5 Groups | 3 | Basic |  |
| 20 | Study on the transient state of RC series circuit | To realize the advantage of the application of the data acquisition to the physical experiment via investigating the charging and discharging process of the RC electric circuit by using the method of compute data acquisition. Observe the change law of the voltage and current during the process of the transient state of RC series circuit and better understand the property of the capacitor. Measure the time constant and half-life period of the RC electric circuit and calculate the capacity of the unknown capacitor according to the known resistance value. | 5 Groups | 3 | Basic |  |
| 21 | Study on the gas-discharge plasma | Get to know the characteristics of the gas-discharge plasma. Measure some basic parameters of plasma by using the plasma diagnostic technique. | 5 Groups | 3 | Basic |  |
| 22 | The solar cell characteristics research | To Measure the volt-ampere characteristic curve of solar cells under the condition of no light and to get the experience formula of the relationship between voltage and current. To measure the output characteristics of solar cell under light and to determine some characteristic parameters such as the short circuit current,maximum output power and fill factor. To measure the relationship between the short circuit current and the relative light intensity, and to measure the relationship between the opencircuit voltage and the relative light intensity. | 5 Groups | 3 | Basic |  |
| 23 | Study on light polarization | To observe light polarization phenomenon, understand the principle of polarization, and master the methods of how to produce polarized light and check it. Verify Malus’s Law. Learn how to find and measure Brewster's angle, and further calculate the refractive index of the glass. | 5 Groups | 3 | Basic |  |
| 24 | Laser hologram photography | Learn the technique of holography and the method of the reconstruction. Know the main characteristic of the hologram photography. | 5 Groups | 3 | Basic |  |

**3. Course Material**

Required Text:

1. Experiment Tutorial In Physics, Offset Printing Textbook，China University of Petroleum Press, 2008

Required Reading

1. Experimental College Physics, Yingli WU and Pingzhou Li, ISBN: 9787560642901,

Xidian University Press, 2016.

2) Introductory Physics Experiment for undergraduatea, Fu Hao and Zhixiong Li, ISBN: 9787030514073, Science Press, 2017.

3) College Physical Experiment，Li Shuguang, Zhang Yaping, Zhu Haifeng. ISBN：9787030556516, Science Press (in Chinese）.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

|  |  |  |
| --- | --- | --- |
| Grading | Evaluation | Percentage |
| Basic theory | 10% |
| Experimental operation | 40% |
| Experimental report | 40% |
| Course work | 10% |

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.and complete all the required experimental projects .

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 电工电子学（一）

**Course Syllabus**

**Electrotechnics & Electronics (Ⅰ)(** **0540399)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 2.5 | Toal Course Hours | 40 |
| Lecture Hours | 30 | Experiment Hours | 10 |
| Programming Hours | 0 | Other Practical Hours | 0 |
| Course Instructors:Zhou Lanjuan | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students should be able to:

1. To master the basic analysis method of DC circuit

(2) To master the concept of phasor, analysis method of sinusoidal AC circuit,

(3) To understand the calculation method of symmetrical three-phase AC circuit.

(4) To understand the terminology of digital circuits, convert numbers between decimal, binary and other forms. Interconnect logic gates of various types to implement a given logic function.

**2. Course Content**

**Chapter 1 Introduction**

1.1 Overview of Electrical Engineering.

1.2 Circuits, Currents, and Voltages.

1.3 Power and Energy.

1.4 Kirchhoff’s Current Law.

1.5 Kirchhoff’s Voltage Law.

1.6 Independent on Circuit Elements.

**Chapter 2 Resistive Circuits**

2.1 Resisitancs in Series and in Parallel.

2.2 Network Analysis by using Series and in Parallel Equivalents.

2.3 Voltage-Divider and Current-Divider Circuits.

2.4 Thevenin's and Norton Equivalent Circuits.

2.5 Superposition Principle.

Experiment 1：The application of ohm's law and Voltage-Division theorem

Experiment 2：The application of Thevenin's theorem and research

**Chapter 3 Inductance and Capacitance**

3.1 Capacitance.

3.2 Capacitance in Series and Parallel.

3.3 Physical Characteristics of Capacitors.

3.4 Inductance.

3.5 Inductance in Series and Parallel.

3.6 PhysicalInductors.

**Chapter 4 Steady-State Sinusoidal Analysis**

4.1.Sinusoidal Currents and Voltages

4.2 Phasors.

4.3 Complex Impedances.

4.4 Circuit Analysis with Phasors and Complex Impedances.

4.5 Power in AC Circuits.

4.6 Thevenin's and Norton Equivalent Circuits.

4.7 Balanced Three-Phase Circuits.

Experiment 3： The measurement and research of Single phase AC circuit.

Experiment 4： The measurement and research of Three-Phase AC circuit.

**Chapter 5 Logic Circuits**

5.1 Basic Logic Circuit Concepts.

5.2 Representation of Numerical Data in Binary Form.

5.3 Combinatorial Logic Circuits.

Experiment 5： The Application of combinational logic circuits.

**3. Course Material**

**Required Text:**

Electrical Engineering Principles and Applications(Fourth Edition). Editor in Chief: Allan R. Hambley, China Machine Press, 2010. ISBN：978-7-111-31459-2

**Required Reading**

电工电子学（第三版），刘润华，ISBN：978-7-04-043369-2

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

**Attendance, homework assignments, in-class activities and quizzes** (20%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

**Experiment** (20%): This component of the final grade is based upon 5 experiments. Each experiment is worth 4%.

**Final-term exam** (60%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 理论力学

**Course Syllabus**

**Theoretical Mechanics(Full English) (0641199)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 3 | Toal Course Hours | 48 |
| Lecture Hours | 48 | Experiment Hours | / |
| Programming Hours | / | Other Practical Hours | / |
| Course Instructors: Jianlin Liu, Demin Zhao | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students will have gained and understanding of the basic concepts, principles, methods and applications, improve their skill, and also increase the ability of physical modeling on abstraction, simplification, analysis and judgment. Specific learning objectives are:

1. To master the basic concept, theory and method of theoretical mechanics;
2. To cultivate the modeling ability of abstract, simplification, analysis, judgment and so on for engineering objects;
3. Learning to analyze and solve some simple practical engineering problems by using Theoretical Mechanics;
4. Mastering the fundamental route to solve actual problems in use of Theoretical Mechanics knowledge;

**2. Course Content**

Chapter 1 Basic concepts in Statics

* 1. Basic concepts and axioms in Statics
  2. Constraint and reactive forces
  3. Force analysis

Chapter 2 Simplification of the force group

2.1 Basic concepts of the force group

2.2 Simplification of the force group

Chapter 3 Coplanar generalized force group

3.1 Forms of the balance equation

3.2 Write down the balance equation

3.3 Balance of the multi-body system

Chapter 4 Truss and gravitation center of the body

4.1 Truss

4.2 Gravitational center

Chapter 5 Basic motion of the point

Chapter 6 Basic motion of the rigid body

6.1 Translation

6.2 Rotation

Chapter 7 Planar motion of the rigid body

7.1 Planar motion of the rigid body

7.2 Velocity analysis

Chapter 8 Newton’s second law

Chapter 9 Theorem of the momentum

9.1 Theorem of the momentum

9.2 Motion law of the mass center

Chapter 10 Theorem of the angular momentum

10.1 Theorem of the angular momentum

10.2 Differential rotation equation of the rigid body to an axis

10.3 Moment of inertia

Chapter 11 Theorem of kinetic energy

11.1 Work

11.2 Kinetic energy

11.3 Theorem of kinetic energy

**3. Course Material**

Required Text:

1. A Lecture Note on Theoretical Mechanics, Liu Jianlin, Metallurgical industry press , 2016.

Required Reading

1. Engineering Mechanics (I, II), Hou Mishan, Hu Yulin, Petroleum University press , 2008.
2. Theoretical Mechanics (7th ed.), Teaching group of Theoretical Mechanics in Harbin Institute of Technology, Higher Education Press, 2012.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (20%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Final-term exam (80%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

Other Items: other factors, such as class and group participation and puncture, regular attdendance may be used, at the professor’s discretion, to make adjustments to final grades in borderline cases. The instructor will assume that you are well prepared for class each week.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

## 第4学期

### 中国概况（2-2）

**Course Syllabus**

**Course Name (Course Code 2094299)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 3 | Toal Course Hours | 48 |
| Lecture Hours | 48 | Experiment Hours | 0 |
| Programming Hours | 0 | Other Practical Hours | 0 |
| Course Instructors: | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students will have gained basic knowledge of China and developed a deep understanding of related concepts and phenomenons.

Specific learning objectives are:

1. Understand Chinese characters and the Chinese language. And try to improve your Chinese daily.

2. Have a general understanding of China geography and tourism Resources.

3. Explain elements of change and continuity in the process of ancient China and modern China.

4. Use relevant concepts to analyze examples of China’s development, linking them to their political, economic and social contexts.

5. Understand the Chinese education system.

6. Have a general understanding of China’s oil industry.

7. Use materials to construct an argument that contributes to a better understanding of China.

**2. Course Content**

This course is designed for postgraduate students in China University of Petroleum. The course provides an introduction to major issues in the development of China from antiquity to the present.

Chapter 1 Introduction

1.1 China Today

1.2 How to study abroad in China

Chapter 2 Chinese Characters and Language

2.1 Chinese Characters

2.2 Chinese Language from a comparative perspective

2.3 How to improve your Chinese Daily

Chapter 3 Geography and Tourism Resources in China

3.1 Geographical Landscape

3.2 Tourism Resources in China

3.3 What’s your favorite travel destinations in China?（Group Discussion）

Chapter 4 Education in China

4.1 Ancient Education in China

4.2 Education in the People's Republic of China

4.3 Top Universities in China

4.4 International Education in China

Chapter 5 Ancient China and Modern China

5.1 A Synopsis of Chinese History

5.2 Ancient History of China

5.3 Modern History of China

5.4 China Today （*The focal point: Important historical events of P. R. China；“Reform and Opening UP”；“The Belt and Road”；High-speed railways and China's Infrastructure Boom；Mobile pay and Life Today in China）*

Chapter 6 China Petroleum

6.1 China - An ancient country with petroleum

6.2 Petroleum and Natural Gas Resources in China

6.3 Major Oil Fileds in China

6.4 Communication between China and Foreign Countries in Oil Industry

**3. Course Material**

Required Text/ Reference Book:

*China Panorama* by Guo Peng, Higher Education Press, 2012.

Required Reading/ Reference Books:

1. 《中国历史常识（中英）》，国家汉语国际推广领导小组办公室，高等教育出版社，2007.
2. 《中国地理常识（中英）》，国家汉语国际推广领导小组办公室，高等教育出版社，2007.
3. 《中国文化常识（中英）》，国家汉语国际推广领导小组办公室，高等教育出版社，2007.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and presentations(30%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and presentations.

Final-term exam (70%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

Other Items: other factors, such as class and group participation and puncture, regular attdendance may be used, at the professor’s discretion, to make adjustments to final grades in borderline cases. The instructor will assume that you are well prepared for class each week.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

**Assignments:**

In both the profesional and academic world, you must meet the deadlines.

### 电工电子学（二）

**Course Syllabus**

**Electrotechnics & Electronics (Ⅱ) (0540499)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 2.5 | Toal Course Hours | 40 |
| Lecture Hours | 30 | Experiment Hours | 10 |
| Programming Hours | 0 | Other Practical Hours | 0 |
| Course Instructors:Zhou Lanjuan | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students should be able to:

(1) To master the concept of transience and steady state, circuit switching, circuit switching rule, calculation of the initial value for voltage and current. To understand the zero-input response, zero-state response and total response of first-order circuit. To master the concept of the time constant. To understand three-factor method for transient analysis of first-order circuit and know how to calculate the three-factor of first-order circuit.

(2) To understand the terminology of digital circuits, and understand how gates are connected to gather to form flip-flops. To master how to analyze the registers and counters.

(3) To understand the diode operation and select diodes for various applications. Master the basic analysis method of circuit include diodes.

(4) To master the basic analysis using various amplifier models to calculate amplifier perfomance for given sources and loads. Master the analysis and calculation of integrated operational amplifying circuit and basic concept of negative feedback.

**2. Course Content**

**Chapter 1 Inductance and Capacitance**

1.1 Capacitance.

1.2 Capacitance in Series and Parallel.

1.3 Physical Characteristics of Capacitors.

1.4 Inductance.

1.5 Inductance in Series and Parallel.

1.6 PhysicalInductors.

**Chapter 2 Transient**

2.1.First Order RC circuit

2.2 DC Steady State

3.3 First Order RL circuits

3.4 Three-factor method of First-Order circuit

Experiment 1：Operation of commonly used electronic instrument.

Experiment 2：Transition investigation of First-Order RC circuit.

