

Wuxi University



## 09.1 Module Descriptions

Department of Automation

School of Automation

2025

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## Advanced Mathematics I(1)

Module designation	Advanced Mathematics I (1)
Semester(s) in which the module is taught	1 <sup>th</sup> semester
Person responsible for the module	Lecturer Yang Chunlong
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Lesson
Workload (incl. contact hours, self-study hours)	Total workload = 180 hours Contact hours = 96 hours Self-study hours = 84 hours
Credit points	6.0
Required and recommended prerequisites for joining the module	Elementary Mathematics
Module objectives/intended learning outcomes	To master the basic concepts, theories and methods of limits and continuity of functions, calculus of one-variable functions, ordinary differential equations, etc., and to lay the necessary mathematical foundation for the study of subsequent courses; to improve the ability of abstract thinking, logical reasoning and the ability of applying the knowledge of calculus to solve complex geometrical and physical problems; and to cultivate the scientific spirit of seeking truth from facts, thinking independently, and being brave to make innovations.
Content	<p><b>Chapter 1: Functions and Limits</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Mappings and Functions;  (2) Limits of Sequences;  (3) Limits of Functions;  (4) Infinitesimals and Infinity;  (5) Limit Operation Rules;  (6) Limit Existence Criteria &amp; Two Fundamental Limits;  (7) Comparison of Infinitesimals;  (8) Continuity and Discontinuities of Functions;  (9) Operations on Continuous Functions &amp; Continuity of Elementary Functions;  (10) Properties of Continuous Functions on Closed Intervals.</p> <p><b>Chapter 2 Derivatives and Differentials</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Concept of derivatives;</p>

	<p>(2) Derivative rules for functions;</p> <p>(3) Higher-order derivatives;</p> <p>(4) Derivatives of implicit functions and functions defined by parametric equations; related rates;</p> <p>(5) Differentials of functions.</p> <p><b>Chapter 3 Mean Value Theorems and Applications of Derivatives</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Mean value theorems of differential calculus;</p> <p>(2) L'Hôpital's Rule;</p> <p>(3) Taylor's formula;</p> <p>(4) Monotonicity of functions and concavity of curves;</p> <p>(5) Extrema of functions; maximum and minimum values;</p> <p>(6) Graphical representation of functions;</p> <p>(7) Curvature.</p> <p><b>Chapter 4 Indefinite Integrals</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Concept and properties of indefinite integrals;</p> <p>(2) Integration by substitution;</p> <p>(3) Integration by parts;</p> <p>(4) Integration of rational functions.</p> <p><b>Chapter 5 Definite Integrals</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Concept and properties of definite integrals;</p> <p>(2) Fundamental theorem of calculus;</p> <p>(3) Substitution method and integration by parts for definite integrals;</p> <p>(4) Improper integrals.</p> <p><b>Chapter 6 Applications of Definite Integrals</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Method of infinitesimal elements in definite integrals;</p> <p>(2) Geometric applications of definite integrals;</p> <p>(3) Physical applications of definite integrals.</p> <p><b>Chapter 7 Differential Equations</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Basic concepts of differential equations;</p> <p>(2) Separable differential equations;</p> <p>(3) Homogeneous equations;</p> <p>(4) First-order linear differential equations;</p> <p>(5) Higher-order differential equations reducible to lower order;</p> <p>(6) Higher-order linear differential equations;</p> <p>(7) Homogeneous linear differential equations with constant coefficients;</p> <p>(8) Nonhomogeneous linear differential equations with constant coefficients.</p>
Examination forms	Closed-book written exam

Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%</p> <p>Final assessment (closed-book written exam) accounts for 60%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Advanced Mathematics (Micro Course Edition) (2nd Edition), edited by Zhang Tao and Yin Junfeng, published by People's Posts and Telecommunications Press in 2022.</p> <p>[2] Advanced Mathematics (Economics and Management) (3rd edition), edited by the School of Mathematical Sciences, Tongji University, published by Tongji University Press in 2017.</p> <p>[3] Advanced Mathematics, edited by Luo Qinglai, Yu Dagang, and Song Baisheng, published by Southeast University Press in 2003.</p> <p>[4] Mathematical Analysis (5th edition), edited by the Department of Mathematics, East China Normal University, published by Higher Education Press in 2019</p> <p>[5] Guide to Complete Solutions of Higher Mathematics Exercises, edited by the School of Mathematical Sciences, Tongji University, published by Higher Education Press in 2023.</p> <p>[6] Advanced Mathematics Tutoring, edited by Sheng Xiangyao, Ge Yanlin, etc., published by Tsinghua University Press in 2013.</p> <p>[7] Advanced Mathematics (Micro-course Edition, Vol. 1) (2nd ed.), edited by Zhang Tao and Yin Junfeng, People's Posts and Telecommunications Publishing House, 2022.</p> <p>[8] Advanced Mathematics (Vol. 1), edited by Wang Shunfeng, Xia Dafeng et al., Higher Education Press, 2013.</p> <p>[9] Advanced Mathematics (Vol. 1), edited by Luo Qinglai, Yu Dagang, and Song Baisheng, Southeast University Press, 2003.</p> <p>[10] Mathematical Analysis (5th ed.), edited by the Department of Mathematics, East China Normal University, Higher Education Press, 2019.</p> <p>[11] Advanced Mathematics Tutorial (Vol. 1), edited by Sheng Xiangyao, Ge Yanlin et al., Tsinghua University Press, 2013.</p>
Data of last amendment	August 2024

## Advanced Mathematics I(2)

Module designation	Advanced Mathematics I (2)
Semester(s) in which the module is taught	Second Semester
Person responsible for the module	Associate Professor Yuan Junli
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Lesson
Workload (incl. contact hours, self-study hours)	Total workload = 180 hours Contact hours = 96 hours Self-study hours = 84 hours
Credit points	6.0
Required and recommended prerequisites for joining the module	Advanced Mathematics I (1)
Module objectives/intended learning outcomes	To master the basic concepts, theories and methods of limits and continuity of functions, calculus of one-variable functions, ordinary differential equations, etc., and to lay the necessary mathematical foundation for the study of subsequent courses; to improve the ability of abstract thinking, logical reasoning and the ability of applying the knowledge of calculus to solve complex geometrical and physical problems; and to cultivate the scientific spirit of seeking truth from facts, thinking independently, and being brave to make innovations.
Content	<p><b>Chapter 8 Vector Algebra and Analytic Geometry of Space</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Vectors and their linear operations;  (2) Dot product; Cross product;  (3) Planes and their equations;  (4) Spatial lines and their equations;  (5) Surfaces and their equations;  (6) Space curves and their equations.</p> <p><b>Chapter 9 Differential Calculus of Multivariable Functions and Its Applications</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Basic concepts of multivariable functions;  (2) Partial derivatives;  (3) Total differential;  (4) Differentiation rules for multivariate composite functions;  (5) Differentiation formulas for implicit functions;</p>

	<p>(6) Geometric applications of multivariable differential calculus;</p> <p>(7) Directional derivatives and gradients;</p> <p>(8) Extrema of multivariable functions and their computation.</p> <p><b>Chapter 10 Multiple Integrals</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Concept and properties of double integrals;</p> <p>(2) Computation methods for double integrals;</p> <p>(3) Triple integrals;</p> <p>(4) Applications of multiple integrals.</p> <p><b>Chapter 11 Line Integrals and Surface Integrals</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Line integrals with respect to arc length;</p> <p>(2) Line integrals with respect to coordinates;</p> <p>(3) Green's theorem and its applications;</p> <p>(4) Surface integrals with respect to area;</p> <p>(5) Surface integrals with respect to coordinates;</p> <p>(6) Gauss's theorem;</p> <p>(7) Stokes' theorem.</p> <p><b>Chapter 12 Infinite Series</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Concepts and properties of constant-term series;</p> <p>(2) Convergence tests for constant-term series;</p> <p>(3) Power series;</p> <p>(4) Expanding functions into power series;</p> <p>(5) Fourier series.</p>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>The course assessment comprises: classroom participation and discussions with post-class feedback performance (40%) + summative assessment (60%).</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Advanced Mathematics (Micro-course Edition, Vol. 2) (2nd ed.), edited by Zhang Tao and Yin Junfeng, People's Posts and Telecommunications Publishing House, 2022.</p> <p>[2] Advanced Mathematics (Vol. 2), edited by Wang Shunfeng, Xia Dafeng et al., Higher Education Press, 2013.</p> <p>[3] Advanced Mathematics (Vol. 2), edited by Luo Qinglai, Yu Dagang, and Song Baisheng, Southeast University Press, 2003.</p> <p>[4] Mathematical Analysis (5th ed.), edited by the Department of Mathematics, East China Normal University, Higher Education Press, 2019.</p> <p>[5] Advanced Mathematics Tutorial (Vol. 2), edited by Sheng Xiangyao, Ge Yanlin et al., Tsinghua University Press, 2013.</p>

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## Linear Algebra

Module designation	Linear Algebra
Semester(s) in which the module is taught	Second Semester
Person responsible for the module	Associate Professor Zhu Fengqin
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Lesson, discussion, and exercise
Workload (incl. contact hours, self-study hours)	Total workload = 90 hours Contact hours = 48 hours Self-study hours = 42 hours
Credit points	3.0
Required and recommended prerequisites for joining the module	Advanced Mathematics
Module objectives/intended learning outcomes	The main tasks are to study determinants, matrix theory, linear dependence of vectors, systems of linear equations, quadratic forms, and related knowledge. Students will master the basic concepts, understand the basic theories and methods of linear algebra, initially grasp its fundamental ideas and approaches, and develop the ability to analyze and solve practical problems using linear algebra.
Content	<p>Chapter 1 Determinants</p> <p>1. Teaching Content</p> <p>(1) Second-order and third-order determinants;</p> <p>(2) Permutations and inversions;</p> <p>(3) Definition of n-order determinants;</p> <p>(4) Properties of determinants;</p> <p>(5) Expansion of determinants by rows or columns.</p> <p>Chapter 2 Matrices and Their Operations</p> <p>1. Teaching Content</p> <p>(1) The concept of systems of linear equations and the corresponding matrix representations;</p> <p>(2) Matrix operations; block matrices;</p> <p>(3) Inverse matrices;</p> <p>(4) Cramer's rule;</p> <p>(5) Matrix partitioning.</p> <p>Chapter 3: Elementary Transformations of Matrices and Systems of Linear Equations</p> <p>1. Teaching Content</p>

	<p>(1) Elementary transformations of matrices;  (2) Rank of matrices;  (3) Solutions of systems of linear equations.</p> <p>Chapter 4 Linear Dependence of Vector Groups  1. Teaching Content  (1) Vector groups and their linear combinations;  (2) Linear dependence and independence of vector groups;  (3) Rank of vector groups;  (4) Vector spaces;  (5) Structure of solutions to systems of linear equations.</p> <p>Chapter 5 Similar Matrices and Quadratic Forms  1. Teaching Content  (1) Inner product, length, and orthogonality of vectors;  (2) Eigenvalues and eigenvectors of square matrices;  (3) Similar matrices;  (4) Diagonalization of real symmetric matrices;  (5) Quadratic forms and their standard forms;  (6) Positive definite quadratic forms.</p>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40% (consisting of homework 20% + classroom discipline and participation 10% + midterm exam 10%)  Final assessment (closed-book written exam) accounts for 60%.</p>
Reading list	<p>1. Required books</p> <p>[1] Linear Algebra (2nd Edition), edited by Pu Yanmin and Yin Junfeng, People's Posts and Telecommunications Press, 2022.</p> <p>[2] Linear Algebra, edited by Kong Xinlei and Sun Mingzheng, Tsinghua University Press, 2021.</p> <p>[3] Linear Algebra and Its Applications (2nd Edition), written by Mao Lixin, Xian Meixin, and Yang Zhiyan, Higher Education Press, 2022.</p> <p>[4] Linear Algebra (Original 10th Edition), by Steven J. Leon and Lisette G. de Pillis, translated by Zhang Wenbo and Zhang Lijing, 2023.</p>
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## Probability Theory and Statistics

Module designation	Probability Theory and Statistics
Semester(s) in which the module is taught	Third Semester
Person responsible for the module	Lecturer Zhang Guangle
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Lesson, discussion-based teaching, case-based teaching, etc.
Workload (incl. contact hours, self-study hours)	Total workload = 90 hours Contact hours = 48 hours Self-study hours = 42 hours
Credit points	3.0
Required and recommended prerequisites for joining the module	Advanced Mathematics, Linear Algebra
Module objectives/intended learning outcomes	Through this course, students will understand and master the basic concepts of probability theory and mathematical statistics, understand their basic theories and research methods, guide students to transition from traditional deterministic thinking modes to stochastic thinking modes, train their mathematical thinking, enhance their logical thinking and reasoning abilities, and cultivate their basic abilities and qualities in applying probability and statistical knowledge and methods to analyze and solve practical problems. This will lay a necessary and solid mathematical foundation for students' subsequent professional courses and even for handling practical problems in future work and life.
Content	<p><b>Chapter 1: Random Events and Probability</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Random events; (2) Probability; (3) Conditional probability; (4) Independence of events.</p> <p><b>Chapter 2: Random Variables and Their Distributions</b></p> <p><b>Teaching Content</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Random variables and distribution functions; (2) Discrete random variables; (3) Continuous random variables; (4) Distributions of functions of random variables.</p> <p><b>Chapter 3: Multidimensional Random Variables and Their Distributions</b></p>