**Chapter 3 Logic Circuits**

3.1 Logic circuits.

3.2 Synthesis of Logic Circuits.

Experiment 3：The Research of Flip-Flop.

Experiment 4：The Research of Counter. **Chapter 4 Diodes**

4.1 Basic Diode Concepts.

4.2 Ideal Circuit Model.

4.3 The Other Type Diode.

**Chapter 5 Amplifiers: Specifications and External Characteristics**

5.1 Basic Amplifier Concepts. 5.2.Cascaded Amplifiers. 5.3.Power Supplies and Efficiency.

5.4 Additional Amplifier Models.

**Chapter6 Operational Amplifiers**

6.1 Ideal Operational Amplifiers.

6.2 Inverting Amplifiers.   
6.3 Noninverting Amplifiers.

6.4 Nonlinear Limitations.

Experiment 5： The research and application of integrated operational amplifier.

**3. Course Material**

**Required Text:**

Electrical Engineering Principles and Applications(Fourth Edition). Editor in Chief: Allan R. Hambley, China Machine Press, 2010. ISBN：978-7-111-31459-2

**Required Reading**

电工电子学（第三版），刘润华，ISBN：978-7-04-043369-2

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

**Attendance, homework assignments, in-class activities and quizzes** (20%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

**Experiment** (20%): This component of the final grade is based upon 5 experiments. Each experiment is worth 4%.

**Final-term exam** (60%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 材料力学

**Course Syllabus**

**Mechanics of Materials (0641299)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 4.0 | Toal Course Hours | 64 |
| Lecture Hours | 60 | Experiment Hours | 4 |
| Programming Hours | 0 | Other Practical Hours | 0 |
| Course Instructors:Yuguang Cao, Ming Song | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

The course of mechanics of materials is compulsory for the undergraduates majoring in mechanical engineering, civil engineering, petroleum engineering and other specialties.

Mechanics of materials is an important basic course for engineering undergraduates. It is a bridge linking theoretical courses and specialized courses, as well as a technical basis for solving engineering problems. The mechanics of materials course mainly include two parts, which are static and mechanics of materials. In the "static" part, the knowledge on balance of force, simplifications and equilibrium conditions of force system, and synthesis of force system will be taught. In the part of “mechanics of materials”, the learning content include the deformation and failure of objects under the external force, the basic law and theory of the deformation of component under external force, the design theory and calculation method of strength, stiffness and stability for the component. This course is the theoretical basis for subsequent specialized courses and future engineering design.

The objectives of this course lie several points. No.1 is to enable students to understand and acquire the basic knowledge of mechanics of materials. No. 2 is to enable students to master the basic theory and analytical methods for engineering design. No.3 is to train the capabilities of students in solving practical engineering problems and performing engineering calculation. No.4 is to train the practical abilities of students in performing experiments.

**2. Course Content**

**Chapter 0. Introduction 2 class hour**

* 1. Research object and content of mechanics of materials
  2. Analytical methods of mechanics of materials

**Chapter 1. The basic concept of statics and the force analysis of object 6 class hour**

Focus and difficulties: Method and subject of studying statics, constrains and types of constrains, force analysis and force diagram.

* 1. Basic concepts and axioms of statics

Force, system of forces, rigid body, balance, balance axioms of two forces, axiom of addition and subtraction of balanced system, Newton’s third law of motions, principle of solidification.

* 1. Force vector calculation

The projection of the force on the Cartesian axis, the parallelogram of force, moment of force about a point, moment of force about an axis.

* 1. The constraint and constraint reaction

Constraint, constraint reaction, the basic types of constraints.

* 1. Force analysis and force diagram

Force analysis, separation and force diagram.

**Chapter 2. The basic concepts of mechanics of materials 2 class hour**

Focus and difficulties: The basic assumptions of materials mechanics, internal force, stress, strain.

6.1 Tasks and research object in mechanics of materials

The strength failure, stiffness failure, stability failure, the basic deformation form of bar.

6.2 Basic assumptions of deformable solid

Deformable solid, assumption of continuity, assumption of homogeneity, assumption of isotropy, assumption of small deformation.

6.3 Basic concepts of stress and strain.

The internal force, normal stress, shear stress, strain and shear strain.

**Chapter 3. Analysis of internal force 8 class hour**

Focus and difficulties: Cross section method for calculating internal force of bar, relationship among *Q, M* and *q*.

7.1 Study on the method of internal force and classification

The cross section method, internal force.

7.2 Axial tension (compression) and the internal force of the torsion shaft rod

The axial force, axial tension (compression) force, torque rod, force .diagram of shaft torsion.

7.3 Internal force of bending beam

The concepts of plane bending, internal force of bending beam (bending moment and shear force, bending force equation of beam), and method of moment diagram.

7.4 The relationship between load, shear force and bending moment.

Load collection degree, the relationship between shear force and bending moment, the superposition method of drawing bending moment diagram.

7.5 The internal force chart of frame

The internal force diagram and components of the internal forces of frame.

**Chapter 4. The axial tension and compression 8 class hour**

Focus and difficulties: Calculation of stress strut strength conditions, the mechanical properties of the material.

8.1 Calculations of normal stress and strength on the cross section of pressure bar and tensile bar.

The plane assumption, a stress on the cross section of axial tensile and compression rod, Saint Venant principle, strength condition of axial tensile and compression rod, strut axial, dangerous section, allowable stress, safety factor, three kinds of strength problems in engineering.

8.2 Deformation calculation of axial tensile and compression rod

Hooke's law, the elastic modulus, Poisson's ratio, calculation of the deformation of the axial tensile and compression rod, the relationship between stress and strain, calculation of deformation energy.

8.3 Mechanical properties of materials in the tensile and compressive process

Tensile diagram of low carbon steel, the stress-strain curve and main mechanical properties, cold hardening and cold drawing aging, mechanical properties of other materials, the safety coefficient and the allowable stress, stress concentration.

8.4 Statically indeterminate problem of axially loaded bar

Redundant constraints, deformation coordination equation, statically indeterminate problem of axially loaded bar, assembly stress, temperature stress

**Experiment 1**. Tensile testing of low carbon steel and cast iron. 2 class hour

**Chapter 5. Torsion of circular shaft 6 class hour**

Focus and difficulties: Derivation of equations for calculating torsional shear stress, pure shear, shear stress reciprocal theorem.

9.1 Stress and strength condition in torsion of circular shaft

Stress on the cross-section of torsion of circular shaft, pure shear, shear stress reciprocal theorem, Hooke's law for shear, polar moment of inertia and torsional section modulus and strength condition of torsion of circular shaft.

9.2 Deformation and stiffness condition of torsion shaft

Stiffness condition of relative torsional angle, torsional stiffness, torsion of circular shaft.

**Chapter 6. Bending stress analysis and strength calculation 8 class hour**

Focus and difficulties: mechanical model of beam bending, pure bending normal stress, bending shear stress

10.1 The geometric properties of planar graph

Static moment, moment of inertia, product of inertia, formula and application of parallel, principal axis of inertia.

10.2 Normal stress on the cross section of straight beam bending

Pure bending and transverse bending, the neutral axis, the relationship between bending moment and curvature, bending rigidity and bending modulus of pure bending section, calculation equation of normal stress.

10.3 The application and the strength conditions of pure bending force equation

Generalization of the equation of pure bending normal stress, strength condition of bending stress.

10.4 The bending shear stress and strength condition

Bending shear stress profiles, bending shear stress strength condition.

10.5 Measurements of improving the bending strength

Measurements of improving the bending strength

**Experiment 2. Normal stress testing of pure bending beam 2 class hour**

**Chapter 7. Deformation of plane bending 4 class hour**

Focus and difficulties: Differential equation of beam deflection curve，deformation comparison method for deformation of statically indeterminate beams.

11.1 Differential equation of the deflection curve

Deflection and rotation, deflection curve, deflection equation, differential equation of the deflection curve.

11.2 Integral method for calculating deformation of beams

The integral constants, boundary conditions, integral method for calculating deformation of beams.

11.3 Superposition method for calculating deformation of beams

The superposition method of calculating displacement.

11.4 The stiffness condition of the beam and measurements of improving the rigidity of the beam

The stiffness conditions of the beam, measurements of improve the beam bending stiffness.

11.5 The deformation comparison method for solving statically indeterminate beam

Static base, equivalent system, the deformation comparison method for solving statically indeterminate beam

**Chapter 8. Shear and extrusion 2 class hour**

Focus and difficulties: Determination of shear area and extrusion area, practical calculation methods of calculating extrusion surface.

12.1 The practical calculation of shear

The concept of shear, shear plane, practical calculation of shearing.

12.2 The practical calculation of extrusion

The concept of extrusion, extrusion plane, extrusion and practical calculation.

**Chapter 9. The stress state and strength theory 8 class hour**

Focus and difficulties: Stress state, principal stress, generalized Hooke's law, the strength theory and etc.

13.1 Description of the state of stress on a point

The concept of stress state on a point, the concept of unit, classification of stress state.

13.2 The analytical method of two dimensional stress state analysis

The stress acting on any inclined plane, the principal stress and principal plane, analytical method of analyzing plane stress.

13.3 The graphic method of two dimensional stress state analysis

The Mohr stress circle, the graphic method of two dimensional stress state analysis.

13.4 The stress circle and maximum shear stress of triaxle stress state

The stress circle and maximum shear stress of triaxle stress state.

13.5 The generalized Hooke's law, deformation ratio energy under the complex stress state

The generalized Hooke's law, volume strain, concept of deformation ratio energy under the complex stress state.

13.6 Theory of strength

The concept of strength theory, basic ideas and method of establishing strength conditions under complex stress state, four kinds of strength theory and equivalent stress.

**Chapter 10. Strength calculation of the combined deformation 4 class hour**

Focus and difficulties: Study method of combined deformation, strength analysis of the combined deformation of bending and torsion

14.1 The concept and the engineering examples of the combined deformation

The concept and the engineering examples of the combined deformation.

14.2 Oblique bending

Oblique bending, stress and the deformation of oblique bending, strength calculation of oblique bending.

14.3 Combination of tensile (compression) and bending

Strength calculation of the combined deformation of tensile (compression) and bending, strength calculation the combined deformation of eccentric tension (compression).

14.4 A combination of bending and torsion of circular shaft

Strength calculation of the combined deformation of bending and torsion.

**Chapter 11. Buckling of columns 4 class hour**

Focus and difficulties: Equations for calculating critical pressure and critical stress, calculation on buckling of columns.

15.1 The critical force of slender bar

The concept of buckling of columns, critical force of slender bar hinged at both ends, the influence of constraints on critical force.

15.2 Three different types of columns

Flexibility, length factor, equivalent length and slenderness ratio, the scope of the Euler formula, empirical formula of critical load in medium-long column, critical stress diagram.

15.3 Safety check of column

Buckling safety factor, stable licensing pressure, stability calculation of column, measurement of improving column stability.

**3. Course Material**

Required Text:

1. 《Mechanics of Materials》（第五版），J. M. Gere, 机械工业出版社，2009；
2. 《Mechanics of Materials》（第六版），Ferdinand P. Beer，[E.Russell Johnston](https://book.jd.com/writer/E.Russell%20Johnston_1.html)，[John T. Dewolf](https://book.jd.com/writer/John%20T.Dewolf_1.html)，David F.Mazurek著，[机械工业出版社](https://book.jd.com/publish/%E6%9C%BA%E6%A2%B0%E5%B7%A5%E4%B8%9A%E5%87%BA%E7%89%88%E7%A4%BE_1.html)，2013。

Required Reading

1. 《工程力学（静力学和材料力学）》，范钦珊主编，高等教育出版社，2007；
2. 《材料力学》（Ⅰ、Ⅱ），吕英民编，中国石油大学出版社，2007；
3. 《材料力学》（Ⅰ），刘鸿文编，高等教育出版社，2011。

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (25%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Experiments (5%): This component is based upon performance in the experiment and report submitted after the expriment.

Final-term exam (70%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

Other Items: other factors, such as class and group participation and puncture, regular attdendance may be used, at the professor’s discretion, to make adjustments to final grades in borderline cases. The instructor will assume that you are well prepared for class each week.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 机械原理

**Course Syllabus**

**Theory of Machines and Mechanisms (04351)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 4 | Toal Course Hours | 64 |
| Lecture Hours | 64 | Experiment Hours | 0 |
| Programming Hours | 0 | Other Practical Hours | 0 |
| Course Instructors: Cui Junguo | | | |
| Course Website: | | | |

**1. Course Description**

Theory of Machines and Mechanisms is one of the main technical basic courses for mechanical students to study the general problems of machinery and is an important part of mechanics. This course lays the foundation for students to solve mechanical and technical problems in the future, and is also necessary to learn the following courses and new mechanical techniques. With a large knowledge coverage, the task of this course is to cultivate the ability of mechanical system scheme innovative design in the global cultivating students' comprehensive design ability, and this course occupies a very important position in the mechanical design curriculum system.

The main contents of this course: Structural analysis of planar mechanisms and calculation of degree of freedom; Kinematic analysis of planar mechanisms; Force analysis of planar mechanisms and friction of kinematic pair; Dynamics in machines; Working principle and motion design of common mechanisms; Link mechanism, cam mechanism, gear trains and other common mechanisms; schematic design of mechanical system.

Through the learning of this course, make students understand some basic concepts and theory of theory of machines and mechanisms and the basic methods for structural analysis and design, have the preliminary ability of mechanical system scheme innovative design, which is conducive to the cultivation of innovation ability and engineering consciousness.

**2. Objectives and Learning Outcomes**

**Outcome 1:** Understand some basic concepts, definition and theories of theory of machines and mechanisms, master the working principle, composition, performance characteristics and design methods of common mechanisms in general machinery and master the idea, methods and steps of schematic design of mechanical system.

**Outcome 2:** Obtain the ability of mechanics analysis and calculation of mechanisms and machines with the application of mathematics, physics, mechanics knowledge, and the ability to refer to technical information.

**Outcome 3:** Be able to use the knowledge and practical skills synthetically, and have the ability to design simple machinery and simple mechanism and analyze and solve the general mechanical engineering problems.

**Outcome 4:** Strengthen the engineering quality through the case analysis, establish the correct engineering values, motivate the patriotic feelings, establish the sense of innovation and develop the habit of good at observation and independent thinking.

**3. Course Content**

**Chapter 1 Introduction**

Key points：Study object, scope of study and nature of curriculum of Theory of Machines and Mechanisms. The relationship and distinction between related concepts related to machinery, machine, mechanism, components, parts.

Difficulties：The development tendency and technology frontier of modern machinery.

1.1 The study object and contents of this course

Summarize the characteristics of machine and mechanism, distinguish the relationship between machinery, machine, and mechanism, and clarify the relationship between mechanism, machine and machinery. On the basis of project cases, briefly introduce the working principle of several common machineries and realize the innovativeness of design.

1.2 Purpose of this course

Clarify the nature, contents and tasks of the course and know the research characteristics of technical basic course.

1.3 Learning methods for this course

Master the characteristics of this course, pay attention to linking theory with practice, establish engineering views and have productive thinking. Illustrate the application of the fundamental of theory of mechanism in modern machinery. Know the significant contribution about machinery in our history, and raise the patriotism emotion of students.

1.4 The development tendency and technology frontier of modern machinery

Introduce some application examples of modern machinery from the aspect of some typical areas. Experience the advanced degree and development direction of modern machinery.

**Chapter 2 Structural Analysis of Planar Mechanisms**

Key points：Calculation of degree of freedom of planar mechanisms and conditions for having predictable motion in a mechanism.

Difficulties：Points for attention when calculating degree of freedom, especially the judgement about redundant constraints.

2.1 Composition of mechanism

Recognize the composition of mechanism, distinguish part and link, understand the static connection and dynamic coupling and master the definition of kinematic pair. Master the definition of kinematic chain and the conditions for kinematic chain becoming a mechanism.

2.2 Schematic Diagrams of Planar Mechanisms

Know the purpose of drawing a schematic diagram of a mechanism, master the symbols of common used links and pairs and conclude the procedure of drawing a schematic diagram.

2.3 Calculation of degree of freedom of planar mechanisms

Master the computational formula of degree of freedom and identify lower pair and higher pair.

2.4 Conditions for having predictable motion in a mechanism and the law of minimum resistance.

2.5 Points for attention when calculating degree of freedom

Identity the multiple pin joints and passive degree of freedom and deduce the redundant constraints including trajectory superposition, dead in line and symmetrical component. Conclude how to determine the redundant constraints in actual mechanisms.

2.6 Composition principle, structure classification, structural analysis of planar mechanisms

The definition and characteristic of link group. The relationship between simple mechanism and complex mechanism. Progressive increase link group and progressive decrease link group.

**Chapter 3 Kinematic Analysis of Planar Mechanisms**

Key points：Instantaneous center, the application of Kennedy theorem, kinematic analysis by using graphical method of vector equation. Instantaneous centers method for velocity analysis.

Difficulties：Determination of instantaneous center position in particular cases, the drawing of the acceleration polygon when using graphical method of vector equation and whether there is Coriolis acceleration or not and the determination of direction of Coriolis acceleration.

3.1 Task, purpose and method of kinematic analysis of planar mechanisms

Clarify kinematic analysis which lays the foundation for the subsequent dynamic analysis and the relationship between graphic method and analytic method.

3.2 Instantaneous centers method for velocity analysis

Summarize the definition of instantaneous center, master how to find out the instantaneous centers and expand the application of instantaneous centers method. Clarify the limitation of instantaneous centers method.

3.3 Graphical method of vector equation

Fundamental of relative motion, motion relationship of two points on the same link, motion relationship of two coincident points on different links, determination of Coriolis acceleration. The examples emphasically explained to students should contain Coriolis acceleration.

3.4 Analytical method of vector equation

The establishment of closed vector equation of links, deduction and establishment of displacement equation, velocity equation and acceleration equation. Mathematic analysis method of the equations. Kinematic analysis with matrix method.

3.5 Kinematical diagram of mechanism.

**Chapter 4 Force Analysis of Planar Mechanisms**

Key points：Kineto static analysis by using graphical method, the theoretical basis of which is D'Alembert principle in theoretical mechanics.

Difficulties：The force analysis of planar mechanisms will be very difficult if both the inertia force and friction are considered. It is called kineto static analysis if only the inertia force are considered.

4.1 Task, purpose and method of force analysis of planar mechanisms

Classification of type of forces. Graphic method and analytic method.

4.2 Instantaneous centers method for velocity analysis

Master general mechanics method and know the substitution method of masses. Substitution method of masses provides an analytical tool for balance of machinery.

4.3 Kineto static analysis of planar mechanism

In this chapter the friction is not considered during force analysis and the D'Alembert principle is used. The kinetic analysis is changed to static analysis.

Determine the condition of statically determinate for link group.

The step and method for kineto static analysis by using graphic method. Learn how to select the detached body for force analysis.

**Chapter 5 Mechanical Friction and Mechanical Efficiency**

There is friction between two links in any machine, and the friction has advantages and disadvantages. Use the advantages masterly and overcome the disadvantages.

In this chapter the inertial force is not considered during force analysis.

Key points：The basic concept of kinematic pair friction, the calculation of mechanical efficiency and the condition for self-locking.

Difficulties：How to correctly understand mechanical self-locking and how to determine the conditions of self-locking of various kinds of mechanisms.

5.1 Kinematic pair friction

It is the foundation to know the plane friction in sliding pair, and both the v-groove surface friction and half cylinder surface friction can be compared with plane friction and be equivalent to plane friction.

Study the friction in slope surface, and the relationship between v-groove surface friction and slope surface friction and the relationship between friction in helical pair and slope surface friction.

Know the difference between turning pair friction and half cylinder surface friction.

5.2 Mechanical self-locking

Self-locking phenomenon and definition. The conditions of self-locking of sliding pair, turning pair and helical pair.

5.3 Force analysis considering the friction

Regardless of the inertial force. The balance between two forces and principle of three-forces converging should be masterly used duringe force analysis.

5.4 Mechanical efficiency

The concept of mechanical efficiency, the meaning of improving mechanical efficiency and the contribution to the national economy.

Establish the concept of ideal machine. The new calculation formula of mechanical efficiency is derived by using the ideal machine.

Master how to determine the self-locking conditions by the concept of mechanical efficiency and working resistance.

Mechanical efficiency of the unit.

**Chapter 6 Balance of Machinery**

Key points：The principle and calculation of static balance and dynamic balance of rigid rotor.

Difficulties：The principle and method of dynamic balance and the balance of planar mechanism.

6.1 The purpose and content of balance of machinery

The concept of eccentric quality. How to adjust the mass distribution and eliminate the inertial force.

The classification of balance of machinery and the method of balance of machinery.

6.2 Balance of rigid rotors

Distinguish the disc rotor and columnar rotor, know the static balance conditions for disc rotor and master the graphic method and analytic method used for the calculation of static balance of disc rotor.

Know the dynamic balance conditions for columnar rotor. Master the principle and method of dynamic balance according to the decomposition law of parallel force. Know the graphic method and analytic method used for the calculation of dynamic balance of rotor. Clarify the relationship between static balance and dynamic balance.

Know the selection of specific implementation position of mechanical balance.

6.3 Balance test of rigid rotors

Distinguish principle difference and experimental equipment difference between static balance test and dynamic balance test.

6.4 Balance of planar mechanism

Understand the difficulty difference of balance of total inertia force and inertia moment and master the balance conditions of planar mechanism.

Learn how to masterly use symmetry principle and adding balance quality to completely balance the mechanism. Deeply understand the use of quality substitution method in the method using balance mass. Understand the partial substitution principle.

**Chapter 7 Fluctuation and Regulation in Speed of Machines**

Key points：The principle of regulation of periodic speed fluctuation by installing flywheel and the simple calculation method of flywheel design.

Difficulties：The establishment of the equivalent dynamics model of the machine operation, and the establishment and the solving method of the mechanical motion equation. The calculation of the maximum increment or decrement of work during the regulation of periodic speed fluctuation by installing flywheel.

7.1 Operating process of machinery

Know the three phase of actual production machine running and the type of the driving force and the working resistance acting on the machine, and find out the reasons for periodic speed fluctuation.

7.2 Establishment of equation of motion of machinery

General expression of equation of motion of machinery. Learn how to establish the equation of motion of machinery with theorem of kinetic energy and then derive the equivalent dynamics model of the machinery system. Master the concepts of equivalent link, equivalent force (moment), equivalent mass (moment of inertia) and so on.

Know the transformation and deduction of the equation of motion of machinery.

7.3 Solution of equation of motion of machinery

Know the method and procedure of solving the equation with graphic method and analytic method.

7.4 Periodic fluctuation and regulation in speed of machines

Deeply understand the mechanics principle of speed fluctuation and deduce the condition of absolutely uniform motion. Clarify the classification of the speed fluctuation.

Focus on the regulation method of periodic speed fluctuation and master the principle and method of the regulation of periodic speed fluctuation by installing flywheel. The energy storage principle and various purposes of flywheel. Be sure to master the design and calculation of the flywheel, in which the calculation of the maximum increment or decrement of work is the key problem.

7.5 Aperiodic speed fluctuation and regulation

Understand the self-regulating characteristic of three-phase AC asynchronous motor as well as the working principle of speed regulation of steam engines, gas turbines and internal combustion engine with the three-phase AC asynchronous motor as the prime mover.

**Chapter 8 Planar Linkages and its Design**

Key points：The basic knowledge, type and evolution of four-bar linkage mechanism.

Difficulties：The characteristics and design of four-bar linkage mechanism.

8.1 Know about the linkage mechanism

Understand the definition of linkage mechanism (lower pair mechanism) and give an example of application. Transmission characteristics of linkage mechanism.

8.2 Types of planar linkage mechanism and its evolution

Identify the basic types of planar linkage mechanism: including crank and rocker mechanism, double-crank mechanism and double-rocker mechanism. Distinguish slider-crank mechanism, guide-bar mechanism, oscillating slider mechanism and and fixed block mechanism.

Summarize the evolution methods of planar linkage mechanism and explain that combining with actual machines.

Think widely about the innovation thought of multi-bar linkage combination and its engineering application.

8.3 The basic characteristics of four-bar linkage mechanism

Prove the conditions of existence of generalized crank, master the judgment method of planar four-bar linkage mechanism, deduce the quick-return characteristics and coefficient of travel speed variation, draw the pressure angle and transmission angle, and recognize the dead point and continuity of motion.

8.4 Design of planar linkage mechanism

Study the design of planar linkage mechanism and find out the design variables. Summarize the function of planar linkage mechanism, including rigid body guidance, function generating, path generating and comprehensive functions. Design the planar linkage mechanism by using graphical method, analytical method and experimental method.

**Chapter 9 Cam Mechanism and its Design**

Key points：Common motion law of follower. Reversal method for the design of profile curve of cam mechanism.

Difficulties：Design of eccentric translating follower plate cam profile. Analytical method for the design of profile curve of cam mechanism.

9.1 Application, characteristic and classification of cam mechanism

Recognize the composition and application of cam mechanism, know the characteristic and classification of cam mechanism,, and simulate the transformation method of cam mechanism types.

9.2 The working process of cam mechanism

Know the nomenclature about cam mechanism, the definition of base circle, and which working process are necessary and which are not.

9.3 Common motion law of follower

Distinguish the function relationship between follower displacement and cam angle: polynomial motion laws, trigonometric function motion laws and improved combined motion law. List the selection principle of motion law of follower. Master the constant speed motion law, constant acceleration & deceleration motion law and sine acceleration motion law.

Conclude and distinguish the impact characteristic of common motion law.