	<p><b>1. Teaching Content</b></p> <p>(1) Two-dimensional random variables and their distributions;  (2) Marginal distributions and independence of random variables;  (3) Distributions of functions of two-dimensional random variables.</p> <p><b>Chapter 4: Numerical Characteristics and Limit Theorems</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Mathematical expectation;  (2) Variance;  (3) Covariance and correlation coefficient;  (4) Law of Large Numbers and Central Limit Theorem.</p> <p><b>Chapter 5: Statistics and Their Distributions</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Population, sample, and statistics;  (2) Sampling distributions.</p> <p><b>Chapter 6: Parameter Estimation</b></p> <p><b>This chapter corresponds to sub-objectives 1.6, 2.1, and 2.2 of the course teaching objectives, as well as sub-objectives 3.1, 3.2, and 3.3 of the course educational objectives.</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Point estimation;  (2) Interval estimation.</p> <p><b>Chapter 7: Hypothesis Testing</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Basic concepts of hypothesis testing;  (2) Hypothesis testing of parameters of normal populations.</p>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Forms of the course assessment include discussion in class and feedback after class (40%) + result-based assessment (60%).</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Probability Theory and Mathematical Statistics, edited by Cao Guangxi, Meng Xiangrui, and Wang Bei, published by Higher Education Press in 2021;</p> <p>[2] Probability Theory and Mathematical Statistics (5th Edition), edited by Sheng Zhou and Xie Qianshi, published by Higher Education Press in 2019;</p> <p>[3] Learning Guidance and Exercise Selection for Probability Theory and Mathematical Statistics, edited by Sheng Zhou and Xie Qianshi, published by Higher Education Press in 2003;</p> <p>[4] Textbook on Probability Theory and Mathematical Statistics, edited by Mao Shisong, published by Higher Education Press in 2011;</p> <p>[5] Probability Theory and Mathematical Statistics, edited by Chen Xiru,</p>

	published by Higher Education Press in 2009.
Data of last amendment	August 2024

## Complex Function and Integral Transformation

Module designation	Complex Functions and Integral Transformation
Semester(s) in which the module is taught	Third Semester
Person responsible for the module	Associate Professor Zhu Fengqin
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Combining Lecturing with Practice
Workload (incl. contact hours, self-study hours)	Total workload =60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	Advanced Mathematics, Linear Algebra
Module objectives/intended learning outcomes	This course consists of two parts: Complex Functions and Integral Transforms. Through the study of Complex Functions, students will understand fundamental concepts and related theories such as complex functions, analytic functions, complex integrals, Taylor series, Laurent series, and residues, thereby laying a solid theoretical foundation for the subsequent study of Integral Transform theory. Integral Transforms introduces the two most basic types of integral transforms: Fourier Transform and Laplace Transform, enabling students to comprehend their definitions and practical significance. Students will also grasp the relationships between these two transforms, understand their properties and calculations, and gain a preliminary understanding of their basic applications. Through the study of this course, students will master the basic theories and methods of the course and develop the ability to apply complex function and integral transform techniques to solve practical problems. Additionally, the course aims to cultivate students' abstract thinking and logical reasoning abilities, thereby laying a solid mathematical and physical foundation for subsequent courses and practical engineering applications.
Content	<b>Chapter 1 Complex Numbers and Complex Functions</b> <b>1. Teaching Content</b> (1) Complex Numbers; (2) Trigonometric Representation of Complex Numbers; (3) General Concepts of Plane Point Sets; (4) Complex Functions.

	<p><b>Chapter 2: Analytic Functions</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Concept of Analytic Functions</p> <p>(2) Elementary Functions</p> <p><b>Chapter 3: Integration of Complex Functions</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Concept of Complex Integrals: Definition and introduction.</p> <p>(2) Cauchy's Integral Theorem: Statement, conditions, and implications.</p> <p>(3) Cauchy's Integral Formula: Derivation and applications.</p> <p>(4) Higher-Order Derivatives of Analytic Functions: Calculation methods and properties.</p> <p><b>Chapter 4: Series Representation of Analytic Functions</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Complex-number term series;</p> <p>(2) Series of complex-variable function terms;</p> <p>(3) Taylor series;</p> <p>(4) Laurent series.</p> <p><b>Chapter 5: Residues and Their Applications</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Isolated singularities;</p> <p>(2) Residues.</p> <p><b>Chapter 6: Fourier Transform</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Concept of Fourier Transform;</p> <p>(2) Properties of Fourier Transform.</p> <p>Chapter Seven: Laplace Transform</p> <p>1. Teaching Content</p> <p>(1) Concept of Laplace Transform;</p> <p>(2) Properties of Laplace Transform;</p> <p>(3) Inverse Laplace Transform.</p>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Forms of the course assessment include discussion in class and feedback after class (40%) + result-based assessment (60%).</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Functions of Complex Variables, compiled by the Advanced Mathematics Teaching and Research Section of Xi'an Jiaotong University, Higher Education Press, June 2023 edition.</p> <p>[2] Integral Transforms, compiled by the Department of Mathematics of Southeast University, Higher Education Press, 2003 edition.</p> <p>[3] Functions of Complex Variables and Integral Transforms, compiled by the Department of Mathematics of Huazhong University of Science and</p>

	<p>Technology, Higher Education Press, 1999 edition.</p> <p>[4] Functions of Complex Variables and Integral Transforms, by Gai Yunying and Bao Gejun, Science Press, 2005 edition.</p> <p>[5] Functions of Complex Variables and Integral Transforms, compiled by Liu Hong'ai et al., Jiangsu University Press, 2018 edition.</p>
Data of last amendment	August 2024

## College Physics II(1)

Module designation	College Physics II(1)
Semester(s) in which the module is taught	Semester 2
Person responsible for the module	Lecturer Liu Xiaodan
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Organic integration of online learning and offline classroom teaching.
Workload (incl. contact hours, self-study hours)	Total workload =90 hours Contact hours = 48 hours Self-study hours = 42 hours
Credit points	3.0
Required and recommended prerequisites for joining the module	Advanced Mathematics
Module objectives/intended learning outcomes	Learning through College Physics II(1), it can enable students to have a more systematic understanding and correct understanding of the basic concepts, theories and methods of physical knowledge such as particle kinematics and particle dynamics, particle (system) motion theorem and mechanical energy conservation law, momentum conservation law, angular momentum conservation law and rigid body dynamics, vibration and fluctuation, special relativity and gas dynamics theory, laying a solid foundation for further study of subsequent professional courses. In each teaching link of college physics course, we should not only impart knowledge, but also pay attention to the cultivation of students' ability to analyze and solve problems, the cultivation of students' exploration spirit and innovation consciousness, and strive to realize the coordinated development of students' knowledge, ability and quality in 3 aspects.
Content	<p><b>Chapter 1 Motion of the particle</b></p> <p><b>1. Teaching content</b></p> <p>(1) Mass and reference system;  (2) Describe the physical quantities of particle motion;  (3)The coordinate system describing the motion of the particle;  (4) Newton's law of motion;  (5) common forces in mechanics;  (6) Galileo's principle of relativity.</p> <p><b>Chapter 2 The Law of Conservation of Mechanical Energy</b></p> <p><b>1. Teaching content</b></p>

	<p>(1) work and power;  (2) kinetic energy and kinetic energy theorem;  (3) potential energy;  (4) the law of conservation of mechanical energy.</p> <p><b>Chapter 3 The Law of Conservation of Momentum</b></p> <p><b>1. Teaching content</b></p> <p>(1) momentum and momentum theorem;  (2) the momentum theorem of the particle system and the theorem of the hanging center motion;  (3) the law of conservation of momentum;  (4) The collision.</p> <p><b>Chapter 4 Law of Conservation of Angular Momentum</b></p> <p><b>1. Teaching content</b></p> <p>(1) Torque;  (2) The law of conservation of particle angular momentum.</p> <p><b>Chapter 5 Rigid Body Mechanics</b></p> <p><b>1. Teaching content</b></p> <p>(1) movement of rigid body;  (2) Rigid body dynamics;  (3) The law of conservation of angular momentum of a fixed-axis rotating rigid body.</p> <p><b>Chapter 7 Vibration and Fluctuation</b></p> <p><b>1. Teaching content</b></p> <p>(1) Simple harmonic vibration;  (2) superposition of harmonic vibration;  (3) Basic concepts of volatility;  (4) Simple harmonic;  (5) wave interference.</p> <p><b>Chapter 9 Basic Properties of Gases</b></p> <p><b>1. Teaching content</b></p> <p>(1) Gas dynamic theory and ideal gas model;  (2) the pressure and temperature of the ideal gas;  (3) The internal energy of the ideal gas.</p>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>The course assessment methods include: usual scores (40%, including mid-term Test 10% + course assignment 20% + classroom performance 10%) + result assessment (60%).</p>
Reading list	<p><b>1. recommend teaching material</b></p> <p>Physics (Fifth Edition), edited by Liu Kezhe and others, Higher Education Press, 2018.</p> <p><b>2. Bibliography and Literature</b></p>

	<p>[1] Physics (3rd Edition) (Part I), edited by Zhang Sanhui, Higher Education Press, 2017.</p> <p>[2] Physics (6th Edition) (upper and lower), edited by Ma Wenwei, Higher Education Press, 2014.</p> <p>[3] Principles of Physics (Third Edition), edited by Serway &amp; Jewett, Tsinghua University Press, 2004.</p> <p>[4] General Physics (6th Edition), edited by Cheng Shouzhu, Higher Education Press, 2006</p> <p>[5] New College Physics Course, edited by Guo Zhenping, Science Press, 2016.</p> <p>[6] College Physics (Part I), edited by Liu Bo, Science Press, 2019.</p> <p>3. Online Learning Resources: Resources of the University Physics Teaching and Research Section: <a href="https://mooc1.chaoxing.com/course/240597803.html">https:// mooc1.chaoxing.com/course/240597803.html</a></p>
Data of last amendment	August 2024

## College Physics II(2)

Module designation	College Physics II(2)
Semester(s) in which the module is taught	The 3rd Semester
Person responsible for the module	Lecturer Yang Yinbiao
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	The teaching method involves an organic integration of online learning and offline classroom lectures.
Workload (incl. contact hours, self-study hours)	Total workload =90 hours Contact hours = 48 hours Self-study hours = 42 hours
Credit points	3.0
Required and recommended prerequisites for joining the module	Advanced Mathematics, College Physics II(1)
Module objectives/intended learning outcomes	By studying the 'College Physics II (2)' course, students can gain a systematic understanding and correct comprehension of the basic concepts, theories, and methods of physical knowledge such as electrostatic fields, steady magnetic fields, electromagnetic induction, wave optics, and waves and particles, which will lay a solid foundation for further study of subsequent courses. Throughout the teaching process of the college physics course, while imparting knowledge, great emphasis is laid upon cultivating students' problem-analysis and problem-solving abilities, as well as their spirit of exploration and innovation, striving to achieve the coordinated development of students' knowledge, abilities, and qualities.
Content	<p><b>Chapter 10 Charge and Electrostatic Field</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Charge and Coulomb's Law;  (2) Electric Field and Electric Field Intensity;  (3) Gauss's Theorem;  (4) Electric Potential and Its Relationship with Electric Field Intensity;  (5) Metal Conductors in Electrostatic Fields;  (6) Capacitance and Capacitors;  (7) Dielectrics in Electrostatic Fields;  (8) Energy of Electrostatic Fields.</p> <p><b>Chapter 11 Current and Steady Magnetic Field</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Conditions for Steady Current and Conductivity Laws;</p>