9.4 Design of cam profile curve

Understand the fundamental of cam design, master designing cam profile curve by using graphical method, solve the problems in designing translating follower plate cam profile, and design swing follower plate cam mechanism by analogy. Master the relationship between pitch curve and cam contour.

Analyze the motion of eccentric translating knife-edge follower plate cam mechanism with graphical method. Know how to design the cam profile curve with analytical method.

9.5 Determination of the basic parameters of cam mechanism

Draw the pressure angle in cam mechanism, understand the relationship between pressure angle and pivot of cam or radius of base circle. Know the coming to a point and distortion of roller follower plate cam mechanism actual contour.

Analyze the relationship between eccentric direction of follower and rotation direction of cam.

**Chapter 10 Gear Mechanism and its Design**

Key points：Theory of meshing, basic parameters and calculation of standard involute spur gear.

Difficulties：Meshing characteristic of involute profiles and profile shifted gear.

10.1 Characteristic and classification of gear mechanism and fundamental law of tooth profile meshes

Know the history of development of gear mechanism, conclude the characteristics of gear mechanism, summarize the classification according to the axes relationship and tooth profile, prove the fundamental law of tooth profile meshes with instantaneous center method and understand the conjugate profile.

Analyze the type of actual gear transmission and deduce the conditions for constant transmission ratio.

10.2 Development and characteristics of the involute

Animated show the development and list the characteristics of the involute, derive the involute equation, define the pressure angle on the involute profile, and deduce the fundamental law of satisfying the constant transmission ratio meshing with involute profile.

Conclude the meshing characteristics of involute profile.

10.3 Nomenclatures of standard involute spur gear and gear sizes

Recognize the nomenclatures and symbols of standard spur gear, know the basic parameters, and master the calculation formula for the basic parameters of standard spur gear.

Talk about the engineering application of the calculation formula for the basic parameters of standard spur gear.

10.4 Meshing drive of standard spur gears

Prove the conditions of correctly meshing for involute gears, recognize the standard center distance and working pressure angle of gears, simulate the working process of involute spur gear, and deduce conditions of continuous transmission of involute spur gear.

Summarize the conditions of normal transmission of involute spur gear.

10.5 Cutting of involute profile and undercutting

Understand the fundamental for cutting tooth profile, recognize the standard rack cutter and the machining of standard gear. Recognize the undercutting and discuss the prevention method. Analyze the generating process of undercutting with graphical method when machining the gears with a rack cutter and deduce the minimum number of teeth to avoid undercutting.

10.6 Profile shifted gear

Clarify the defects of standard gear and how the profile shifted gear is proposed. The type of profile shifted gear is determined by how to change the position of the tool relative to the blank. Distinguish the positive displacements and the positive transmission and negative displacement and negative transmission. Know the geometry size calculation of profile shifted gear.

10.7 Parallel helical gears

Simulate the generating process of tooth profile and recognize the normal module, transverse module, normal and transverse pressure angle, transverse pressure angle, normal coefficients of addendum and coefficient of radial clearance. Distinguish the helix angles on base cylinder and reference cylinder. Deduce the conditions of correctly meshing for parallel helical gears. Explain the contact ratio and equivalent number of teeth. Summarize the advantages and disadvantages of helical gear transmission.

Analyze the basic parameters and the process of correctly meshing for helical gears.

10.8 Bevel gear mechanism

Summarize bevel gears, clarify that the tooth profile of bevel gear is spherical curve, know about the generating process of tooth profile and the equivalent number of teeth, and deduce the conditions of correctly meshing for standard spur bevel gear. Know the geometry size calculation of bevel gear.

10.9 Worm and worm gear

Demonstrate the formation and the meshing characteristics of worm drive, introduce the basic parameters of worm drive, which leads to the Archimedes worm drive. Clarify the important concept of the middle plane. Introduce the processing methods of worm and worm gear, and master the correctly meshing condition and geometrical dimension calculation of worm drive.

**Chapter 11 Gear trains and its design**

Key points：The calculation of transmission ratio of epicyclic gear trains and the function of gear trains.

Difficulties：The calculation of transmission ratio of combined gear train

11.1 Classification and application of gear trains

Recognize the classification of gear trains: ordinary gear train, epicyclic gear trains and combined gear train. Illustrate the function of gear trains.

11.2 The calculation of transmission ratio of ordinary gear train

Master the calculation of transmission ratio of planar ordinary gear train and master the the calculation of transmission ratio of spatial ordinary gear train. Learn the determination method for determining the rotation direction of the first and the last gears in gear train.

Draw inferences: The recognization of the actual gear train type in engineering machinery and the calculation of transmission ratio.

11.3 The calculation of transmission ratio of epicyclic gear train

Master the structure and classification of the epicyclic gear trains and identify planetary gear train and differential gear train. Learn to use inversion method (theory of relative motion) to calculate the transmission ratio of epicyclic gear train, that is the epicyclic gear train can be converted to a hypothetical ordinary gear train and then use the method of transformation mechanisms.

11.4 The calculation of transmission ratio of combined gear train

Master the process of dividing the combined gear train, calculating respectively and solving simultaneously. Identify closed planetary gear train.

11.5 The function of gear trains

Master the function of gear trains: variable transmission, higher transmission ratio and multiplex transmission, reversing transmission, synthesis and decomposition of motion and carring out high power drive with small size. Illustrate the principle and structure of automotive transmission and differential mechanism.

11.6 Type of planetary gear train and determination of number of teeth

According to the transmission ratio condition, concentric conditions, uniform distribution condition, adjacency condition determine the number of teeth of each gear, and display the planetary gear trains with type of 2K-H and 3K.

Chapter 12 Other mechanism in common use

Key points：Working principle of common intermittent mechanism

Difficulties：Analysis of application characteristic of combined mechanism

**12.1 Intermittent mechanism**

Know the working principle, type, characteristic and application of common intermittent mechanism: ratchet mechanism, geneva mechanism, intermittent gear mechanism, indexing cam mechanism.

Distinguish the similarities and differences of several common intermittent mechanism and study the respective applications.

12.2 Screw mechanisms

Understand the principle and type of screw mechanism: transmission screw, lifting screw and feeding screw.

12.3 Universal joints

Distinguish single universal joint and double universal joint and master the constant speed condition for double universal joint.

12.4 Combined mechanisms

Know about the ganged cam mechanism, gear-cam mechanism, cam-linkage mechanism and gear-linkages and the application characteristics of various combined mechanism.

**Chapter 13 Industrial robot mechanism and its design**

This chapter have not been required because it has been a new course.

**Chapter 14 Scheme design of mechanical system**

Key points：Type selection and combination of mechanisms

Difficulties：Protocol working principle of machinery

14.1 Introduction

Master the composition of the mechanical system, clarify the work requirements of mechanical systems and understand the general process of mechanical design. Be sure to tell clearly that the mechanical system design in this chapter is limited to scheme design, including the general kinematic and dynamic design and calculation, but not including the structure design, material selection and strength calculation of parts.

14.2 Scheme design of mechanical system

Explain clearly the overall principle for scheme design of mechanical system, learn to draw up the working principle of the mechanical system, choose the kinematic and dynamic parameters of prime motor and execute component, arrange the mechanical drive system, and carry out the type selection and combination of mechanisms and the kinematic and dynamic design for mechanical system. Learn program evaluation and selection.

14.3 Type selection and combination of mechanisms

Master the comparison of the function of the common used mechanisms, and list the reciprocating motion mechanism, intermittent motion mechanism, constant speed drive mechanism, etc. Carry out the combination design and selection of mechanisms, including series type, parallel type, closed type, etc.

14.4 Motion coordination and work cycle diagram of executive components

Clarify the needed motion coordination and speed coordination of the executive components and learn drawing the linear, circular and rectangular coordinate work cycle diagram of machinery.

**4. Course Material**

4.1 Recommended textbook

《Theory of Machines and Mechanisms》, Sun Huan, Chen Zuomo, Ge Wenjie, Higher Education Press, 2014, “The Twelfth Five-year” General higher education national level planning textbooks for undergraduate students, 8th Edition.

《Learning Guide book for the theory of machines and mechanisms and machine design》(Volume One), Liu Feng, Qi Yaoguang, Cui Xuezheng, China University of Petroleum Press, 2010, Textbook for higher education.

4.2 Major reference books

《Theory of Machines and Mechanisms》, Zheng Wenwei, Wu Kejian, Higher Education Press, 2015, General higher education national level planning textbooks for undergraduate students, 7th Edition.

《Course of Theory of Machines and Mechanisms》, Shen Yongsheng, Tsinghua University Press, 2015, Outstanding textbooks of Tsinghua University, 3rd Edition.

《Theory of Machines and Mechanisms》, Yang Jiajun, Huazhong University of Science and Technology Press, 2014, “The 11th Five-year” national level planning textbooks for undergraduate students, Second Edition.

**5. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (30%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Final-term exam (70%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be open book or close book.

**6. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

## 夏季小学期

### 电工电子学实习

**Course Syllabus**

**Electrotechnics & Electronics Practice (0594199)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 2 | Toal Course Hours | 2 weeks |
| Lecture Hours | 2 weeks | Experiment Hours | 0 |
| Programming Hours | 0 | Other Practical Hours | 0 |
| Course Instructors:Zhou Lanjuan | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students should be able to:

(1) To master the use of simulation software such as Multisim in circuit design through the study of this practical course, and can skillfully apply simulation software to circuit simulation.

(2) Through the practice, students master the recognition, measurement and use of low-voltage electrical devices and electronic components, master the maintenance method of electronic equipment, and electrical equipment, master the use of common testing methods and tools, and have the ability of drawing schematics and manual welding, grasp the assembly process of practical circuit(such as the temperature detection, control and alarm circuit in practice etc.), learn to use the knowledge to make trouble shooting of complex circuit, to design, assembly and debugging of typical circuit, master safety knowledge of electricity.

(3) To learn the application of electrical and electronic technology in the practical engineering circuit through the study of the practice, and master the background knowledge of engineering application.

**2. Course Content**

**1. Simulation design and analysis**

Learn how to use the international simulation software for circuit design and analysis--Multisim.

**2. Component recognition**

Learn how to recognize, test and use electronic components.

**3. Welding practice**

Learn the basic knowledge of electronic circuit welding, learn the basic method of manual welding, and complete a simple circuit welding and functional test, such as a power circuit.

**4. Circuit assembly and connection**

Reasonable layout of the device, the design of circuit board wiring diagram and draw, in the board on the assembly circuit, welding circuit, block function test, and finally the joint adjustment.

**5. Finish the practice report**

Writing the practice report according to both practice contents.

**3. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

**Simulation design and analysis** (30%): Attedance and the completion of various simulation circuits

**Welding practice** (20%): A simple circuit welding completion and functional test, such as a power circuit.

**Circuit assembly and connection**(30%): Reasonable layout of the device, the design of circuit board wiring diagram and draw, in the board on the assembly circuit, welding circuit, block function test, and finally the joint adjustment.

**The practice report** (20%): Summarize thepractice process

**4. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

# 第三学年

## 第5学期

### 高级汉语(2-1)

**Course Syllabus**

**Advanced Chinese（2-1） (2096199)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 4 | Toal Course Hours | 64 |
| Lecture Hours | 64 | Experiment Hours | / |
| Programming Hours | / | Other Practical Hours | / |
| Course Instructors: Geng Jingying | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

In order to achieve teaching objectives , teacher should be able to:

1. Developing students’ability to express in segment,pave the way for entering HSK-4;
2. Developing students’abilities in listening,speaking,reading and writing.
3. Improving students’ability to use Chinese in daily communication.

Upon sucessful completion of the course,

1. Students should master the basic vocabulary and grammar required by the HSK-3.
2. Students should grasp the common knowledge of Chinese culture in textbook.

**2. Course Description and Course Content**

**2.1 Course Descripion**

This course is designed for postgraduate students preparing for HSK-3. There are 20 lessons in this course.Each lesson is divided into four scenes.The averange number of new words in each lesson is 12~20.The averange number of language points is 2~3.This course covers all language points and vocabulary in the HSK-3 syllabus.Warm-up,texts,notes and exercises are provided for each lesson.Set up a Chinese character knowledge board every four lesson.Set up a culture knowledge board every five lesson.

**2.2 Course Content**

Lesson 1 What’s your plan for the weekend

1. New words.There are 15 new words.
2. Warm-up
3. Texts
4. Notes.
5. The complement of result“好”.
6. The negative structure“一……也/都+不/没……”.
7. The conjunction “那”.
8. Exercises
9. Characters
10. Application
11. Common saying.