	<p>(2) Magnetic Field and Magnetic Induction Intensity;  (3) Biot - Savart Law;  (4) Gauss's Theorem of Magnetic Field and Ampere's Circuital Law;  (5) The Action of Magnetic Field on Current;  (6) The Action of a Magnetic Field on Charged Particles;  (7) Magnetization of Magnetic Media.</p> <p><b>Chapter 12 Electromagnetic Induction</b>  <b>1. Teaching Content</b>  (1) Electromagnetic induction and its basic laws;  (2) Mutual inductance and self-inductance;  (3) Energy of the magnetic field.</p> <p><b>Chapter 14 Optics</b>  <b>1. Teaching Content</b>  (1) Basic Laws and Principles in Geometric Optics;  (2) Light Waves and Their Coherence Conditions;  (3) Young's Double - Slit Interference;  (4) Thin - Film Interference;  (5) Huygens - Fresnel Principle and Classification of Diffraction Phenomena;  (6) Fraunhofer Diffraction of Single Slit and Circular Aperture;  (7) Diffraction Grating;  (8) Applications of Diffraction Laws.</p> <p><b>Chapter 15 Waves and Particles</b>  <b>1. Teaching Content</b>  (1) Black - Body Radiation;  (2) Photoelectric Effect;  (3) Compton Effect.</p>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>The assessment methods for this course include discussion in class and feedbacks after class (40%) + result-based assessment (60%).</p>
Reading list	<p><b>1. Recommended Textbooks</b>  Physics (5th Edition), edited by Liu Kezhe, et al., Higher Education Press, 2019.</p> <p><b>2. Reference Books and Literature</b>  [1] Physics (3rd Edition) (Volume I), edited by Zhang Sanhui, Higher Education Press, 2017.  [2] Physics (6th Edition) (Volumes I and II), edited by Ma Wenwei, Higher Education Press, 2014.  [3] Principles of Physics (Third Edition), by Serway &amp; Jewett, Tsinghua University Press, 2004.  [4] General Physics (6th Edition), edited by Cheng Shouzhu, et al., Higher</p>

	Education Press, 2006. [5] New College Physics Tutorial, edited by Guo Zhenping, Science Press, 2016. [6] College Physics (Volume I), edited by Liu Bo, Science Press, 2019.
Data of last amendment	August 2024

## College Physics Experiment II

Module designation	College Physics Experiment II
Semester(s) in which the module is taught	3 <sup>rd</sup> semester
Person responsible for the module	Lecturer Yang Yinbiao
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	This course adopts an integrated approach that combines online learning with offline classroom instruction and laboratory practice.
Workload (incl. contact hours, self-study hours)	Total workload = 90 hours Contact hours = 48 hours Self-study hours = 42 hours
Credit points	3.0
Required and recommended prerequisites for joining the module	College Physics
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Master the theories of experimental error and uncertainty, and understand their significance in physical measurements.</li> <li>2. Grasp the basic methods of experimental data processing, such as the tabulation method, difference method, and graphical method.</li> <li>3. Master the measurement techniques of typical physical quantities, including length, time, temperature, velocity, current, voltage, and resistance.</li> <li>4. Become familiar with the structure and operational principles of common experimental instruments, and master their correct usage.</li> <li>5. Understand the fundamental principles and important applications of various physics experiments.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Be able to independently complete assigned experimental projects after preparation, with standardized operation, accurate data recording and processing, reasonable results, and reliable conclusions.</li> <li>2. Possess a preliminary ability to analyze sources of experimental</li> </ol> </li> </ul>

	<p>error and assess their impact on results.</p> <ol style="list-style-type: none"> <li>3. Develop an initial ability to relate theory to practice, using theoretical knowledge to analyze and interpret experimental phenomena.</li> <li>4. Be able to objectively evaluate experimental results and write qualified laboratory reports that meet academic standards.</li> </ol> <p>● <b>Competence:</b></p> <ol style="list-style-type: none"> <li>1. Cultivate a scientific attitude of seeking truth from facts and a serious, responsible work ethic that emphasizes the integration of theory with practice.</li> <li>2. Foster an enterprising and inquisitive spirit, constantly striving for improvement and excellence in experimental exploration.</li> <li>3. Develop a collaborative mindset, encouraging mutual cooperation and collective inquiry among classmates in experimental work.</li> </ol>
Content	<p><b>Experiment teaching</b> (48 contact hours; 42 self-study hours)</p> <p><b>Chapter 1 Introduction</b></p> <p>(3 contact hours; 2 self-study hours)</p> <p>1. Teaching Content</p> <ol style="list-style-type: none"> <li>(1) Status, Role, and Objectives of Physics Experiments Electric Field and Electric Field Intensity.</li> <li>(2) Course Structure, Teaching Requirements, and Measurement Fundamentals.</li> <li>(3) Uncertainty Theory and Data Processing Methods.</li> </ol> <p><b>Chapter 2 Length Measurement</b></p> <p>(3 contact hours; 2 self-study hours)</p> <p>1. Teaching Content</p> <ol style="list-style-type: none"> <li>(1) Principle of vernier and micrometer screw devices.</li> <li>(2) Use of vernier caliper and micrometer.</li> <li>(3) Data processing.</li> </ol> <p><b>Chapter 3 Measurement of Object Density</b></p> <p>(3 contact hours; 2 self-study hours)</p> <p>1. Teaching Content</p> <ol style="list-style-type: none"> <li>(1) Application of force sensors.</li> <li>(2) Measurement of regular object density using measurement rules.</li> <li>(3) Measurement of irregular object density using the hydrostatic balance method.</li> </ol> <p><b>Chapter 4 Measurement of Moment of Inertia Using a Trifilar Pendulum</b></p>

	<p>(3 contact hours; 2 self-study hours)</p> <p>1. Teaching Content</p> <p>(1) Measure the moment of inertia of a ring and a cylinder about their symmetric axes using a trifilar pendulum.</p> <p>(2) Verify the parallel axis theorem.</p> <p><b>Chapter 5 Moment of Inertia About the Symmetric Axis</b></p> <p>(3 contact hours; 3 self-study hours)</p> <p>1. Teaching Content</p> <p>(1) Measure the moment of inertia of an object about its symmetric axis.</p> <p>(2) Verify the parallel axis theorem</p> <p><b>Chapter 6 Measurement of Liquid Viscosity Using the Falling Ball Method</b>(3 contact hours; 2 self-study hours)</p> <p>(1) Phenomenon of internal friction and viscosity in liquids.</p> <p>(2) Basic principle of measuring viscosity using the falling ball method.</p> <p><b>Chapter 7 Measurement of Resistance Using a Wheatstone Bridge</b></p> <p>(3 contact hours; 2 self-study hours)</p> <p>(1) Basic principle and operation method of measuring resistance with a Wheatstone bridge.</p> <p>(2) Structure of the box-type bridge.</p> <p>(3) Wiring method of the panel-type bridge.</p> <p><b>Chapter 8 Use of the Oscilloscope</b></p> <p>(3 contact hours; 3 self-study hours)</p> <p>(1) Structure and basic working principle of the oscilloscope.</p> <p>(2) Methods for measuring the voltage and period of signals using the oscilloscope.</p> <p>(3) Measurement of sine wave frequency using Lissajous figures.</p> <p><b>Chapter 9 Measurement of Lens Curvature Radius Using Newton's Rings</b>(3 contact hours; 3 self-study hours)</p> <p>(1) Observe equal-thickness interference phenomena and understand the characteristics of equal-thickness interference to deepen the understanding of the wave nature of light.</p> <p>(2) Learn to use Newton's rings to measure the curvature radius of a lens.</p> <p><b>Chapter 10 Measurement of Solution Concentration Using a Polarimeter</b></p> <p>(3 contact hours; 3 self-study hours)</p> <p>(1) Observe the optical rotation phenomenon of linearly polarized</p>
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	<p>light passing through optically active substances and understand the structure and working principle of the polarimeter.</p> <p>(2) Use the polarimeter to measure the optical rotation and concentration of optically active solutions.</p> <p><b>Chapter 11 Measurement of Young's Modulus of a Metal Wire Using the Static Tensile Method</b></p> <p>(3 contact hours; 3 self-study hours)</p> <p>(1) Principle and method of measuring small elongation using the optical lever method.</p> <p>(2) Data processing using the method of successive differences.</p> <p>(3) Estimation of the uncertainty of a single measurement.</p> <p><b>Chapter 12 Measurement of the Surface Tension Coefficient of a Liquid</b>(3 contact hours; 3 self-study hours)</p> <p>(1) Concept of surface tension and surface tension coefficient.</p> <p>(2) Force analysis during the stretching process of a liquid film and derivation of the measurement formula for the surface tension coefficient.</p> <p>(3) Use of a force sensor.</p> <p><b>Chapter 13 Measurement of Temperature Using a Thermocouple and Determination of the Temperature Coefficient of Platinum</b>(3 contact hours; 3 self-study hours)</p> <p>(1) Principle of measuring the temperature coefficient of metal resistance.</p> <p>(2) Principle and method of temperature measurement using a thermocouple.</p> <p>(3) Data processing — graphical method.</p> <p><b>Chapter 14 Hall Effect and Its Applications</b></p> <p>(3 contact hours; 3 self-study hours)</p> <p>(1) Mechanism of the Hall effect.</p> <p>(2) Characteristics of Hall elements and applications of the Hall effect.</p> <p>(3) Data processing using the graphical method.</p> <p><b>Chapter 15 Michelson Interferometer</b></p> <p>(3 contact hours; 3 self-study hours)</p> <p>(1) Structure, working principle, and adjustment method of the Michelson interferometer.</p> <p>(2) Principle and method of measuring the wavelength of He–Ne laser light using the Michelson interferometer.</p> <p><b>Chapter 16 Measurement of the Speed of Light</b></p> <p>(3 contact hours; 3 self-study hours)</p>
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	<p>(1) Structure, working principle, and adjustment method of the light speed measurement apparatus.</p> <p>(2) Relationship between prism displacement and phase variation.</p> <p>(3) Modulation of light.</p> <p><b>(4) Methods of phase measurement.</b></p>
Examination forms	Assessment (Laboratory Report)
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>The assessment methods for this course include 30% regular performance (attendance 10% + pre-lab reports 10% + lab performance 10%) and 70% result-based assessment.</p>
Reading list	<p><b>1.Recommended book:</b></p> <p>Chen, Y. College physics experiments. Shanghai Jiao Tong University Press, 2024.</p> <p><b>2.References:</b></p> <p>[1] Liu, W. (2022). College physics experiment tutorial. Higher Education Press.</p> <p>[2] Wu, P. (2024). Physics experiment tutorial for science majors. Tsinghua University Press.</p> <p>[3] Du, H. (2020). College physics experiments. Science Press.</p> <p>[4] You, B., et al. (2021). College physics experiments – Basic and advanced edition. Higher Education Press.</p> <p>[5] Pu, T., et al. (2018). College physics experiments(2nd ed.). Tsinghua University Press.</p>
Data of last amendment	August 2024

### An Introduction to Professions

Module designation	An Introduction to Professions
Semester(s) in which the module is taught	1 <sup>th</sup> semester
Person responsible for the module	Lecturer Xi Wanqiang
Language	Chinese
Relation to curriculum	Compulsory

Teaching methods	Theoretical teaching
Workload (incl. contact hours, self-study hours)	Total workload = 30 hours Contact hours = 16 hours Self-study hours = 14 hours
Credit points	1.0
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Understand the core concepts, principles, and applications of automation technology.</li> <li>2. Familiarize with the structure and working mechanisms of automation systems.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Analyze and explain common control phenomena and automation technologies.</li> <li>2. Understand the design and implementation of feedback control systems.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Develop an awareness of the environmental and societal impacts of automation technology.</li> <li>2. Cultivate a mindset for lifelong learning and continuous professional development.</li> </ol> </li> </ul>
Content	<p><b>Theoretical teaching</b> (16 contact hours; 14 self-study hours)</p> <p><b>Chapter 1 Introduction</b> (4 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of automation concepts, history, and applications.</li> </ul> <p><b>Chapter 2 Basic Control Methods</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Study of open-loop, feedback, compensation, and composite control systems.</li> </ul> <p><b>Chapter 3 Control Techniques</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Introduction to PID control and intelligent control methods.</li> </ul> <p><b>Chapter 4 Applications of Automation</b> (4 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Exploration of automation applications in various industries.</li> </ul>
Examination forms	Course report
Study and examination requirements	Regular Grades (30%): Homework assignments (30%): Assess understanding of automation concepts, control methods, and applications.

	<p>Summative Assessment (70%):</p> <p>Course Report (70%): Submit a detailed report covering automation concepts, societal impacts, and personal learning reflections.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Zhao Yao. Introduction to Automation (2nd Edition) [M]. Beijing: Mechanical Industry Press, 2014.</p> <p><b>2. Reference books</b></p> <p>[1] Wan Baiwu. Introduction to Automation (4th Edition) [M]. Wuhan: Wuhan University of Technology Press, 2019.</p> <p>[2] Zhou Xianzhong. Introduction to Automation (3rd Edition) [M]. Beijing: Science Press, 2022.</p>
Data of last amendment	April 2025

## Engineering Drawing

Module designation	Engineering Drawing
Semester(s) in which the module is taught	1 <sup>th</sup> semester
Person responsible for the module	Lecturer Dai Xuesong
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	An Introduction to Professions
Requirements according to the examination regulations	Only students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> Master the basic theories of projection methods and skillfully apply these theories to draw engineering drawings. Develop students' spatial visualization and three-dimensional modeling abilities, enabling them to accurately understand and express design intentions, and correctly draw orthographic projections (three views), sectional views, and axonometric projections.</li> <li>● <b>Skills:</b> Master the correct use of drawing tools, and become proficient in using computer-aided drawing software as well as freehand sketching. Be able to read part drawings and assembly drawings, and accurately express parts and assemblies using various types of views.</li> <li>● <b>Competence:</b> Ability to independently analyze and solve common problems in engineering drawing, and have the ability for innovative design and optimization.</li> </ul>
Content	<b>Part A. Theoretical teaching</b> (24 contact hours; 20 self-study hours) <b>Chapter 1 Basic Knowledge of Drawing</b>

	<p>(2 contact hours; 1 self-study hours)</p> <ul style="list-style-type: none"> <li>● Drawing tools and their use;</li> <li>● Some regulations in the national standards 'Technical Drawing' and 'Mechanical Drawing';</li> <li>● Geometric drawing;</li> <li>● Dimensional analysis and drawing steps of plane figures.</li> </ul> <p><b>Chapter 2 Fundamentals of Orthographic Projection</b></p> <p>(6 contact hours; 5 self-study hours)</p> <ul style="list-style-type: none"> <li>● Basic knowledge of projection methods;</li> <li>● Projection of points;</li> <li>● Projection of lines;</li> <li>● Projection of plane.</li> </ul> <p><b>Chapter 3 Basic Solids and Surface Intersection Lines</b></p> <p>(8 contact hours; 7 self-study hours)</p> <ul style="list-style-type: none"> <li>● Projection of plane solids;</li> <li>● Projection of rotational solids;</li> <li>● Intersection of a plane with a plane solid;</li> <li>● Intersection of a plane with a rotational solid;</li> <li>● Intersection of rotational surfaces.</li> </ul> <p><b>Chapter 4 Composite Bodies</b></p> <p>(6 contact hours; 5 self-study hours)</p> <ul style="list-style-type: none"> <li>● Analysis of composite body composition;</li> <li>● Drawing methods for composite body views;</li> <li>● Dimensioning of composite bodies;</li> <li>● Methods for reading composite body views;</li> <li>● Axonometric drawing.</li> </ul> <p><b>Chapter 5 Assembly Drawings</b></p> <p>(2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● The function and content of assembly drawings;</li> <li>● Methods for expressing components;</li> <li>● Dimensioning and technical requirements of assembly drawings;</li> <li>● Part numbering and detail list in assembly drawings;</li> <li>● Drawing methods for component assembly diagrams.</li> </ul> <p>Part B. <b>Computer practice</b> (8 contact hours,8 self-study hours)</p> <p>Project 1 Fundamentals of Engineering Drawing and Drawing Practice</p> <p>(2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Master the basic knowledge and skills of engineering drawing.</li> <li>● Be able to independently complete basic engineering drawing tasks.</li> <li>● Learn to use CAD software for engineering design.</li> </ul> <p>Project 2 Fundamentals of Orthographic Projection and Experiments in 3D Geometric Modeling</p> <p>(2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Master the basic knowledge and drawing techniques of</li> </ul>
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	<p>orthographic projection.</p> <ul style="list-style-type: none"> <li>● Be able to independently draw orthographic projections of three-dimensional objects.</li> <li>● Learn to use CAD software for 3D geometric modeling and orthographic projection drawing.</li> </ul> <p>Project 3 Experiments in Drawing and Analysis of Basic Solids and Surface Intersection Lines (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Master the geometric characteristics of basic solids and methods for identifying surface intersection lines.</li> <li>● Be able to independently draw orthographic projections of basic solids and their surface intersection lines.</li> <li>● Learn to use CAD software for constructing 3D models and analyzing intersection lines.</li> </ul> <p>Project 4 Experiments in Orthographic Projection Drawing and Spatial Analysis of Composite Bodies (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Master the geometric properties of basic solids and the methods for identifying surface intersection lines.</li> <li>● Be able to independently draw orthographic projections of basic solids and their surface intersection lines.</li> <li>● Learn to use CAD software for constructing 3D models and analyzing intersections.</li> </ul>
<p>Study and examination requirements and forms examination</p>	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including coursework(15%), homework (10%), computer practice (15%).</p> <p>Final assessment (closed-book written exam) accounts for 60%.</p>
<p>Reading list</p>	<p><b>1. Required books</b></p> <p>[1] Zhu Juxiang, Guo Yecai, Li Peng. Modern Engineering Drawing (1st Edition) [M]. Beijing: China Machine Press, 2023.</p> <p>[2] Zhang Zhaoliang, Yao Zhaohua. Exercise Book for Modern Engineering Drawing (1st Edition) [M]. Beijing: China Machine Press, 2023.</p> <p><b>2. Reference books</b></p> <p>[1] General Administration of Quality Supervision, Inspection and Quarantine of China. GB/T 4457.4-2002 Mechanical Drawing: Methods of Representation of Drawings. China Standards Press, 2014.1</p> <p>[2] Yao Ji, He Peibin, Li Jingjing. Engineering Drawing and Computer Graphics [M]. Chongqing University Press: Higher Education Planning Textbook for Civil Engineering, Excellence Engineer Series, 2016.2.185.</p> <p>[3] He Jianying, Ruan Chunhong, Chi Jianbin, Zhu Dongmei. Descriptive Geometry and Mechanical Drawing [M]. Higher Education Press, 2016.9</p> <p>[4] Chen Jiefeng. Mechanical Drawing [M]. Chongqing University Press:</p>

	Planning Textbook for Applied Undergraduate Education in Higher Education, 2017.6.341.
Data of last amendment	April 2025

## Circuit Theory

Module designation	Circuit Theory
Semester(s) in which the module is taught	2 <sup>nd</sup> semester
Person responsible for the module	Lecturer Song Ying
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching
Workload (incl. contact hours, self-study hours)	Total workload = 120 hours Contact hours = 64 hours Self-study hours = 56 hours
Credit points	4.0
Required and recommended prerequisites for joining the module	Advanced Mathematics I, College Physics II
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Basic theoretical knowledge, basic method of analysis and calculation.</li> <li>2. Analyze each type of circuit according to the circuit characteristics.</li> <li>3. Analyze and calculate complex circuits.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Be able to understand the concepts of modelling, simulation, and process.</li> <li>2. Be able to synthesize circuit theory to abstract, model, analyze and solve practical circuit problems.</li> <li>3. Be able to analyze complex engineering problems encountered in engineering activities and give reasonable explanations.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Understand and master the basic concepts and principles of the circuit theory.</li> <li>2. Master the ability to abstract, model, analyze and solve practical circuit problems, and be able to analyze complex circuits according to their characteristics.</li> <li>3. Master the use of electronic circuit simulation software Multisim to assist circuit analysis and design.</li> </ol> </li> </ul>
Content	<p><b>Theoretical teaching</b> (64 contact hours; 56 self-study hours)</p> <p><b>Chapter 1 Basic concepts and laws of the circuit</b> (6 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Circuits and circuit models.</li> </ul>

	<ul style="list-style-type: none"> <li>● Current and voltage reference direction.</li> <li>● Electrical power and energy.</li> <li>● Circuit component</li> <li>● Resistor element</li> <li>● Voltage source and current source</li> <li>● Controlled source</li> <li>● Kirchhoff's law</li> </ul> <p><b>Chapter 2 Equivalent transformation of resistance circuit</b> (8 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Equivalent transformation of a circuit.</li> <li>● Series and parallel resistors.</li> <li>● The equivalent interchange of the Y-connection and the <math>\Delta</math> connection of the resistance.</li> <li>● Series and parallel connection of voltage and current sources.</li> <li>● Two models of real power supply and their equivalent transformations.</li> <li>● Input resistance</li> </ul> <p><b>Chapter 3 General analysis of resistance circuits</b> (10 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Design of circuit diagram.</li> <li>● Number of independent equations of KCL and KVL Windows and graphics clipping techniques.</li> <li>● Branch current method.</li> <li>● Mesh current method.</li> <li>● Loop current method.</li> <li>● Nodal method of analysis.</li> </ul> <p><b>Chapter 4 Circuit Theorems</b> (8 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Superposition theorem.</li> <li>● Substitution theorem.</li> <li>● Thevenin theorem.</li> <li>● Norton theorem.</li> <li>● Maximum power transfer theorem.</li> </ul> <p><b>Chapter 5 Energy storage element</b> (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Capacity cell.</li> <li>● Inductance element.</li> <li>● Series and parallel connection of capacitors and inductors.</li> </ul> <p><b>Chapter 6 Transient analysis</b> (8 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● The equations of dynamic circuits and their initial conditions.</li> <li>● Zero input response of a first-order circuit.</li> <li>● Zero-state response of a first-order circuit.</li> <li>● Full response of a first-order circuit.</li> <li>● Step corresponding of a first-order circuit.</li> </ul>
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	<p><b>Chapter 7 Phasor method</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Complex number.</li> <li>● Sinusoidal quantity.</li> <li>● The basis of phasor method.</li> <li>● Phasor form of circuit law.</li> </ul> <p><b>Chapter 8 Sinusoidal steady-state circuit analysis</b> (8 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Impedance and admittance.</li> <li>● Phasor diagram of a circuit.</li> <li>● Analysis of sinusoidal steady state AC circuit.</li> <li>● Power in sinusoidal AC circuits.</li> <li>● Complex power.</li> <li>● Maximum power transmission.</li> </ul> <p><b>Chapter 9 A circuit containing coupled inductors</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Mutual inductance.</li> <li>● Calculation of circuits with coupled inductors.</li> <li>● Power of the coupling inductor.</li> <li>● Transformer principle.</li> <li>● Ideal transformer.</li> </ul> <p><b>Chapter 10 Three-phase AC circuit</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Three-phase circuit.</li> <li>● The relationship between line voltage (current) and phase voltage (current).</li> <li>● Calculation of three-phase symmetrical circuits.</li> <li>● The power of a three-phase circuit</li> </ul>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 20%.</p> <p>Assignments accounts for 10%.</p> <p>Chapter test accounts for 5%.</p> <p>Mid-term examination accounts for 5%.</p> <p>Final assessment (closed-book written exam) accounts for 60%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Qiu Guanyuan, Luo Xianjue. Circuit [M]. Beijing: Beijing Education Press, 2022.</p> <p><b>2. Reference books</b></p> <p>[1] Wang Xiaohui, Tian Qichuan, Shi Honghong, et al. Circuit Theory [M]. Beijing: Tsinghua University Press, 2022.</p> <p>[2] Hu Xiangjun. Circuit Analysis [M]. Beijing: Education Press, 2016.</p>

	[3] Hong Zhongsheng, Wang Ling. Fundamentals of Circuit Analysis [M]. Beijing: Beijing Education Press, 2008. [4] Lao Wuyi. Circuit Analysis Using Tutorial - Simulation and Description using Multisim [M]. Beijing: Tsinghua University Press, 2021.
Data of last amendment	April 2025

## Experiments of Circuit Theory

Module designation	Experiments of Circuit Theory
Semester(s) in which the module is taught	2 <sup>nd</sup> semester
Person responsible for the module	Lecturer Song Ying
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Using experimental operation as a primary teaching method, in combination with classroom teaching and discussion
Workload (incl. contact hours, self-study hours)	Total workload = 30 hours Contact hours = 16 hours Self-study hours = 14 hours
Credit points	1.0
Required and recommended prerequisites for joining the module	Advanced Mathematics I, College Physics II
Requirements according to the examination regulations	Only students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Understand the working principle of electronic circuit and master the use of common electronic instruments.</li> <li>2. Master the measurement method of basic electricity (voltage, current, resistance, etc.).</li> </ol> </li> <li>● <b>Skills:</b> <ol style="list-style-type: none"> <li>1. Ability to recognize the difference between the actual device, the actual application environment and the ideal simulation conditions.</li> <li>2. Proficient in using Multisim software to conduct simulation analysis of circuit performance.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Be able to judge the correctness of experimental results and troubleshoot circuit faults according to experimental results.</li> <li>2. Have the preliminary ability to construct complex experimental circuits based on experimental schemes.</li> </ol> </li> </ul>
Content	<p><b>Experiment /practice teaching:</b> 30 hours (16 contact hours; 14 self-study hours)</p> <p><b>Chapter 1 The use of electrical instruments and the measurement of volt-ampere characteristics of circuit elements</b></p>