Lesson 2 When will he come back

1. New words.There are 18 new words.
2. Warm-up
3. Texts
4. Notes
5. Simple complements of direction
6. The successive occurrence of two actions
7. The rhetoric question“能……吗”
8. Exercises
9. Characters
10. Application
11. Common saying

Lesson 3 There are plenty of drinks on the table

1. New words.There are 17 new words.
2. Warm-up
3. Texts
4. Notes
5. Comparison of “还是”and“或者”
6. Location word+V着+Numeral+Measure word+N
7. “会”indicating the possibility
8. Exercises
9. Characters
10. Application
11. Common saying

Lesson 4 She always smiles when talking to customers

1. New words.There are 16 new words
2. Warm-up
3. Texts
4. Notes
5. The structure“又……又……”
6. The accompanying action
7. Exercises
8. Characters
9. Application
10. Common saying

Lesson 5 I am getting fatter and fatter lately

1. New words.There are 13 new words.
2. Warm-up
3. Texts
4. Notes

a.“了”indicating a change

b.The structure “越来越+adj/mental V”

(5)Exercises

(6)Characters

(7)Applications

(8)Common saying

Lesson 6 Why are they suddenly missing

1. New words.There are 15 new words.
2. Warm-up
3. Texts
4. Notes
5. Complements of possibility introduced by “V得/不”.
6. “N+呢”used to ask about location
7. Comparison of“刚”and“刚才”
8. Exercises
9. Characters
10. Applications
11. Common saying

Lesson 7 I’v known her for five years

1. New words.There are 12 new words.
2. Warm-up
3. Texts
4. Notes
5. To express a period of time
6. To express an interest
7. To indicate time using“半”“刻”or“差”.
8. Exercises
9. Characters
10. Applications
11. Common saying

Lesson 8 I’ll go wherever you go

1. New words.There are 17 new words.
2. Warm-up
3. Texts
4. Notes
5. Comparison of“又”and“再”
6. Flexible use of interrogative pronouns 1
7. Exercises
8. Characters
9. Applications
10. Common saying

Lesson 9 She speaks Chinese like a native

1. New words.There are 13 new words.
2. Warm-up
3. Texts
4. Notes
5. The structure “越A越B”
6. Comparative sentences 1:A跟B一样（+adj）
7. Exercises
8. Characters
9. Applications
10. Common saying

Lesson 10 Maths is much harder than history

1. New words.There are 15 new words.
2. Warm-up
3. Texts
4. Notes
5. A比B+Adj+一点儿/一些/得多/多了
6. Expression of approximate numbers 1
7. Exercises
8. Characters
9. Applications
10. Common saying

Lesson 11 Don’t forget to turn off the air conditioner

1. New words.There are 19 new words.
2. Warm-up
3. Texts
4. Notes
5. A把B+V+……
6. Expression of approximate number 2:左右
7. Exercises
8. Characters
9. Applications
10. Common saying

Lesson 12 Leave the important items with me

1. New words.There are 14 new words.
2. Warm-up
3. Texts
4. Notes
5. Comparison of “才”and“就”
6. A把B+V+在/到/给

（5）Exercises

(6)Characters

(7)Applications

(8)Common saying

Lesson 13 I walked back

1. New words.There are 15 new words.
2. Warm-up
3. Texts
4. Notes
5. Compound complements of direction
6. The structure“一边……一边……”

（5）Exercises

(6)Characters

(7)Applications

(8)Common saying

Lesson 14 Please bring the fruit here

1. New words.There are 17 new words.
2. Warm-up
3. Texts
4. Notes
5. The Ba-sentence 3:A把B+V+complement of result/direction
6. The structure“先……，再/又 ……，然后……”
7. Exercises
8. Characters
9. Applications
10. Common saying

**3. Course Material**

**Required Text Book:**

Standard course HSK 3 by Jiang Liping.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Tests (30%): There are several tests per semester.Tests are taken from workbook.Strictly follow the exam form of HSK 3.The average score of the test is 30% of the final exam results.

Final-term exam (70%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your required Text books.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview, sickness or visa issue) you must contact the instructor ahead of time. More than ten absences per semester,unable to take the final exam.

### 互换性与技术测量基础

**Course Syllabus**

**Comprehensive practice training of Interchangeability and Measurement Technology (417799)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 4 | Toal Course Hours | 64 |
| Lecture Hours | 48 | Experiment Hours | 16 |
| Programming Hours | 0 | Other Practical Hours | 0 |
| Course Instructors: Ji Renjie | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

This course is a basic course of the Mechanical Design, Manufacturing and Automation. The contents mainly consist of two parts: the interchangeability of typical parts, and the measurement techniques. The interchangeability of typical parts mainly introduces the Fits and Tolerances of smooth cylinders combination, corresponding ISO standards and the GB standards. The Geometrical tolerances and its testing methods also introduced according standards of ISO and GB. And beyond that, the labeling, the testing method, and the evaluation parameters of surface roughness, the regulations of interchangeability of rolling bearings, keys and gear are introduced. The second part is mainly about the basics of measurement techniques, measuring instrument and the measurement data processing method. According to these principles and methods above, make the students understand how to determine whether a part is qualified or not.

The teaching method of the course emphasizes on practical training, and the basic knowledge was introduced together with lectures and group discussions. The final evaluation results submitted are based on assignments, practices, reports, etc..

Goal 1: Through this course, make the students understand the importance of geometric precision design in mechanical structure design. To make students understand the concept of interchangeability and to understand the common methods of measuring and testing mechanical products. The students will be familiar with the standards for dimensional tolerances, geometric tolerances and surface roughness, as well as the application of these provisions in typical mechanical structures such as rolling bearings, keys, spline and gear. After learning, the engineering drawings can be correctly understood and annotated correctly when the mechanical structure is designed.

Goal 2: The scientific method can be used to establish the testing scheme for the mechanical structure, to construct the experimental system and to carry out the experiment. Make the students have the ability to collect and arrange the experimental data correctly, analyze and explain the experimental results, and obtain reasonable and effective conclusions.

**2. Course Content**

Chapter1 Introduction

1.1 the overview of interchangeability

1.2 the priority number and priority number system

Chapter 2 The fits and tolerances of smooth cylinders

2.1 basic terms and definitions of tolerances and fits

2.2 The standards for tolerances and fits

2.3 The tolerance zones and fits as specified by standards

2.4 selection of tolerances and fits

2.5 General tolerances, no tolerance for linear dimensions

Chapter 3 the foundation of measurement technology

3.1 overview

3.2 measuring instruments and measurement methods

3.3 measurement error and data processing

Chapter 4 the measurement of workpiece

4.1 measuring with general measuring instruments

4.2 measuring with a gauge

Chapter 5 Geometric tolerance and its detection

5.1 tolerance overview

5.2 callout of geometrical tolerance

5.3 the meaning of geometrical tolerance

5.4 tolerance principle

5.5 selection of geometrical tolerance, the regulation of general tolerance

Chapter 6 Surface Roughness

6.1 evaluation parameters of surface roughness

6.2 Selection and annotation of surface roughness and its detection

**3. Course Material**

The teaching material:

"The foundation of interchangeability and measurement technology", edition 4, wang boping, editor of the machinery industry press, 2013.09; Ordinary higher education "11th five" national planning textbooks; The 12th five-year plan textbook

Reference:

1. The third edition of the foundation of interchangeability and measurement technology, edited by zhou zhaoyuan, mechanical industry press, 2011.03;

2. The second edition of the technical foundation for interchangeability and measurement technology, maohuaihuai editor-in-chief, mechanical industry press, 2011.01;

3. The third edition of "tolerance and measurement technology", huang yunqing, editor-in-chief, mechanical industry press, 2012.04

4. Foundation of interchangeability and measurement technology. 4. Edited by liao ni-zhao, China econometric press, 2009.01;

5. "interchangeability and measurement technology", li zhuxu high, higher education press, 2013.02;

6. "Mechanical precision design and testing basis", liu pin, Chen jun, Harbin Institute of Technology press, 2010.08.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, Attendance and Performance (20%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Experiment (30%): This component of the final grade is based upon two development projects (breif description of the projects). Each project is worth 10%.

Final-term exam (50%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

Other Items: other factors, such as class and group participation and puncture, regular attdendance may be used, at the professor’s discretion, to make adjustments to final grades in borderline cases. The instructor will assume that you are well prepared for class each week.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 控制工程基础

**Course Syllabus**

**Fundamental of Control Engineering (413599)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 4 | Toal Course Hours | 64 |
| Lecture Hours | 62 | Experiment Hours | 0 |
| Programming Hours | 2 | Other Practical Hours | 0 |
| Course Instructors: Shen Rong | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students will have gained and understanding of …… Specific learning objectives are:

Fundamental of control engineering is an important basic technological course for mechanical design-manufacture and automation major. The students should have a good command of the principles and methods of control engineering, get the ability of analyzing the control system, solve practical issues in the mechanical engineering and mechatronic engineering field.

After studying the course, the students should satisfy the requirements as follows:

1) Master the essential principles and methods of classical control theory, and can use them to analyze the transfer, feedback and control of signal in the mechanical and electrical system, to analyze the dynamic performance of the mechanical system.

2) Master the computer aided design method of control system, and master the preliminary principles and methods of discrete control system.

3) Understand the modern control theory and intelligent control theory, and know well the latest development and tendency of control engineering.

**2. Course Content**

**Chapter 1 Introduction to Control Engineering 4**

* 1. Introduction
  2. Open- and Closed-Loop Control
  3. Briefly Introduction of MATLAB

**Chapter 2 System modeling 16**

2.1 Introduction

2.2 Laplace Transforms and Inverse Laplace Transforms

2.3 Differential Equation and Transfer Function

2.4 Linearization of Mathematical Models

2.5 Solution of Constant Coefficient Linear Differential Equation by Using Laplace Transform,

2.5 Transfer Function and Transfer Functions of Typical Elements

2.6 Block Diagram of System

2.7 Signal Flow Graph of Systems and Mason Gain Formula

2.8 Block Diagram of Linear Physical Systems

2.9 Mathematical Model Based on MATLAB

**Chapter 3 Time domain analysis 12**

3.1 Time Domain Response and Common Input Functions

3.2 Time Domain Response of First-Order System

3.3 Time Domain Response of Second-Order System

3.4 Time Domain Response of Higher-Order System

3.5 Step Response Analysis and Performance Specification

3.6 Time Domain Analysis Based on MATLAB

**Chapter 4 Frequency Domain Analysis of Control System 12**

4.1 Basic Concepts of Frequency Domain Analysis

4.2 Nyquist Diagram

4.3 Bode Diagram

4.4 Transfer Function by Frequency Characteristic Curves

4.5 Frequency Characteristics by Unit Step Time Response

4.6 Frequency Domain Analysis Based on MATLAB

**Chapter 5 Stability of Control System 12**

5.1 Basic Concepts of Stability

5.2 Sufficient Necessary Condition of Stability

5.3 Routh-Hurwitz Stability Criterion

5.4 Nyquist Stability Criterion

5.5 Stability of Delay System by Nyquist Stability Criterion

5.6 Stability by Bode Diagram

5.7 Stability Analysis Based on MATLAB

**Chapter 6 Error Analysis and Calculation of System 6**

6.1 Basic Concepts of Steady-State Error

6.2 Steady-State Error by Input Function

6.3 Steady-State Error by Disturbance

6.4 Methods of Error Reduction

6.5 Dynamic Error Coefficients

**3. Course Material**

Required Text:

1. Automatic Control Principle (Note Book) by Li Daogen (bilingual), Harbin Institute of Technology Press. June,2007.
2. Advanced Control Engineering. Butterworth-Heinemann. Roland S. Burns. 2001.

Required Reading

1. Modern Control Engineering, Katsuhiko Ogata
2. 控制工程基础（第四版）. 清华大学出版社.董景新.2015

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (40%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Final-term exam (60%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

## 第6学期

### 高级汉语(2-2)

**Course Syllabus**

**Advanced Chinese（2-2） (2096299)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 4 | Toal Course Hours | 64 |
| Lecture Hours | 64 | Experiment Hours | / |
| Programming Hours | / | Other Practical Hours | / |
| Course Instructors: Geng Jingying | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

In order to achieve teaching objectives , teacher should be able to:

1. Developing students’ability to express in segment,pave the way for entering HSK-4;
2. Developing students’abilities in listening,speaking,reading and writing.
3. Improving students’ability to use Chinese in daily communication.

Upon sucessful completion of the course,

1. Students should master the basic vocabulary and grammar required by the HSK-3.
2. Students should grasp the common knowledge of Chinese culture in textbook.

**2. Course Description and Course Content**

**2.1 Course Descripion**

This course is designed for postgraduate students preparing for HSK-3. There are 20 lessons in this course.Each lesson is divided into four scenes.The averange number of new words in each lesson is 12~20.The averange number of language points is 2~3.This course covers all language points and vocabulary in the HSK-3 syllabus.Warm-up,texts,notes and exercises are provided for each lesson.Set up a Chinese character knowledge board every four lesson.Set up a culture knowledge board every five lesson.

**2.2 Course Content**

Lesson 15 The rest of them are all ok

1. New words.There are 21 new words.
2. Warm-up
3. Texts
4. Notes
5. The structure“除了……以外，都/还/也……”
6. Flexible use of interrogative pronouns 2
7. “极了”used to indicate degree
8. Exercises
9. Characters
10. Applications
11. Common saying

Lesson 16 A am so tired thant I want to do nothing but sleep after work

1. New words.There are 16 new words.
2. Warm-up
3. Texts
4. Notes
5. The structure “如果……（的话），（S）就……”
6. Complex complements of state
7. Reduplication of monosyllabic adj
8. Exercises
9. Characters
10. Applications
11. Common saying

Lesson 17 Everybody is able to cure your“disease”

1. New words.There are16 new words.
2. Warm-up
3. Texts
4. Notes
5. Reduplication of disyllabic berbs
6. Flexible use of interrogative pronouns 3
7. Exercises
8. Characters
9. Applications\
10. Common saying

Lesson 18 I believe they’ll agree

1. New words.There are 17 new words.
2. Warm-up
3. Texts
4. Notes
5. The structure“只要……，就……”
6. The preposion“关于”
7. Exercises
8. Characters
9. Applications
10. Common saying

Lesson 19 Didn’t you recognise him

1. New words.There are 14 new words.
2. Warm-up
3. Texts
4. Notes
5. Extension of the complements of direction
6. Comparison of “使”，“叫”and“让”
7. Exercises
8. Characters
9. Applications
10. Common saying

Lesson 20 I’ve been influenced by him

1. New words.There are 14 new words.
2. Warm-up
3. Texts
4. Notes
5. Exercises
6. Characters
7. Applications
8. Common saying

**3. Course Material**

**Required Text Book:**

Standard course HSK 3 by Jiang Liping.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Tests (30%): There are several tests per semester.Tests are taken from workbook.Strictly follow the exam form of HSK 3.The average score of the test is 30% of the final exam results.

Final-term exam (70%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your required Text books.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview, sickness or visa issue) you must contact the instructor ahead of time. More than ten absences per semester,unable to take the final exam.

### 机械设计

**Course Syllabus**

**Machine design (0435299)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 4 | Toal Course Hours | 64 |
| Lecture Hours | 64 | Experiment Hours | 0 |
| Programming Hours | 0 | Other Practical Hours | 0 |
| Course Instructors:Zhao xuejin,Xiao wensheng,Yu leiyan | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students will have gained and understanding of machine design. Specific learning objectives are:

(1) learn main contents and general procedures of machine design,fundamental requirements and steps of design of mechanical elements;

(2) analyze stresses and strengths of mechanical elements;

(3) describe friction, wear and lubrication;

(4) be able to select screw fastening;

(5) be able to select keys;

(6) performance analysis and calculation of design of belt drives;

(7) force analysis of chain drive and calculation of roller chain drives;

(8) design parameter，allowable stress and accuracy selection of gear transmission and strength calculation of standard helical cylindrical gear;

(9) parameter and geometric dimension of general worm gearing,determining of the calculation load of general worm gearing and calculation of the thermal equilibrium and efficiency;

(10) the structural design and the check calculation of shaft

(11) learn the main types and identification code of rolling bearing and type selection

(12) capable of choosing coupling

(13) learn classifications of clutches

(14) understand the design of speed reducer

**2. Course Content**

Chapter 1 Brief Introduction of Machine Design

* 1. Basic Needs of Machine to be Satisfied
  2. Main Contents and General Procedures of Machine Design
  3. Fundamental Requirements and Steps of Design of Mechanical Elements
  4. Main Failure Modes and Calculation Criteria of Mechanical Elements
  5. Selection of Materials of Mechanical Elements
  6. Manufacturability and Standardization of Mechanical Elements
  7. Brief Introduction of Modern Methods of Design of Mechanical Elements

Chapter 2 Stresses and Strengths of Mechanical Elements

1. Classification of the Loads and Stresses of Mechanical Elements
2. Overall Strength of Mechanical Elements under Static Stress
3. Overall Strength of Mechanical Elementts under Variable Stresses
4. Surface Contact Fatigue Strength of Mechanical Elements
5. Application of Fracture Mechanics in Mechanical Design

Chapter 3 Friction, Wear and Lubrication

1. Friction
2. Wear
3. Lubricants
4. Lubrication States

Chapter 4 Screw Fastenings

* 1. General Introduction of Screw Fastenings
  2. Stiffness of Joints
  3. Strength Design of Single Tension Joints
  4. Strength Design of Shear Joints
  5. Strength Design of Fastening Group
  6. Setscrew
  7. Measures to Increase the Strength of Screw Fastenings
  8. Power Screws

Chapter 5 Other Joints

* 1. Keys
  2. Pins
  3. Force Fit Joints
  4. Riveted Joints and Welded Joints

Chapter 6 Belt driver

6.1 General Introduction of Belt Drives

6.2 Performance Analysis of Belt Drives

6.3 Calculation of Design of V Belt Drives

6.4 Physical Design of V Belt Drives

6.5 Tensioning Device of V Belt Drives

6.6 General Introduction of Timing Belt Drives

6.7 Design Cases of Belt Drives

Chapter 7 Chain Drives

7.1 Features and application of Chain Drive

7.2 The structural characteristics of the transmission chain

7.3 Roller chain sprocket structures and materials

7.4 Kinematics Characteristics of Chain Drive

7.5 Force Analysis of Chain Drive

7.6 Calculation of Roller Chain Drives

7.7 Arrangement, Tensioning and Lubrication of Chain Drives

Chapter 8 Gear transmission

8.1 General introduction

8.2 Failure mode and design rules of gear transmission

8.3 Materials and selection principles of gear

8.4 Allowable stress of gears

8.5 Calculation of Strength of the standard straight cylindrical gear

8.6 Design parameter，allowable stress and accuracy selection of gear transmission

8.7 Strength calculation of standard helical cylindrical gear

8.8 Strength calculation of straight bevel gear

8.9 Structural design of gear

8.10 Lubrication and efficiency of gear transmission

Chapter 9 Worm Gearing

9.1 General Introduction of Worm Gearing

9.2 Types of Worm Gearing

9.3 Parameter and geometric dimension of General Worm Gearing

9.4 Determining of the Calculation Load of General Worm Gearing

9.5 Calculation of the Thermal Equilibrium and Efficiency of Worm Transmission

9.6 Physical Design of the Cylindrical Worm Gearing

Chapter 10 Shaft

10.1 Summary of shaft

10.2 The structural design of shaft

10.3 The check calculation of shaft

10.4 Design example of shaft

Chapter 11 Rolling bearing

11.1 Summary

11.2 The main types and identification code of rolling bearing

11.3 Type selection of rolling bearing

11.4 Force analysis and calculation of rolling bearing

11.5 Size selection of rolling bearing

11.6 Composite design of rolling bearing

Chapter 12 Coupling

12.1 Summary of coupling

12.2 Choosing coupling

Chapter 13 Clutch

13.1 Functions of clutch

13.2 Classifications of clutches

Chapter 14 Design of speed reducer

14.1 Summary of speed reducer

14.2 Process of design

13.3 Overall design of transmission

14.4 Design of Assembly Draft

14.5 Detailed part drawing

**3. Course Material**

Required Text:

1. machine design vol.2 , ISBN978-7-5021-5906-1, 石油工业出版社,Jan 2007

Required Reading

《机械设计》（第四版），邱宣怀，ISBN 9787040056679，高等教育出版社，2011，高等学校教材。

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (30%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Final-term exam (70%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be open book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 虚拟样机技术

**Course Syllabus**

**Virtual Prototyping Technology (412599)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 3 | Toal Course Hours | 48 |
| Lecture Hours | 32 | Experiment Hours | / |
| Programming Hours | 16 | Other Practical Hours | / |
| Course Instructors: Cai Baoping | | | |
| Course Website: / | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students should be able to:

1. Understand the concept and basic principles of Bayesian Network;
2. Understand the applications of Bayesian Network in reliability evalution;
3. Understand the applications of Bayesian Network in fault diagnosis;
4. Be able to use Netica as a tool to build simple Bayesian Networks.

**2. Course Description and Course Content**

**2.1 Course Descripion**

This course is designed for students majoring in Mechanical engineering. The course gives the theoretical basis of Bayesian Network and its applications. The methods required for reliability evalution and fault diagnosis are developed, as well as the Bayesian Network modeling methods. How to model a Bayesian network using the Netica software will be discussed.

**2.2 Course Content**

Chapter 1 Prerequisites on Probability Theory

* 1. Two Perspectives on Probability Theory
  2. Fundamentals of Probability Theory
  3. Probability Calculus for Variables

Chapter 2 Causal and Bayesian Networks

2.1 Reasoning under Uncertainty

2.2 Causal networks and d-Separation

2.3 Bayesian Networks

Chapter 3 Buliding Model

3.1 Catching the Structure

3.2 Determining the Conditional Probabilities

Chapter 4 Netica software

4.1 Introduction

4.2 Creating Bayesian Networks

4.3 Equations

4.4 Dynamic Bayesian Networks

Chapter 5 Application of Bayesian networks in reliability evaluation

Chapter 6 Bayesian networks in fault diagnosis

**3. Course Material**

**Required Text:**

1. Bayesian networks and decision graphs, Finn V. Jensen and Thomas D. Nielsen, ISBN-10: 0-387-68281-3, Springer Science + Business Media, 2007

**Required Reading**

1. Modeling and Reasoning with Bayesian Networks, Adnan Darwiche, ISBN-13 978-0-511-50728-1, Cambridge University Press, 2009
2. Bayesian Networks and Influence Diagrams, Uffe B. Kjærulff, ISBN 978-1-4614-5103-7, Springer Science+Business Media, 2013

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (20%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Projects (20%): This component of the final grade is based upon one simulation project, using the Netica software to model Bayesian Networks to solve the problems in reliability evalution and fault diagnosis. Presentation of the project is required, which should include the brief introduction of the Bayesian Network, the simulation model, the results and analysis, and conclution.

Final-term exam (60%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview, sickness or visa issue) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 机电一体化

**Course Syllabus**

**Mechatronics Technology (419799)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits |  | Toal Course Hours | 48 |
| Lecture Hours | 46 | Experiment Hours | 2 |
| Programming Hours | 0 | Other Practical Hours | 0 |
| Course Instructors: Shen Rong | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students will have gained and understanding of mechatronics technology. Specific learning objectives are:

Fundamental of Mechatronics is an important basic technological course for mechanical design-manufacture and automation major. The students should have a good command of the principles and methods of mechatronics design, get the ability of analyzing the mechatronics system, solve practical issues in the mechanical engineering and mechatronic engineering field.

After studying the course, the students should satisfy the requirements as follows:

1. Understand the basic conceptions of mechatronics.
2. Master the essential principles and methods of metronics system design.
3. Realize the measurement, control and transmission of metronics system

**2. Course Content**

**Chapter 1 Introduction to Mechatronics 2**

* 1. Introduction
  2. Example of Mechatronics system

**Chapter 2 Analog circuits and Components 8**

2.1 Introduction

2.2 Analog Circuit Elements

2.3 Mechanical Switches

2.4 Circuit Analysis

2.5 Equivalent Circuits,

2.5 Impedance

2.6 AC Signals

2.7 Power in Circuits

2.8 Operational Amplifiers

2.9 Grounding

2.10 Solenoids and Relays

**Chapter 3 Semiconductor Electronics Devices and Digital Circuits 8**

3.1 Introduction

3.2 Diode

3.3 Thyristors

3.4 Bipolar Junction Transistor

3.5 Metal-Oxide Semiconductor Field Effect Transistor

3.6 Combinational Logic Circuits

3.7 Sequential Logic Circuits

3.8 Circuit Families

3.9 Digital Devices

3.10 H-Bridge Drivers

**Chapter 4 Data Acquisition and Microcontroller/PC Interfacing 4**

4.1 Introduction

4.2 Sampling Theory

4.3 Analog-to-Digital Converter

4.4 Digital-to-Analog Converter

4.5 Parallel Port

4.6 Data-Acquisition Board Programming

4.7 Serial Peripheral Interface

4.8 USB Communication

4.9 Network Connection

**Chapter 5 Sensors 8**

5.1 Introduction

5.2 Sensor Performance Terminology

5.3 Displacement Measurement

5.4 Proximity Measurement

5.5 Speed Measurement

5.6 Strain Measurement

5.7 Force and Torque Measurement

5.8 Temperature Measurement

5.9 Vibration Measurement

5.10 Signal Conditioning

5.11 Sensor Output

**Chapter 6 Actuators 8**

6.1 Introduction

6.2 DC Motors

6.3 AC Motors

6.4 Stepping Motors

6.5 Other Motor types

6.6 Actuators Selection

**Chapter 7 Feedback Control 5**

7.1 Introduction

7.2 Open- and Closed-loop Control

7.3 Design of Feedback Control Systems

7.4 Control Basics

7.5 PID Controller

7.6 Digital Implementation of a PID Controller

7.7 Other Control Schemes

**Chapter 8 Mechatronics Projects 3**

8.1 Introduction

8.2 Stepper-Motor Driven Rotary Table

**3. Course Material**

Required Text:

1. Fundamentals of Mechatronics. Cengage Learning. M.Jouaneh. 2013

Required Reading

1. Mechatronics Systems Fundamentals. Springer. Rolf Isermann. 2005
2. Mechatronics with Experiments. Wiley. Sabri Cetinkunt. 2007

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (40%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Final-term exam (60%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

## 夏季小学期

### 机械设计课程设计

**Course Syllabus**

**Practice Course of Machine Design (0494699)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 3 | Toal Course Hours | 48 |
| Lecture Hours | 48 | Experiment Hours | 2 |
| Programming Hours | / | Other Practical Hours | / |
| Course Instructors: Wu Baogui | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Teaching objectives:

Design of transmission scheme, Design calculation, Design of structural (Drawing assembly sketch, Drawing the computer assembly diagram, Drawing the computer parts diagram), Writing design instructions.