	<p>- Topics include: (2 contact hours; 0 self-study hours)</p> <ul style="list-style-type: none"> <li>● Familiar with the layout and use of various measuring instruments and power supplies.</li> <li>● Learn how to identify common circuits and components.</li> <li>● Master the test method of the volt-ampere characteristics of linear resistance elements and voltage sources.</li> </ul> <p><b>Chapter 2 Kirchhoff's law experiment</b></p> <p>- Topics include: (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Build (or design) circuits, test the voltage and current of each component, and verify Kirchhoff's current law and voltage law with experimental data.</li> <li>● Master the method of measuring the current of each branch with ammeter.</li> </ul> <p><b>Chapter 3 Superposition theorem experiment</b></p> <p>- Topics include: (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Set up the experimental circuit.</li> <li>● Test the voltage and current of each component.</li> <li>● Master the connection methods of complex circuits.</li> </ul> <p><b>Chapter 4 Thevenin theorem experiment</b></p> <p>- Topics include: (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Set up the experimental circuit.</li> <li>● Test the voltage and current of each component.</li> <li>● Master the measurement method of equivalent circuit parameters of active two-terminal network.</li> </ul> <p><b>Chapter 5 Measurement of the maximum power transfer point</b></p> <p>- Topics include: (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Set up the experimental circuit.</li> <li>● Test the voltage and current of each component.</li> <li>● Master the load to obtain the maximum transmission power conditions.</li> </ul> <p><b>Chapter 6 Measurement of typical signals</b></p> <p>- Topics include: (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Set up the experimental circuit.</li> <li>● Use an oscilloscope to observe telecommunication signals.</li> <li>● Master the use of signal generator, millivolt meter and oscilloscope.</li> </ul> <p><b>Chapter 7 Dynamic process experiment of RC first order circuit</b></p> <p>- Topics include: (2 contact hours; 2 self-study hours)</p>
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	<ul style="list-style-type: none"> <li>● Set up the experimental circuit.</li> <li>● Test the voltage and current of each component.</li> <li>● Draw the voltage variation curve of RC circuit during charging and discharging with experimental data.</li> </ul> <p><b>Chapter 8 Three-phase circuit experiment</b></p> <p>- Topics include: (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Set up the experimental circuit.</li> <li>● Understand the relationship between three-phase line voltage and phase voltage, line current and phase current.</li> <li>● Understand the function of center line in three-phase four-wire power supply system.</li> <li>● Observe the situation when the line fails during the experiment.</li> </ul>
Study and examination requirements and forms examination	<p>After-class assignment shall be done independently by students after each class.</p> <p>In-class performance and attendance accounts for 50%. Report quality accounts for 20%. Comprehensive design report accounts for 30%.</p>
Reading list	<p><b>1. Reference books</b></p> <p>[1] Guo Yecai. Circuit Simulation Analysis and Experiment Course [M]. Jiangsu: Jiangsu University Press, 2020.</p> <p>[2] Zhang Feng. Circuit experiment course [M]. Beijing: Higher Education Press, 2008.</p> <p>[3] Zhang Weizhong. Experiment of Circuit [M]. Beijing: Beijing Institute of Technology Press, 2012.</p>
Data of last amendment	April 2025

## Foundational of Analog Electronics

Module designation	Foundational of Analog Electronics
Semester(s) in which the module is taught	4 <sup>th</sup> semester
Person responsible for the module	Lecturer Song Ying
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 120 hours Contact hours = 64 hours Self-study hours = 56 hours
Credit points	4.0
Required and recommended prerequisites for joining the module	Advanced Mathematics I, College Physics II , Circuit Theory
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Understand the fundamentals of semiconductor devices (diodes, transistors) and their applications.</li> <li>2. Master the principles of amplification circuits, feedback mechanisms, signal processing, and power supply design.</li> <li>3. Grasp the mathematical modeling and analysis methods for analog electronic systems.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Analyze and design basic analog circuits (amplifiers, filters, oscillators)..</li> <li>2. Be able to apply finite element theory to analyse mechanical problems in engineering structures, such as strength limits, stress, and strain.</li> <li>3. Formulate technical specifications and evaluate engineering solutions for analog systems.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Integrate theoretical knowledge with practical skills to solve complex engineering problems.</li> <li>2. Demonstrate teamwork and innovation in designing and optimizing analog circuits.</li> <li>3. Critically assess the societal and ethical implications of electronic technologies.</li> </ol> </li> </ul>
Content	<b>Part A. Theoretical teaching</b> (48 contact hours; 43 self-study hours)

	<p><b>Chapter 1 Semiconductor Devices</b> (7 contact hours; 5 self-study hours)</p> <ul style="list-style-type: none"> <li>● Fundamentals of Semiconductors</li> <li>● Diodes</li> <li>● Transistors</li> <li>● Field-effect transistors</li> </ul> <p><b>Chapter 2 Basic Amplifier Circuits</b> (13 contact hours; 11 self-study hours)</p> <ul style="list-style-type: none"> <li>● Concept of amplification and the main performance indicators of amplifier circuits.</li> <li>● Operating principle of the basic common emitter amplifier circuit.</li> <li>● Analysis methods of amplifier circuits.</li> <li>● Stabilization of the quiescent operating point in amplifier circuits.</li> <li>● Three basic configurations of single-transistor amplifier circuits.</li> <li>● Field-Effect Transistor (FET) amplifier circuits.</li> </ul> <p><b>Chapter 3 Integrated Amplifier Circuits</b> (5 contact hours; 5 self-study hours)</p> <ul style="list-style-type: none"> <li>● Dynamic analysis of multistage amplifier circuits.</li> <li>● Differential amplifier circuit.</li> <li>● Integrated amplifier circuits.</li> </ul> <p><b>Chapter 4 Feedback in Amplifiers</b> (8 contact hours; 7 self-study hours)</p> <ul style="list-style-type: none"> <li>● Basic concepts and judgment methods of feedback.</li> <li>● Four configurations of negative feedback amplifier circuits.</li> <li>● Block diagram and general expression of negative feedback amplifier circuits.</li> <li>● Analysis of amplification factor in deep negative feedback amplifier circuits.</li> </ul> <p><b>Chapter 5 Signal Operations and Processing</b> (5 contact hours; 5 self-study hours)</p> <ul style="list-style-type: none"> <li>● Basic operational circuits(Inverting amplifier, non-Inverting amplifier, summing amplifier, difference amplifier, integrator, differentiator).</li> <li>● Active Filter Circuits (Low-Pass Filter (LPF), High-Pass Filter (HPF), Band-Pass Filter (BPF), Band-Stop Filter (BSF)).</li> </ul> <p><b>Chapter 6 Waveform Generation and Signal Conversion</b> (5 contact hours; 5 self-study hours)</p> <ul style="list-style-type: none"> <li>● Analysis of Sine wave oscillator circuits.</li> <li>● Analysis and design of voltage comparator circuits.</li> </ul> <p><b>Chapter 7 Power Amplifiers</b> (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of power amplifier circuits.</li> <li>● Complementary Power Amplifier Circuits.</li> </ul> <p><b>Chapter 8 DC Power Supplies</b></p>
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	<p>(3 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Composition and functions of DC power supply components</li> <li>● Rectifier circuits (Half-Wave Rectifier, Full-Wave Rectifier)</li> </ul> <p><b>Part B. Experiment teaching</b> (16 contact hours; 13 self-study hours)</p> <ol style="list-style-type: none"> <li>1. Instrumentation Training: Use of oscilloscopes, signal generators, and multimeters. (2 contact hours; 1 self-study hours)</li> <li>2. Single-Stage Amplifier: Static/dynamic testing and waveform analysis. (2 contact hours; 2 self-study hours)</li> <li>3. Emitter Follower: Design and performance evaluation.. (2 contact hours; 1 self-study hours)</li> <li>4. Differential Amplifier: Common-mode rejection and gain measurement. (2 contact hours; 1 self-study hours)</li> <li>5. Negative Feedback Circuits: Stability and distortion improvement. (2 contact hours; 2 self-study hours)</li> <li>6. Operational Circuits: Inverting amplifier, non-Inverting amplifier, summing amplifier, difference amplifier. (2 contact hours; 2 self-study hours)</li> <li>7. Active Filters: Low-pass, high-pass, and band-pass filter design. (2 contact hours; 2 self-study hours)</li> <li>8. Voltage Comparators: Threshold analysis and hysteresis. (2 contact hours; 2 self-study hours)</li> </ol>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including assignments (20%) and experiment (20%).</p> <p>Final assessment (closed-book written exam) accounts for 60%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Tong Shibai, Hua Chengying. Fundamentals of Analog Electronics (6th Edition) [M]. Beijing: Higher Education Press, 2023.</p> <p><b>2. Reference books</b></p> <p>[1] Kang Huaguang. Fundamentals of Electronic Technology: Analog Part (7th Edition) [M]. Beijing: Higher Education Press, 2021.</p> <p>[2] Du Guoliang, Wu Jianhui. Fundamentals of Analog Electronic Circuits [M]. Beijing: China Machine Press, 2014.</p>
Data of last amendment	April 2025

## Foundational of Digital Electronics

Module designation	Foundational of Digital Electronics
Semester(s) in which the module is taught	3 <sup>rd</sup> semester
Person responsible for the module	Professor Wang Keqing
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 120 hours Contact hours = 64 hours Self-study hours = 56 hours
Credit points	4.0
Required and recommended prerequisites for joining the module	Advanced Mathematics I, College Physics II, Circuit Theory
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Master the basic concepts and principles of digital electronics: Students should understand the core concepts of digital electronic systems, such as logic gates, combinational circuits, sequential circuits, and their fundamental theories.</li> <li>2. Understand the basic theoretical knowledge of digital circuits, the working principles of common digital circuits, and the basic analysis and design methods of digital circuits, and be able to correctly express digital circuits by applying the basic principles and methods of digital circuits.</li> <li>3. Be able to analyze and design combinational logic circuits and sequential logic circuits, familiar with the basic steps and methods of analysis and design, and be able to use the basic principles of digital circuits to select the research route and carry out circuit design/development.</li> <li>4. Familiarize with digital system design and analysis: Students need to learn how to design and analyze digital systems, including understanding the functions and applications of different logic gates and circuits.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Develop logic design and simulation skills: It is possible to apply the relevant knowledge and mathematical model methods of circuit/electronic technology. Students should be able to use logical tools to design and simulate digital circuits, verify theoretical analysis</li> </ol> </li> </ul>

	<p>results, and optimize system performance.</p> <p>2. Master digital system design and analysis methods: Students should be capable of designing appropriate digital circuits based on system requirements and analyzing their functionality and performance. It is possible to apply the basic principles of mathematics, physics and engineering sciences to identify and judge the key links and parameters in the design of digital systems and the development of automated systems for the intelligent manufacturing process. It is also possible to construct an experimental system according to the research plan formulated, carry out experiments safely and collect valid experimental data.</p> <p>3. Acquire experimental operation and data analysis skills: Students should be able to build and test digital circuits using experimental platforms, collect experimental data, and analyze it to validate the practical application of theoretical knowledge.</p> <p>● <b>Competence:</b></p> <p>1. Cultivate systematic thinking skills: Students should be able to analyze digital electronic problems from a holistic perspective, understand the interactions among various components of a system, and apply systematic thinking to solve complex engineering problems.</p> <p>2. Enhance problem analysis and solving skills: Students should be able to analyze practical digital electronic problems using theoretical knowledge, propose reasonable solutions, and evaluate their feasibility. Students should be able to analyze practical control problems using theoretical knowledge, propose reasonable solutions, and evaluate their feasibility.</p> <p>3. Strengthen innovation and practical skills: Students should be able to explore innovative digital electronic designs by integrating modern technologies with classical digital electronic theory and apply them to real-world engineering problems. Students should be able to explore innovative control methods by integrating modern technologies and apply them to real-world engineering problems.</p>
Content	<p><b>Part A. Theoretical Teaching (56 contact hours; 48 self-study hours)</b></p> <p><b>Chapter 1 Fundamentals of Logic Algebra (6 contact hours; 4 self-study hours)</b></p> <ul style="list-style-type: none"> <li>● Basic concepts, formulas, and theorems of logic algebra will be introduced and explained.</li> <li>● Methods for simplifying logic functions, including various techniques and strategies.</li> <li>● Representation methods of logic functions and the conversion among them.</li> </ul> <p><b>Chapter 2 Logic Gate Circuits (8 contact hours; 6 self-study hours)</b></p> <ul style="list-style-type: none"> <li>● Switching characteristics of semiconductor diodes, transistors, and MOS tubes.</li> </ul>

	<ul style="list-style-type: none"> <li>● Discrete component gate circuits.</li> <li>● CMOS integrated gate circuits.</li> <li>● TTL integrated gate circuits.</li> </ul> <p><b>Chapter 3 Combinational Logic Circuits</b> <b>(12 contact hours; 12 self-study hours)</b></p> <ul style="list-style-type: none"> <li>● Basic analysis and design methods of combinational circuits.</li> <li>● Adders and numerical comparators.</li> <li>● Encoders and decoders.</li> <li>● Data selectors and demultiplexers.</li> <li>● Implementation of combinational logic functions using medium-scale integrated circuits.</li> <li>● Competition and adventure in combinational circuits.</li> </ul> <p><b>Chapter 4 Triggers</b> <b>(10 contact hours; 10 self-study hours)</b></p> <ul style="list-style-type: none"> <li>● Basic flip-flops.</li> <li>● Synchronous triggers.</li> <li>● Edge triggers.</li> </ul> <p><b>Chapter 5 Sequential Logic Circuits</b> <b>(12 contact hours; 10 self-study hours)</b></p> <ul style="list-style-type: none"> <li>● Basic analysis and design methods of sequential circuits.</li> <li>● Counters.</li> <li>● Registers.</li> </ul> <p><b>Chapter 6 555 Timer and Pulse Generation Shaping Circuits</b> <b>(8 contact hours; 6 self-study hours)</b></p> <ul style="list-style-type: none"> <li>● Working principle of the 555 timer.</li> <li>● Basic application circuits of the 555 timer.</li> </ul> <p><b>Part B. Experimental Teaching</b> <b>(8 contact hours; 8 self-study hours)</b></p> <p>In order to help students better understand the concepts and principles of Digital Electronics theory and improve their practical skills, the following three typical experimental classes will be arranged:</p> <ul style="list-style-type: none"> <li>● 138 decoder logic function and design (2 contact hours; 2 self-study hours)</li> <li>● Combinational logic circuit design experiment (2 contact hours; 2 self-study hours)</li> <li>● Flip-flop experiment (2 contact hours; 2 self-study hours)</li> <li>● Sequential logic circuit design(2 contact hours; 2 self-study hours)</li> </ul>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including assignments (20%) and experiment (20%).</p> <p>Final assessment (closed-book written exam) accounts for 60%.</p>

Reading list	<p><b>1. Required books</b></p> <p>[1] Yu Mengchang, Concise Tutorial on the Basics of Digital Electronic Technology (4th Edition), Higher Education Press, 2018.</p> <p><b>2.Reference books</b></p> <p>[1] Yan Shi, Fundamentals of Digital Electronic Technology (6th Edition), Beijing: Higher Education Press, 2016.</p> <p>[2] Kang Huaguang, Fundamentals of Electronic Technology - Digital Part (6th Edition), Beijing: Higher Education Press, 2014.</p>
Data of last amendment	April 2025

## Signals and Systems

Module designation	Signals and Systems
Semester(s) in which the module is taught	3 <sup>rd</sup> semester
Person responsible for the module	Associate Professor Han Jitai
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 90 hours Contact hours = 48 hours Self-study hours = 42 hours
Credit points	3.0
Required and recommended prerequisites for joining the module	Advanced Mathematics I, Circuit Theory
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Deeply understand the basic concepts, characteristics, and conversion relationships between continuous time signals and discrete-time signals, and clarify the mathematical descriptions and time-domain characteristics of various typical signals.</li> <li>2. Fully grasp the basic theory of linear time invariant systems, including the description of differential equations and difference equations of the system, as well as the analysis methods of important properties such as stability and causality of the system.</li> </ol> </li> <li>● <b>Skills:</b> <ol style="list-style-type: none"> <li>1. Proficient in using mathematical tools such as Fourier transform, Laplace transform, and Z-transform to analyze the frequency spectrum of signals and solve system functions, able to accurately draw signal frequency spectra and system pole zero diagrams.</li> <li>2. Proficient in the application of professional software such as MATLAB in signal and system analysis, able to use software to achieve signal generation, processing, system simulation, and result visualization display.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Ability to establish reasonable signal and system models based on actual engineering problems, and apply learned theories and methods to analyze and solve them, providing effective solutions.</li> <li>2. The ability to conduct in-depth analysis of signal transmission and transformation</li> </ol> </li> </ul>

	<p>processes in complex signal processing systems and actual control systems, diagnose system operation faults, and propose corresponding optimization and improvement measures.</p>
<p>Content</p>	<p><b>Part A. Theoretical teaching</b> (40 contact hours; 30 self-study hours)</p> <p><b>Chapter 1 Signal and System</b></p> <p>-Topics include: (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understand the application and development of signals and systems;</li> <li>● Familiar with the definition and classification of signals and systems; Master the definitions and properties of step functions and impulse functions;</li> <li>● Familiar with basic signal operations, especially graphic operations;</li> <li>● Master the characteristics and classification of the system, as well as the description and analysis methods of the system.</li> </ul> <p><b>Chapter 2 Time Domain Analysis of Continuous Systems</b></p> <p>-Topics include: (8 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understand the general steps of time-domain analysis;</li> <li>● Master the classic methods of system analysis, including the solving methods and processes for zero input response, zero state response, and full response;</li> <li>● Familiar with the solution ideas and relationships between impulse response and step response;</li> <li>● Understand and master convolutional integrals and their properties.</li> </ul> <p><b>Chapter 3 Time Domain Analysis of Discrete Systems</b></p> <p>-Topics include: (8 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understand the importance and process of discrete system analysis;</li> <li>● Familiar with the concepts of difference and difference equations, classical methods for solving difference equations, and solutions for zero input, zero state response, and full response of LTI discrete systems;</li> <li>● Master the solving process and characteristics of unit sequence response and step response;</li> <li>● Understand and master the concepts, properties, and applications of convolution.</li> </ul> <p><b>Chapter 4 Fourier Transform and Frequency Domain Analysis of Systems</b></p> <p>-Topics include: (10 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understand the application of Fourier transform in the industry;</li> <li>● Master the application of Fourier transform for frequency domain</li> </ul>

	<p>analysis and sampling theorem in LTI system;</p> <ul style="list-style-type: none"> <li>● Familiar with Fourier series, frequency spectrum of periodic signals, and frequency spectrum of non periodic signals; The properties of Fourier transform and Fourier transform of periodic signals;</li> <li>● Understand and master the frequency domain analysis of LTI systems.</li> </ul> <p><b>Chapter 5: S-Domain Analysis of Continuous Systems</b></p> <p>-Topics include:</p> <p>(10 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understand bilateral Laplace transform, etc;</li> <li>● Understand the relationship between Laplace transform and Fourier transform;</li> <li>● Master the application of Laplace transform in continuous system analysis, the transformation solutions of differential equations, and the definition of system functions;</li> <li>● Familiar with and proficient in S-domain diagrams, S-domain models of circuits, and their applications.</li> </ul> <p><b>Part B. Experiment teaching</b> (6 contact hours; 12 self-study hours)</p> <p><b>Chapter 1 Basic operations of signals</b></p> <p>-Topics include:</p> <p>(1.5 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Master the use of Matlab to generate continuous time;</li> <li>● The methods of signals and discrete-time signals, as well as the basic operation methods of signals;</li> <li>● Understand the principles of signal filtering and filter design methods.</li> </ul> <p><b>Chapter 2 Time domain analysis of signals</b></p> <p>-Topics include:</p> <p>(1.5 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Master the significance and solution methods of unit impulse response and step response in continuous time systems;</li> <li>● Master the solution method for the response of continuous time systems under arbitrary signal excitation;</li> <li>● Clarify the relationship between impact response and system zero state response;</li> <li>● Understand the role of the system in signals;</li> <li>● Learn to use MATLAB to implement methods for solving system responses.</li> </ul> <p><b>Chapter 3 Fourier transform of continuous time signals</b></p> <p>-Topics include:</p> <p>(1.5 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Master the fast algorithm for discrete periodic signals and its MATLAB implementation;</li> <li>● Clarify the relationship before and after signal transformation;</li> <li>● Understand the significance of spectrum analysis;</li> </ul>
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	<ul style="list-style-type: none"> <li>● Learn to use FFT for signal analysis.</li> </ul> <p><b>Chapter 4 Laplace transform of continuous time signals</b></p> <p>-Topics include: (1.5 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Master the definition of Laplace transform and its inverse transform, and master the implementation method in MATLAB;</li> <li>● Master the definition of continuous time system functions and complex frequency domain analysis methods;</li> <li>● Master the definition of system zeros and poles, and understand the relationship between the distribution of system zeros and poles and system characteristics.</li> </ul>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>Regular grades (40%, including 10% course points + 10% homework + 10% experiment + 10% midterm exam) + outcome based assessment (60%).</p>
Reading list	<p><b>1. Reference books</b></p> <p>[1] Wu Dazheng. Signal and Linear System Analysis (5th edition) [M]. Beijing: Higher Education Press, 2019.</p> <p><b>2. Reference list and literature:</b></p> <p>[1] Zheng Junli Signal and System (3rd edition) [M]. Beijing: Higher Education Press, 2011.</p> <p>[2] Guan Zhizhong, Xia Gongke, Meng Qiao. Signal and Linear Systems (6th edition) [M]. Beijing: Higher Education Press, 2015.</p>
Data of last amendment	April 2025

## Microcomputer Principle and Interface Technology

Module designation	Microcomputer Principle and Interface Technology
Semester(s) in which the module is taught	5 <sup>th</sup> semester
Person responsible for the module	Associate Professor Chen Yifei
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 120 hours Contact hours = 64 hours Self-study hours = 56 hours
Credit points	4.0
Required and recommended prerequisites for joining the module	C Language Programming, Foundational of Digital Electronics, Foundational of Analog Electronics
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. The structure of a microcomputer system.</li> <li>2. The principles of the collaborative operation of hardware and software in a computer system.</li> <li>3. The overall concept of a computer system.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Be able to design commonly used interface circuits for computers.</li> <li>2. Be able to program applications related to programmable interfaces of computers.</li> <li>3. Be able to distill and analyze technical issues in microcomputer application systems and accurately express design concepts through technical reports or oral presentations.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Possess the ability to collaboratively develop computer hardware and software.</li> <li>2. Be able to use relevant development tools to design hardware circuits and programs for specific applications.</li> <li>3. Solve complex problems related to hardware and software design in control systems.</li> </ol> </li> </ul>
Content	<p><b>Part A. Theoretical teaching</b> (48 contact hours; 42 self-study hours)</p> <p><b>Chapter 1 Basic Knowledge of Computers</b> (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Composition of a Microcomputer System</li> </ul>

	<ul style="list-style-type: none"> <li>● Common Number Systems in Computers</li> <li>● Data Representation in Computers</li> <li>● Common Coding Schemes in Computers</li> </ul> <p><b>Chapter 2 The 80x86 Microprocessor</b> (5 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Structure of the 80x86 Microprocessor</li> <li>● Pins and Operating Modes of the 80x86 Microprocessor</li> <li>● Bus Timing of the 80x86 Microprocessor</li> <li>● Memory and I/O Organization of the 80x86 Microprocessor</li> </ul> <p><b>Chapter 3 Instruction Set of the 80x86 Microprocessor</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Addressing Modes</li> <li>● Data Transfer Instructions</li> <li>● Arithmetic Operation Instructions</li> <li>● Logical Operation Instructions</li> <li>● Shift Instructions</li> <li>● Processor Control and Flag Handling Instructions</li> </ul> <p><b>Chapter 4 Assembly Language Programming</b> (8 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Fundamentals of Assembly Language</li> <li>● Sequential Programming</li> <li>● Branch Programming</li> <li>● Loop Programming</li> <li>● DOS System Function Calls</li> <li>● Subroutine Design</li> </ul> <p><b>Chapter 5 Memory Technology</b> (5 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of Memory</li> <li>● Random Access Memory (RAM)</li> <li>● Read-Only Memory (ROM)</li> <li>● Connection between CPU and Memory</li> <li>● Modern Microcomputer Memory Architecture</li> </ul> <p><b>Chapter 6 Input/Output Interface Technology</b> (5 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of I/O Interfaces</li> <li>● I/O Ports and Addressing Methods</li> <li>● Input/Output Methods and Interfaces</li> </ul> <p><b>Chapter 7 The Programmable Parallel Interface Chip</b> (6 contact hours; 5 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of Parallel Interfaces</li> <li>● Structure and Initialization of the 8255A</li> <li>● Analysis of Operating Modes of the 8255A</li> <li>● Applications of the 8255A</li> </ul> <p><b>Chapter 8 Interrupt Technology</b> (5 contact hours; 4 self-study hours)</p>
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	<ul style="list-style-type: none"> <li>● Basic Concepts and Applications of Interrupts</li> <li>● Functions of Interrupt Systems and Interrupt Priority</li> <li>● Interrupt Operations and Responses of the 8086/8088</li> <li>● Interrupt Program Design and Applications</li> </ul> <p><b>Chapter 9 Interrupt Technology</b> (6 contact hours; 5 self-study hours)</p> <ul style="list-style-type: none"> <li>● Pin Functions and Programming Structure of the 8253</li> <li>● Programming the 8253</li> <li>● Operating Modes of the 8253</li> <li>● Applications of the 8253</li> </ul> <p><b>Part B. Experiment teaching</b> (16 contact hours; 14 self-study hours) In order to help students better understand the concept and principle of Microcomputer systems, be able to analyze and design typical microcomputer application systems, and improve their practical skills, the following eight typical experimental classes will be arranged:</p> <ol style="list-style-type: none"> <li>1. Addressing Mode Verification Design (2 contact hours; 1 self-study hours)</li> <li>2. Sequential Programming Design (2 contact hours; 1 self-study hours)</li> <li>3. Branch Programming Experiment (2 contact hours; 2 self-study hours)</li> <li>4. Loop Programming Experiment (2 contact hours; 2 self-study hours)</li> <li>5. Simple Parallel Interface Experiment (2 contact hours; 2 self-study hours)</li> <li>6. 8255 Parallel Interface Experiment (2 contact hours; 2 self-study hours)</li> <li>7. Interrupt Experiment (2 contact hours; 2 self-study hours)</li> <li>8. 8253 Timer/Counter Experiment (2 contact hours; 2 self-study hours)</li> </ol>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 50%, including assignments (15%) and experiment (15%), Daily performance (15%), Mid-term examination (5%).</p> <p>Final assessment (closed-book written exam) accounts for 50%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Zhang Yingchao, Ye Yanfei, Chen Yifei, et al. Microcomputer Principles And Interface Technology (2nd Edition) [M]. Beijing: Publishing House of Electronics Industry, 2017.</p> <p><b>2. Reference books</b></p> <p>[1] Chen Yifei, Ye Yanfei, Sun Ning, Yang Le. Experimental and Practical Tutorial on Microcomputer Principles and Interface Technology—Based</p>