1. Through the curriculum design to study the preliminary ability of the mechanical transmission design, enable students to master the design methods, design steps of mechanical transmission device and training their basic design skills, such as material selection, stress analysis, calculation, drawing, writing design reports, access to information and other basic skills.
2. Through the course study to cultivate students' ability to analyze and solve the preliminary design of the mechanical transmission device, to lay the foundation for the professional comprehensive design and graduation design.
3. Through the study of the course, to develop the students' team spirit, cooperation consciousness and the style of hard work preliminarily.

Upon sucessful completion of the course, students should be able to:

1. Through the course of learning to understand the design methods and design steps of mechanical transmission device;
2. Through the practice of the course, the design of the basic skills to be trained, such as material selection, force analysis, design and calculation, drawing, use of information, writing design reports, etc.;
3. Through the practice of this course, the students are trained to recognize, discover, analyze and solve the mechanical transmission design ability and expression ability;
4. Through the practice of the course, to develop the students' team spirit, cooperation consciousness and the style of hard work preliminarily.

**2. Course Description and Course Content**

**2.1 Course Descripion**

This course is practice of professional basic courses to understand the transmission scheme in design task. Design objective is to understand the design method and procedure of mechanical transmission; Develop the ability to understand, discover, analyze and solve mechanical drive design and engineering expression ability; Cultivate students' team spirit, cooperation consciousness and hard-working style.

Design tasks and content: Single stage gear reducer of belt conveyor. The content includes the transmission scheme analysis, motor selection, power allocation, transmission ratio, motion parameters calculation, transmission parts and shafting parts design, the selection of standard parts, assembly drawings design, parts drawings design, preparation of the design specification.

Design method and procedure: Use the design method based on interpolation. Information access, program design, design calculation, structure design (parts drawings, assembly drawings), design inspection, write design report, reply, etc.

**2.2 Course Content**

Chapter 1 Overall design of transmission device

Key point: Design and calculation of transmission parts

The difficulties: Preliminary structural design of shaft

1.1 Analyze or determine the transmission scheme

Understand the advantages and disadvantages of various transmission, according to the design of the project to draws up the transmission plan.

1.2 Select motor

Understand the type of motor, the efficiency of various types of mechanical transmission and the efficiency of the bearing, according to the motion parameters and dynamic parameters of the machine, calculate the main parameters of the motor, and determine the type of motor.

1.3 Calculate the total transmission ratio and transmission ratio distribution device

According to the motor and the working machine speed calculation of transmission ratio; understand the distribution principle of transmission ratio, assign of transmission ratio reasonably.

1.4 Calculation of motion and dynamic parameters of transmission device

Understand the power, speed, torque calculation formula, the calculation of each axis of motion parameters and dynamic parameters.

1.5 Design and calculation of transmission parts

According to the design methods and steps of the mechanical design basic teaching materials, to design belt drive and gear drive.

1.6 Preliminary design calculation of shaft

According to the design steps of the shaft, estimate the smallest shaft diameter, determines the size of diameter on the axial direction and the size of axis with different parts of the wheel.

Chapter 2 Assembly sketch design of reducer

Key point: Structural design of shafts and gears

The difficulties: Three views layout

2.1 Assembly drawing sketch steps

Firstly, estimate the length and width of the reducer, determine the position of the three view, Secondly, draw the main parts of the symmetrical line, contour line, and then determine the location of the box body wall line, at last check process personnel manual, determine the distance between parts and parts, draw a complete assembly drawing on the coordinate paper.

2.2 The determination of the relative position between the gear and the box

Access to relevant information to determine the relative position between the gear and the box.

2.3 Structural design of shaft

Firstly, understand the basic requirements of shaft design, then according to the preliminary design of shaft design, by modifying the complete assembly draft axis.

2.4 Check calculation of shaft and bearing

After the completion of the assembly sketch, the shaft size has been determined to complete, then can be used to calculate the axis of the combination of bending and torsion; According to the verification of the situation to decide whether to modify the shaft design. According to the axial stress, calculate the bearing force, then complete bearing life calculation; Based on the calculated results, determine whether to replace the bearing type or model.

2.5 Design of rolling bearing combination

According to the force of the shaft and the bearing life calculation, after comprehensive consideration, to determine the bearing combination design.

2.6 Structural design of transmission parts

According to the design calculation results of transmission parts, determine the structure of transmission parts. According to its structure, to make detailed design of transmission parts structure.

2.7 The design of box structure and accessories

According to the transmission power of the designed transmission, determine the body structure and wall thickness; according to the functional requirements of the designed transmission, select standard accessories and design non-standard accessories, and design to the appropriate location of the transmission device.

2.8 Check the assembly draft

First check the positioning and clamping of shaft and transmission parts, then check whether the structural design is reasonable, finally check the box, box cover and other parts of the structure design is reasonable.

Chapter 3 Assembly drawing design of reducer

Key point: Structural design of shafts and gears

The difficulties: The size of the correct annotation, technical requirements

3.1 View

Three views and partial views

3.2 Dimension marking

Four types of dimensions: dimensions, fit dimensions, connection dimensions and fit dimensions

3.3 Technical requirements and characteristics of reducer

The technical requirements of the reducer include assembly technical requirements, lubrication technical requirements, technical requirements of adjustment etc.

3.4 Part number, list and the title bar

According to the standard of engineering drawing, according to a certain law, write the standard number of parts, draw the list and title bar and fill in the complete.

3.5 Computer drawing reducer assembly drawings notice

The layer design (All lines and words cannot be designed in the default layer), linear design should be reasonably, font thickness also should be designed reasonably.

Chapter 4 The parts working drawing design of reducer

Key point: The fine structure design of parts

The difficulties: Correct dimensioning, shape and position tolerance, technical requirements

4.1 Working drawing of shaft parts

Select View reasonably, remove part drawing from assembly drawing, and complete the working drawings of parts, then dimensioning size and tolerances correctly.

4.2 Gear parts working drawing

Select the gear parts view reasonably, remove gear part drawing from assembly drawing, and complete the working drawings of parts, then dimensioning size and tolerances correctly.

4.3 Working drawings of box parts

Select the box parts view reasonably, remove box parts drawing from assembly drawing, and complete the working drawings of parts, then dimensioning size and tolerances correctly.

4.4 The computer drawing parts attention

Can be painted parts with arbitrary proportion drawing, after drawing then insert it into the frame.

Chapter 5 Writing the specification of design and calculation and reply

Key point: Strength check of shaft

The difficulties: Strength check of shaft

5.1 Content of design calculation instructions

There are 14 items in the design specification, can’t missing item. (1) Cover, directory, the title and page number; (2) Design specification, the original data, transmission device layout diagram; (3) A brief description of the transmission scheme and the characteristics of the design; (4) Selection of motor type; (5) Calculation of motion parameters; (6) Design and calculation of transmission parts; (7) Strength check of shaft; (8) Selection and life calculation of rolling bearings; (9) The selection and calculation of the key; (10) The selection of coupling; (11) Box design (design and calculation of main structural dimensions); (12) The choice of lubrication and sealing methods, the number of lubricating oil and oil loading, etc.; (13) Design summary and experience; (14) Reference material.

5.2 Requirements of design calculation specification

There are 6 requirements for the design specification. (1) According to the prescribed format; (2) Computing content to be complete, comprehensive; (3) The content of each calculation only needs to write the formula, the basis, the data and the conclusion. Do not have to write all the operation and modification process; (4) Should be accompanied by a schematic diagram of the calculation and the necessary structural design; (5) The language should be concise and fluent, the font should be neat, not altered; (6) The calculation results should have analysis and conclusion.

5.3 Design practice summary

Write your own experience and harvest in the design practice, also to put forward opinions and suggestions on the curriculum.

**3. Course Material**

**Required Text:**

Lu Yong Ming, Yun Ping Li, "Curriculum Design of Mechanical design", China University of Petroleum Press, 2007.9 First Edition, ISBN978-7-5636-2434-8.

**Required Reading**

1. Edited by Wu Zong Ze, Gao Zhi Tsinghua University; Writed by Luo Sheng Guo, Li Wei University of Science and Technology Beijing, "Mechanical Design Course Design Manual", Higher Education Press, 2012.5 Fourth Edition, ISBN978-7-04-034801-9.
2. Edited by Song Bao Yu Harbin Institute of Technology, "Mechanical design curriculum design guide book", Higher Education Press, 2006.8 First Edition,ISBN978-7-04-019505-7.
3. Edited by Zhang Jin Ming, "Mechanical design basis curriculum design", Southeast University Press, 2013.12 First Edition, ISBN978-7-5641-4664-1.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Evaluation 1 Attendance and Performance 15%

Evaluation 2 Design calculation 10%

Evaluation 3 Manual assembly drawing 25%

Evaluation 4 Computer drawing assembly drawing 20%

Evaluation 5 Computer drawing parts drawing 10%

Evaluation 6 Writing the specification of design and calculation 10%

Evaluation 7 Reply 10%

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview, sickness or visa issue) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

# 第四学年

## 第7学期

### 石油工程装备概论

**Course Syllabus**

**Introduction to the Oil Drilling and Production Equipment (411399)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 3 | Toal Course Hours | 48 |
| Lecture Hours | 36 | Experiment Hours | 0 |
| Programming Hours | 0 | Other Practical Hours | 12 |
| Course Instructors: Xu Xingping | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students will be able to :

1. Know something about exploring and drilling for oil and gas;
2. Know different rigs, such as land rig and offshore rigs;
3. Understand the drilling rig and its main components;
4. Understand the hoisting system and its working theory;
5. Understand the circulation system and its working theory and have a good master of mud pump;
6. Understand the rotation system and its working theory and have a good master of top drive drilling system and down hole motors;
7. Understand well control and its equipment;
8. Understand beam pumping systems and their main components;
9. Understand electric submersible pumps;
10. Know something about pipeline, its laying method and inspection.

**2. Course Content**

Chapter 1 Exploring and Drilling for Oil and Gas

1.1 Oil and gas

1.2 Oil and gas reservoirs

1.3 Drilling methods

1.4 drilling rigs

Chapter 2 Drilling rig

2.1 Introduction

2.2 Hoisting system

2.3 Rotating system

2.4 Circulating system

Chapter 3 Downhole motors

3.1 Turbine

3.2 Positive Displacement Motors

3.3 Electrically power motors

Chapter 4 Drilling tools

4.1 Drill pipe

4.2 Drill bits

4.3 Fishing tools

Chapter 5 Well control

5.1 Introduction

5.2 Blowout preventers

Chapter 6 Oil production

6.1 Introduction

6.2 Beam pumping system

6.3 Electric submersible pump

6.4 Progressing Cavity Pump

Chapter 7 Oil transporation

7.1 Introduction

7.2 pipeline laying

7.3 Pipeline pigs

Chapter 8 Introduction to UBD

8.1 Introduction

8.2 Air drilling

8.3 Foam drilling

8.4 Aerated drilling

**3. Course Material**

Required Text:

1. Oilwell Drilling, Paul Bommer, ISBN 0-88698-227-8, The University of Texas, 2008
2. Oil and gas production handbook, Håvard Devold, ISBN 978-82-997886-1-8, ABB, May 2009

Required Reading

1. 石油钻采机械概论, 李继志, ISBN978-7-5636-2994-7, 中国石油大学出版社, 2009.12

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (30%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Final-term exam (70%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

Other Items: other factors, such as class and group participation and puncture, regular attdendance may be used, at the professor’s discretion, to make adjustments to final grades in borderline cases. The instructor will assume that you are well prepared for class each week.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 计算机辅助机械工程

**Course Syllabus**

**Computer Aided Mechanical Engineering (0411099)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 4 | Toal Course Hours | 64 |
| Lecture Hours | 64 | Experiment Hours | / |
| Programming Hours | 0 | Other Practical Hours | / |
| Course Instructors: Gao Leilei | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students should be able to:

1. Understand the method of building 2-D sckech using Solidworks software for mechanical design;
2. Understand the method of building 3-D part model using Solidworks software for mechaincal design;
3. Understand the method of building assembly model using Solidworks software for mechanical design;
4. Be able to draw a part or assembly drawing, including the dimension of tolerance and fit;
5. Understand the basic principle of finite element analysis;
6. Understand the process of Ansys software;
7. Be able to build FEA model, and be able to finish a static analysis for mechanical parts.