	<p>on Proteus Simulation[M]. Beijing: Publishing House of Electronics Industry, 2016.</p> <p>[2] Song Zhiqiang, Chen Yifei, et al. Microcontroller Principles and Applications: A Task-Driven Tutorial Based on C51 + Proteus [M]. Beijing: China Machine Press, 2022.</p>
Data of last amendment	April 2025

## Automatic Control Theory

Module designation	Automatic Control Theory
Semester(s) in which the module is taught	4 <sup>th</sup> semester
Person responsible for the module	Lecturer Ji Nan
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 120 hours Contact hours = 64 hours Self-study hours = 56 hours
Credit points	4.0
Required and recommended prerequisites for joining the module	Advanced Mathematics II, Complex Functions and Integral Transformations, Circuit Theory Foundational of Analog Electronics, Foundational of Digital Electronics
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Master the basic concepts and principles of automatic control: Students should understand the core concepts of automatic control systems, such as feedback control, open-loop and closed-loop control, stability, accuracy, and speed, as well as the fundamental theories behind them.</li> <li>2. Familiarize with mathematical models of control systems: Students need to learn how to establish mathematical models of control systems, including differential equations, transfer functions, and state-space representations, and comprehend their physical significance.</li> <li>3. Understand analytical methods of classical control theory: Students should master basic methods of classical control theory, such as time-domain analysis, root locus method, and frequency-domain analysis, and be able to analyze the dynamic and steady-state performance of systems.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Develop system modeling and simulation skills: Students should be able to use mathematical tools (e.g., MATLAB) to model and simulate control systems, verify theoretical analysis results, and optimize system performance.</li> <li>2. Master control system design and correction methods: Students should be capable of designing appropriate controllers (e.g., PID controllers) based on system performance requirements and improving</li> </ol> </li> </ul>

	<p>dynamic and steady-state characteristics through correction methods.</p> <p>3. Acquire experimental operation and data analysis skills: Students should be able to build control systems using experimental platforms (e.g., simulation kits or digital simulation software), collect experimental data, and analyze it to validate the practical application of theoretical knowledge.</p> <p>● <b>Competence:</b></p> <p>1. Cultivate systematic thinking skills: Students should be able to analyze control problems from a holistic perspective, understand the interactions among various components of a system, and apply systematic thinking to solve complex engineering problems.</p> <p>2. Enhance problem analysis and solving skills: Students should be able to analyze practical control problems using theoretical knowledge, propose reasonable solutions, and evaluate their feasibility.</p> <p>3. Strengthen innovation and practical skills: Students should be able to explore innovative control methods by integrating modern control technologies (e.g., intelligent control, adaptive control) with classical control theory and apply them to real-world engineering problems.</p>
Content	<p><b>Part A. Theoretical teaching</b> (48 contact hours; 40 self-study hours)</p> <p><b>Chapter 1 General Concepts of Automatic Control</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Basic principles and methods of automatic control.</li> <li>● Examples of control systems.</li> <li>● Classification of control systems.</li> <li>● Basic requirements for control systems.</li> </ul> <p><b>Chapter 2 Mathematical Models of Control Systems</b> (8 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Time-domain and complex-domain mathematical models.</li> <li>● System block diagrams.</li> <li>● Signal flow graphs.</li> </ul> <p><b>Chapter 3 Time-Domain Analysis of Linear Systems</b> (8 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Performance indicators.</li> <li>● First-order and second-order system analysis.</li> <li>● Stability analysis.</li> <li>● Steady-state error calculation.</li> </ul> <p><b>Chapter 4 Root Locus Method for Linear Systems</b> (8 contact hours; 7 self-study hours)</p> <ul style="list-style-type: none"> <li>● Basic concepts of root locus.</li> <li>● Rules for drawing root locus.</li> <li>● System performance analysis.</li> </ul> <p><b>Chapter 5 Frequency-Domain Analysis of Linear Systems</b> (8 contact hours; 7 self-study hours)</p> <ul style="list-style-type: none"> <li>● Frequency response.</li> <li>● Bode plots.</li> </ul>

	<ul style="list-style-type: none"> <li>● Nyquist stability criterion.</li> <li>● Stability margins.</li> </ul> <p><b>Chapter 6 Correction Methods for Linear Systems</b> (10 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● System design and correction.</li> <li>● common correction devices.</li> <li>● series correction.</li> </ul> <p><b>Part B. Experiment teaching</b> (16 contact hours; 14 self-study hours) In order to help students better understand the concepts and principles of automatic control theory, and improve their practical skills, the following three typical experimental classes will be arranged:</p> <ol style="list-style-type: none"> <li>1. Typical Elements and Step Response. (4 contact hours; 3 self-study hours)</li> <li>2. Second-Order System Step Response. (4 contact hours; 3 self-study hours)</li> <li>3. Stability Analysis of Control Systems. (4 contact hours; 4 self-study hours)</li> <li>4. Frequency Response Measurement. (4 contact hours; 4 self-study hours)</li> </ol>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including assignments (20%) and experiment (20%).</p> <p>Final assessment (closed-book written exam) accounts for 60%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Hu Shousong. Principles of Automatic Control (8th Edition) [M]. Beijing: Science Press, 2023.</p> <p><b>2. Reference books</b></p> <p>[1] Pan Feng, Xu Yingqin. Principles of Automatic Control (2nd Edition) [M]. Beijing: Mechanical Industry Press, 2019.</p> <p>[2] Sun Bingda. Automatic Control Theory (5th Edition) [M]. Beijing: Mechanical Industry Press, 2022.</p> <p>[3] Li Xiaoxiu, Song Lirong. Principles of Automatic Control (2nd Edition) [M]. Beijing: Mechanical Industry Press, 2019.</p>
Data of last amendment	April 2025

## Fundamentals of Robot Technology

Module designation	Fundamentals of Robot Technology
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Semester(s) in which the module is taught	5 <sup>th</sup> semester
Person responsible for the module	Lecturer Shao Ziyang
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching
Workload (incl. contact hours, self-study hours)	Total workload = 120 hours Contact hours = 64 hours Self-study hours = 56 hours
Credit points	4.0
Required and recommended prerequisites for joining the module	Advanced Mathematics I, College Physics II, Robot Operating System(ROS)
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1.The development history, current status, and future trends of robots; the application of robots in different fields and their technological characteristics; the basic composition of robot mechanical structures, including joints, links, actuators, etc., and their kinematic and dynamic characteristics.</li> <li>2.The mathematical description methods for robot position and posture, the use of homogeneous transformation matrices, coordinate transformation, and kinematic modeling; the methods for forward and inverse kinematics solutions, and the basic principles of statics and dynamics modeling.</li> <li>3.The basic syntax and structure of robot programming languages, the basic methods of robot motion planning, including path planning and trajectory planning, and the sensor technologies used in robot control systems and their applications.</li> <li>4. Typical application scenarios of industrial robots, service robots, and special-purpose robots, and the application of robots in areas such as automated production lines, medical, logistics, and agriculture.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1.The ability to apply the basic theories of robot kinematics, dynamics, and statics to analyze and solve practical problems in robot engineering, such as motion control of robot arms and load capacity analysis.</li> <li>2. Proficiency in the basic operations of robot programming languages</li> </ol> </li> </ul>

	<p>and the ability to write simple robot control programs. Familiarity with the use of robot simulation software to conduct kinematic and dynamic simulations.</p> <p>3. The ability to design simple robot mechanical structures and control systems based on functional requirements, to perform motion planning and path optimization, and to debug and optimize robot systems to meet specific application scenarios and performance requirements.</p> <p>● <b>Competence:</b></p> <p>1.The ability to analyze complex problems in robot engineering, propose solutions, and verify their effectiveness through experiments or simulations.</p> <p>2.The ability to initially design motion schemes and control strategies for robot systems, considering multiple factors such as mechanical structures, sensors, and controllers, to complete the overall design of robot systems.</p> <p>3.The ability to apply professional knowledge and innovative thinking to propose new solutions or improvements for practical problems in the field of robotics. The ability to conduct experiments to verify the feasibility of theoretical analyses and design solutions.</p>
Content	<p><b>Chapter 1 Introduction</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understand the definition, development history, classification, and applications of robots.</li> <li>● Master the main technical parameters of robots.</li> <li>● Understand the definition, technologies, and research methods of robotics.</li> </ul> <p><b>Chapter 2 Robot Mechanical Structure</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understand the composition of the robot system.</li> <li>● Understand the typical structures of the robot body and arm.</li> <li>● Master the issues to be aware of when designing the robot body and the basic requirements for arm design.</li> <li>● Understand the typical structures of the wrist.</li> <li>● Master the functions, degrees of freedom, and classification of the wrist.</li> <li>● Understand the composition, classification, and characteristics of several typical walking mechanisms.</li> </ul> <p><b>Chapter 3 Mathematical Description of Robot Pose and Coordinate Transformation</b> (10 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understand the representation of position and orientation.</li> <li>● Understand and master the application of coordinate transformation, homogeneous coordinate transformation, and general rotation transformation in robots.</li> </ul> <p><b>Chapter 4 Robot Kinematics</b></p>

	<p>(10 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Master the representation of the D-H coordinate system for articulated robots.</li> <li>● Be able to perform forward kinematics calculations and solve inverse kinematics using the inverse transformation method.</li> </ul> <p><b>Chapter 5 Robot Statics</b> (8 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Master the velocity Jacobian and velocity analysis methods.</li> <li>● Master the force Jacobian and static force calculation.</li> </ul> <p><b>Chapter 6 Robot Dynamics</b> (10 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Master the robot dynamics equations and dynamic characteristics.</li> <li>● Focus on analyzing two methods for solving the dynamics equations of robotic manipulators: the Lagrangian energy balance method and the Newton-Euler dynamic equilibrium method. ● Summarize the steps for establishing the Lagrangian equations.</li> </ul> <p><b>Chapter 7 Robot Trajectory Planning</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understand the issues to be considered in trajectory planning.</li> <li>● Master the interpolation calculation of joint trajectories, Cartesian path trajectory planning, and methods for real-time generation of planned trajectories and their applications.</li> </ul> <p><b>Chapter 8 Robot Sensing and Control Systems</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understand the principles of various sensors and their applications in robots.</li> <li>● Understand the basic control principles of robots.</li> <li>● Be able to understand and master the methods and applications of position control, force and position hybrid control, and intelligent control of robots.</li> </ul> <p><b>Chapter 9 Robot Languages and Programming</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understand common robot programming methods and languages.</li> <li>● Be familiar with the structure and basic functions of robot language systems, commonly used robot programming languages, and the significance of online and offline programming.</li> </ul> <p><b>Chapter 10 Robot Applications</b> (4 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understand the applications of robots in various industries.</li> </ul>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including assignments (25%),</p>