**2. Course Description and Course Content**

**2.1 Course Descripion**

This course is designed for postgraduate students majoring in Machine Design & Manufacturing. The course includes two parts. One part is teaching Solidworks software and anthoer part is teaching Ansys software. Solidworks software is used for mechanical design, and ansys software is used for deformation and stress analysis. In this course, the method of buliding a 2-D model, 3-D model and engineering drawings of mechanical part will be teached. the method of building of a finite element model, definition and setting of material properties, method of finite element mesh division, and the use of post-processor will be also teached.

**2.2 Course Content**

Chapter 1 Introduction

* 1. Introduction of CAD、CAM and CAE
  2. The features and software introduction of AutoCAD and CAXA
  3. The features and software introduction of SolidWorks、UG、Pro/E
  4. The features and software introduction of ANSYS and Abaqus.

Chapter 2 How to bulid 3-D model by solidworks

2.1 Introduction of menu

2.2 How to finish a sketch

2.3 The use of extrude base feature for 3-D model

2.4 The use of revolved base feature for 3-D model

2.5 The use of lofted and swept feature for 3-D model Black-oil model

Chapter 3 How to build assembly

3.1 How to input a new part

3.2 The use of mate tool

3.3 How to change the part color

3.4 Creating a new animation

Chapter 4 Engineering drawings

4.1 The methof of changing drawings format

4.2 The method of adding the dimention and surface finish

4.3 The method of adding the geometric tolerance and ballon

Chapter 5 How to modify the part or assembly

5.1 Method of modify the sketch

5.2 Method of modify the feature

5.3 Method of modify the assembly

Chapter 6 Preprocessor of Ansys

6.1 The composition and function of the Pre-processor

6.2 The function of each component of the Pre-processor and

6.3 The setting steps of Pre-processor

6.4 The method of building a FEA model

Chapter 7 Meshing and Postprocessor of Ansys

7.1 Meshing method for link, beam, plane and solid element.

7.2 The set up for boundary condition

7.3 The check of deformation, stress, strain, axial force and other results

**3. Course Material**

**Required Text:**

1)SolidWorks 2018中文版从入门到精通, ISBN:978-7-115-49693-5, 潘春详, 人民邮电出版社,2019

2)Song Peng, ANSYS 15 finite element analysis from entry to master, China Machine Press, 2015.

**Required Reading**

1) Solidworks turorials from Solidworks software help file.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (40%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes may be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Final- assignment (60%): This component is based upon performance on your drawing of about 6-8 parts, including 3-D model, dimention, tolerance and the FEA results.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview, sickness or visa issue) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

### 机电系统设计

**Course Syllabus**

**Mechatronic System Design (413499)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Credits | 3 | Toal Course Hours | 48 |
| Lecture Hours | 48 | Experiment Hours | / |
| Programming Hours | / | Other Practical Hours | / |
| Course Instructors: Luo Cai | | | |
| Course Website: | | | |

**1. Objectives and Learning Outcomes**

Upon sucessful completion of the course, students should be able to:

1. Understand the concept and basic principles of MATLAB/SIMULINK and its applications in mechatronic field development;
2. Understand the basic MATLAB usage, and be able to derive the continuity equations for mechanics model and control model;
3. Understand how to design mechatronic model, simulate, and analyze systems whose outputs change over time;
4. Understand the basic solution methods for differential mechatronic control system equations;
5. Be able to explore the behavior of a wide range of real-world dynamic systems, including electrical circuits, shock absorbers, braking systems, and many other electrical, mechanical, and thermodynamic systems.

**2. Course Content**

**2.1 Course Descripion**

This course is designed for postgraduate students majoring in Mechatronic Engineering. In the mechatronics system, simulating a dynamic system is a two-step process with Simulink. First, students create a block diagram, using the Simulink model editor, which graphically depicts time-dependent mathematical relationships among the system’s inputs, states, and outputs. The students then commands Simulink to simulate the system represented by the model from a specified start time to a specified stop time.

**2.2 Course Content**

Chapter 1 How Simulink Works

1.1 Modeling Dynamic Systems.

1.2 Simulating Dynamic Systems.

1.3 Modeling and Simulating Discrete Systems.

Chapter 2 Starting Simulink .

2.1 Opening Models.

2.2 Model Editor.

2.3 Updating a Block Diagram.

Chapter 3 Creating a Model

3.1 Specifying Block Diagram Colors.

3.2 Connecting Blocks.

3.3 Annotating Diagrams.

Chapter 4 Working with Blocks

4.1 Editing Blocks.

4.2 Working with Block Parameters.

4.3 Working with Block Libraries.

Chapter 5 Working with Signals

5.1 Signal Basics

5.2 Determining output signal dimensions

5.3 Displaying signals represented

Chapter 6 Running Simulations

6.1 Simulation Basics

6.2 Choosing a solver

6.3 Importing and exporting simulation data

**3. Course Material**

Required Text:

1. MATLAB For Beginners: A Gentle Approach, [Peter I. Kattan](https://www.amazon.com/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Peter+I.+Kattan&text=Peter+I.+Kattan&sort=relevancerank&search-alias=books), 1438203098, Create Space Independent Publishing Platform, April 11, 2008
2. MATLAB for Engineers (5th Edition), Holly Moore, 0134589645,  Pearson; 5 edition, January 14, 2017

Required Reading

1. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers, Rudra Pratap, 0190602066, Oxford University Press, August 2, 2016
2. Programming and Engineering Computing with MATLAB 2018, Huei-Huang Lee, 1630571717, SDC Publications , April 2, 2018.

**4. Course Evaluation**

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, homework assignments, in-class activities and quizzes (20%): This component of the final grade is based upon your contribution to the class in the form of attendance, homework assignments, class activities and quizzes. Any number of unannounced quizzes amy be given druing the semester at the beginning of class or at the end of class. A quiz may cover material from the assigned reading, any previous class period, or the current class period.

Case studies (10%):

Final-term exam (70%): This component is based upon performance on one individual examination. The exam is mandatory. The exam will be closed book.

Other Items: other factors, such as class and group participation and puncture, regular attdendance may be used, at the professor’s discretion, to make adjustments to final grades in borderline cases. The instructor will assume that you are well prepared for class each week.

**5. Course Policies**

Attendance and preparation for class: You are expectecd to attend all scheduled class sessions with your reading and supplementary materials.

Absences: Absence from class is inexcusable and will result in a reduction in your performance evaluation. In the event you have an excused absence from the class (e.g. a job interview) you must contact the instructor ahead of time.

Assignments: In both the profesional and academic world, you must meet the deadlines.

第一学年

第1学期

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 课程编码 | 课程名称 | 学分 | 学时 | 讲授学时 | 实验 | 上机 |
| 2091199 | 初级汉语口语（2-1） | 4.0 | 64 | 64 |  |  |
| 2092199 | 初级汉语精读（2-1） | 4.0 | 64 | 64 |  |  |
| 0911199 | 高等数学(2-1) | 6.0 | 96 | 96 |  |  |
| 0434199 | 工程制图 | 4.0 | 64 | 64 |  |  |
| 0711299 | 程序设计 | 3.0 | 48 | 32 |  | 16 |
| 2092099 | 道德与法律 | 1.0 | 16 | 16 |  |  |
| 学期总计 | | 22.0 | 352 | 336 |  | 16 |

第2学期

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 课程编码 | 课程名称 | 学分 | 学时 | 讲授学时 | 实验 | 上机 |
| 2091299 | 初级汉语口语（2-2） | 4.0 | 64 | 64 |  |  |
| 2092299 | 初级汉语精读（2-2） | 4.0 | 64 | 64 |  |  |
| 0911299 | 高等数学(2-2) | 5.0 | 80 | 80 |  |  |
| 0711399 | 大学计算机 | 1.0 | 24 | 24 |  |  |
| 0931199 | 大学物理(2-1) | 4.0 | 64 | 64 |  |  |
| 0941199 | 大学物理实验(2-1) | 1.0 | 24 |  | 24 |  |
| 2010199 | 金工实习 | 2.0 | 2.0 周 |  |  |  |
| 学期总计 | | 21 | 320 | 296 | 24 |  |

夏季学期

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 课程编码 | 课程名称 | 学分 | 学时 | 实验 | 上机 |
| 0494499 | 工程测绘 | 1.0 | 1.0 周 |  |  |
| 学期总计 | | 1.0 |  |  |  |

第二学年

第3学期

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 课程编码 | 课程名称 | 学分 | 学时 | 讲授学时 | 实验 | 上机 |
| 2094199 | 中国概况（2-1） | 3.0 | 48 | 48 |  |  |
| 2095199 | 中级汉语（2-1） | 4.0 | 64 | 64 |  |  |
| 0540399 | 电工电子学（一） | 2.5 | 40 | 30 | 10 |  |
| 0641199 | 理论力学 | 3.0 | 48 | 48 |  |  |
| 0931299 | 大学物理(2-2) | 3.5 | 56 | 56 |  |  |
| 0941299 | 大学物理实验(2-2) | 1.0 | 24 |  | 24 |  |
| 学期总计 | | 17 | 280 | 246 | 34 |  |

第4学期

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 课程编码 | 课程名称 | 学分 | 学时 | 讲授学时 | 实验 | 上机 |
| 2094299 | 中国概况（2-2） | 3.0 | 48 | 48 |  |  |
| 2095299 | 中级汉语（2-2） | 4.0 | 64 | 64 |  |  |
| 0540499 | 电工电子学（二） | 2.5 | 40 | 30 | 10 |  |
| 0641299 | 材料力学 | 4.0 | 64 | 60 | 4 |  |
| 0435199 | 机械原理 | 4.0 | 64 | 64 |  |  |
| 学期总计 | | 17.5 | 280 | 266 | 14 |  |

夏季学期

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 课程编码 | 课程名称 | 学分 | 学时 | 实验 | 上机 |
| 0594199 | 电工电子学实习 | 2.0 | 2.0周 |  |  |
| 学期总计 | | 2.0 |  |  |  |

第三学年

第5学期

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 课程编码 | 课程名称 | 学分 | 学时 | 讲授学时 | 实验 | 上机 |
| 2096199 | 高级汉语（2-1） | 4.0 | 64 | 64 |  |  |
| 0419599 | 机械加工概论 | 4.0 | 64 | 56 | 8 |  |
| 0417799 | 互换性与技术测量基础 | 4.0 | 64 | 48 | 16 |  |
| 0419899 | 机械完整性检测 | 3.0 | 48 | 40 | 8 |  |
| 0413599 | 控制工程基础 | 4.0 | 64 | 64 |  |  |
| 学期总计 | | 19.0 | 304 | 272 | 32 |  |

第6学期

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 课程编码 | 课程名称 | 学分 | 学时 | 讲授学时 | 实验 | 上机 |
| 2096299 | 高级汉语（2-2） | 4.0 | 64 | 64 |  |  |
| 0435299 | 机械设计 | 4.0 | 64 | 64 |  |  |
| 0400599 | 机械制造工程 | 4.0 | 64 | 56 | 8 |  |
| 0412599 | 虚拟样机技术 | 3.0 | 48 | 32 | 16 |  |
| 0419799 | 机电一体化 | 3.0 | 48 | 40 | 8 |  |
| 学期总计 | | 18.0 | 288 | 256 | 32 |  |

夏季学期

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 课程编码 | 课程名称 | 学分 | 学时 | 实验 | 上机 |
| 0494699 | 机械设计课程设计 | 3.0 | 3周 |  |  |
| 学期总计 | | 3.0 | 3周 |  |  |

第四学年

第7学期

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 课程编码 | 课程名称 | 学分 | 学时 | 讲授学时 | 实验 | 上机 |
| 0411399 | 石油工程装备概论 | 3.0 | 48 | 48 |  |  |
| 0411099 | 计算机辅助机械工程 | 4.0 | 64 | 64 |  |  |
| 0413499 | 机电系统设计 | 3.0 | 48 | 40 | 8 |  |
| 学期总计 | | 10.0 | 160 | 152 | 8 |  |

第8学期

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 课程编码 | 课程名称 | 学分 | 学时 | 实验 | 上机 |
| 0499999 | 毕业设计 | 18.0 | 18周 |  |  |
| 学期总计 | | 18.0 |  |  |  |