	<p>midterm examination (15%).</p> <p>Final assessment (closed-book written exam) accounts for 60%.</p>
Reading list	<p><b>1.Required books</b></p> <p>Cai Zixing, Xie Bin Robotics (Fourth Edition) [M], Beijing: Tsinghua University Press, 2022.</p> <p><b>Reference books</b></p> <p>[1] Combat Strength, Robotics - Mechanisms, Kinematics, Dynamics, and Motion Planning [M], Beijing: Tsinghua University Press, two thousand and nineteen</p> <p>[2] Liu Jifeng and Yang Xiaolan, Fundamentals of Robotics Technology (Third Edition) [M], Beijing: Higher Education Press, two thousand and nineteen</p> <p>[3] John J. Crag, translated by Yun Chao and Wang Wei, Introduction to Robotics (4th edition of the original book) [M], Beijing: Machinery Industry Press, 2018</p>
Data of last amendment	April 2025

## The Base of Artificial Intelligence

Module designation	The Base of Artificial Intelligence
Semester(s) in which the module is taught	7 <sup>th</sup> semester
Person responsible for the module	Associate Professor Fan Shibo
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching
Workload (incl. contact hours, self-study hours)	Total workload = 90 hours Contact hours = 48 hours Self-study hours = 42 hours
Credit points	3.0
Required and recommended prerequisites for joining the module	Linear Algebra, C Language Programming
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Master the basic theories of artificial intelligence such as knowledge representation methods, deterministic reasoning methods, search strategies, machine learning, and artificial neural networks.</li> <li>2. Familiar with typical artificial intelligence technologies such as image processing and recognition, data mining, and deep learning.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Be able to master the key technologies of artificial intelligence and possess the basic ability to solve practical problems.</li> <li>2. Cultivate scientific methods and thinking abilities.</li> <li>3. Improve the abilities of analyzing problems, solving problems, self-study and summarizing and generalizing.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Inspire the innovative spirit and lay the necessary theoretical and practical foundation for future research and application in the field of artificial intelligence.</li> <li>2. Cultivate the spirit of exploration, cooperation, and science.</li> </ol> </li> </ul>
Content	<p><b>Chapter 1 Introduction</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Definition of artificial intelligence.</li> <li>● The birth and development of artificial intelligence.</li> <li>● Methods and approaches for artificial intelligence research.</li> <li>● Research and application fields of artificial intelligence.</li> </ul>

	<p><b>Chapter 2 Knowledge Representation Methods</b> (9 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Related concepts of knowledge representation.</li> <li>● First-order predicate logic representation.</li> <li>● Semantic network representation.</li> <li>● Frame representation.</li> <li>● State space representation.</li> <li>● And/or tree representation.</li> </ul> <p><b>Chapter 3 Reasoning Method</b> (9 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Reasoning overview.</li> <li>● Propositional logic and predicate logic.</li> <li>● Natural deductive reasoning method.</li> <li>● Attribution reasoning method.</li> </ul> <p><b>Chapter 4 Search Strategy</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● The concept and types of search.</li> <li>● Blind search strategy.</li> <li>● Heuristic search strategy.</li> <li>● And/or tree search.</li> </ul> <p><b>Chapter 5 Machine Learning</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of machine learning.</li> <li>● Basic model of machine learning system.</li> <li>● ID3 decision tree algorithm.</li> <li>● Deep machine learning.</li> </ul> <p><b>Chapter 6 Expert Systems</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of Expert Systems.</li> <li>● The basic structure of expert systems.</li> <li>● Design and construction of expert systems.</li> <li>● Expert system developing tools.</li> </ul> <p><b>Chapter 7 Artificial Neural Network</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Basic concepts of neural networks.</li> <li>● Perceptron model and its learning algorithm.</li> <li>● Backpropagation model and its learning algorithm.</li> <li>● Hopfield model and its learning algorithm.</li> </ul>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including assignments (20%) and</p>

	<p>classroom performance (20%).</p> <p>Final assessment (closed-book written exam) accounts for 60%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Zhang Yangsen. Tutorial of Artificial Intelligence (2nd Edition) [M]. Beijing: Higher Education Press, 2016.</p> <p><b>2. Reference books</b></p> <p>[1] Mo Hongwei. Introduction to Artificial Intelligence (2nd Edition) [M]. Beijing: Posts and Telecommunications Press, 2024.</p> <p>[2] Shang Wenqian. Principles, Algorithms, and Practices of Artificial Intelligence (2nd Edition) [M], Beijing: Tsinghua University Press, 2021.</p> <p>[3] Wang Wanliang,. Introduction to Artificial Intelligence (5th Edition) [M]. Beijing: Higher Education Press, 2020.</p>
Data of last amendment	April 2025

## Motor drive and Movement Control System

Module designation	Motor Drive and Movement Control System
Semester(s) in which the module is taught	6 <sup>th</sup> semester
Person responsible for the module	Lecturer Yuan Jie
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 120 hours Contact hours = 64 hours Self-study hours = 56 hours
Credit points	4.0
Required and recommended prerequisites for joining the module	Power Electronic Technology
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Master the basic theory of electromechanical energy conversion. Understand the classification, construction, working principles, and external characteristics of motors.</li> <li>2. Be able to establish dynamic and static mathematical models of motors when they are used as controlled objects.</li> <li>3. Gain knowledge of the principles and design of AC and DC motion control systems, as well as the experimental testing and debugging methods of DC and AC motor speed-control systems.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Have the ability to apply professional knowledge to analyze and design motion control systems.</li> <li>2. Be able to conduct experiments and tests on DC and AC motor speed-control systems, and debug them to achieve the desired performance.</li> <li>3. Integrate knowledge and skills to design comprehensive motion control systems, considering factors such as system performance, cost, and reliability.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Continuously learn and update knowledge about motor drive and motion control systems to keep up with the latest technological developments.</li> <li>2. Apply the knowledge and skills learned in this course to innovative</li> </ol> </li> </ul>

	<p>projects and competitions, and have the ability to propose innovative solutions to problems.</p> <p>3. Use scientific engineering thinking methods to analyze and solve practical problems in the field of motor drive and motion control, and have a good awareness of quality, innovation, and efficiency.</p>
Content	<p><b>Part A. Theoretical teaching</b> (48 contact hours; 48 self-study hours)</p> <p><b>Chapter 1 Electromechanical Energy Conversion Fundamentals</b> (8 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Energy conversion and magnetic circuits in motors.</li> <li>● Establishment of magnetic fields.</li> <li>● Magnetic induction law and two types of electromotive force.</li> <li>● Analysis of steady-state AC magnetic circuits and power transformers.</li> </ul> <p><b>Chapter 2 DC Motor Principles and Operating Characteristics</b> (10 contact hours; 10 self-study hours)</p> <ul style="list-style-type: none"> <li>● DC motor principles.</li> <li>● Electric motors and driven loads.</li> <li>● Steady-state equations and external characteristics of separately excited DC motors.</li> <li>● Operating characteristics of separately excited DC motors.</li> </ul> <p><b>Chapter 3 Controllable DC Power Supply and Its Mathematical Model</b> (10 contact hours; 10 self-study hours)</p> <ul style="list-style-type: none"> <li>● Controllable DC power supply and its mathematical model.</li> <li>● Requirements for speed-control systems and problems of open-loop systems.</li> <li>● Speed-control system with single-closed-loop speed negative feedback.</li> <li>● Anti-load disturbance control.</li> </ul> <p><b>Chapter 4 Three-phase AC Motor Principles</b> (10 contact hours; 10 self-study hours)</p> <ul style="list-style-type: none"> <li>● Basic issues and structures of AC motors.</li> <li>● Magnetic motive force and electromotive force of AC motors.</li> <li>● Induction motor principles and characteristics.</li> </ul> <p><b>Chapter 5 Constant Voltage-frequency Ratio Control of AC Induction Motor</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Characteristics and types of AC speed-control systems.</li> <li>● Voltage-source PWM inverter and control methods.</li> </ul> <p><b>Chapter 6 Modern Control Theory in Motor</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Introduction to modern control theory.</li> <li>● Application of modern control theory in motor drive and motion control systems.</li> </ul> <p><b>Part B. Experiment teaching</b> (16 contact hours; 8 self-study hours) These experiments are designed to help students understand and</p>

	<p>master the principles and methods of motor drive and movement control, improve their practical skills, and cultivate their ability to solve engineering problems.</p> <ol style="list-style-type: none"> <li>1. Recognition of Various Motors. (2 contact hours; 1 self-study hours)</li> <li>2. DC Motor Speed Control. (2 contact hours; 1 self-study hours)</li> <li>3. DC Motor Torque Control. (2 contact hours; 1 self-study hours)</li> <li>4. AC Motor Speed Control. (2 contact hours; 1 self-study hours)</li> <li>5. AC Motor Torque Control. (4 contact hours; 2 self-study hours)</li> <li>6. Motion Control System. (4 contact hours; 2 self-study hours)</li> </ol>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including assignments (20%) and experiment (20%).</p> <p>Final assessment (closed-book written exam) accounts for 60%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Yang Geng. Electric Motors and Motion Control Systems (2nd Edition) [M]. Beijing: Tsinghua University Press, 2014.</p> <p><b>2. Reference books</b></p> <p>[1] Ruan Yi. Electric Drive Automatic Control System Motion Control System (5th Edition) [M]. Beijing: Mechanical Industry Press, 2021.</p>
Data of last amendment	April 2025

## Process Control System

Module designation	<b>Process Control System</b>
Semester(s) in which the module is taught	6 <sup>th</sup> semester
Person responsible for the module	Lecturer Sun Fengyong
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 90 hours Contact hours = 48 hours Self-study hours = 42 hours
Credit points	3.0
Required and recommended prerequisites for joining the module	Automatic Control Theory, Computer Control System
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Understand the composition and classification of process control systems, as well as the performance metrics and their implications. Additionally, learn about the dynamic characteristic parameters of controlled objects and their significance.</li> <li>2. Comprehend the components of computer-based process control systems, their working principles, and typical application methods.</li> <li>3. Master the design and analysis methods for process control systems, including the selection of control schemes, control variables, and controlled variables, as well as the implementation of negative feedback.</li> <li>4. Gain proficiency in designing typical complex control systems and implementing various control strategies and controllers. This includes cascade control, feedforward control, systems with large time delays, decoupling control, and the design of controllers such as PID and digital controllers.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Proficiently use simulation software such as MATLAB/Simulink for control system simulation and experimentation.</li> <li>2. Capable of solving problems encountered in engineering practice.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Possess the ability to analyze, design, operate, and research process control systems.</li> </ol> </li> </ul>

	2. Demonstrate engineering practical skills and innovative capabilities.
Content	<p><b>Part A. Theoretical teaching</b> (40 contact hours; 34 self-study hours)</p> <p><b>Chapter 1 Introduction</b> (4 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Examples of process control system applications.</li> <li>● Composition of process control systems.</li> <li>● Performance metrics of process control systems.</li> <li>● Overview of the development of process control systems.</li> <li>● Process and instrumentation diagrams (p&amp;id).</li> </ul> <p><b>Chapter 2 Detection Technology</b> (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Performance metrics and output signal standards of detection instruments.</li> <li>● Temperature measurement.</li> <li>● Pressure measurement.</li> <li>● Level measurement.</li> <li>● Flow measurement.</li> </ul> <p><b>Chapter 3 Computer Input/Output Interface Technology</b> (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Industrial control computers.</li> <li>● Computer input/output channels.</li> <li>● Industrial control networks.</li> </ul> <p><b>Chapter 4 Actuators</b> (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Pneumatic control valves.</li> <li>● Electric control valves and other common control valves.</li> </ul> <p><b>Chapter 5 Process</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Mechanism modeling.</li> <li>● Incremental linearization.</li> <li>● Process dynamic characteristics.</li> <li>● Empirical modeling.</li> </ul> <p><b>Chapter 6 Feedback Controller</b> (10 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Feedback control and closed-loop systems.</li> <li>● Discrete control.</li> <li>● Continuous control.</li> <li>● Digital controller.</li> </ul> <p><b>Chapter 7 Simple Loop Design</b> (10 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Controller parameter tuning.</li> <li>● Steps in simple loop design.</li> <li>● Selection of the controlled variable.</li> <li>● Selection of the manipulated variable.</li> </ul>

	<ul style="list-style-type: none"> <li>● Controller action (direct or reverse).</li> </ul> <p><b>Chapter 8 Complex Control Systems</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Feedforward control systems.</li> <li>● Cascade control systems.</li> <li>● Ratio control systems.</li> <li>● Large time-lag process control systems.</li> </ul> <p><b>Part B. Experiment teaching</b> (8 contact hours; 8 self-study hours)</p> <p>To help students better understand the fundamental concepts of process control systems and the analysis of controlled objects, control system design, and validation methods related to process control systems, this course includes the following four experiments:</p> <ol style="list-style-type: none"> <li>1. Experiment for determining the mathematical model of a single-tank water level. (2 contact hours; 2 self-study hours)</li> <li>2. Single-tank water level control experiment. (2 contact hours; 2 self-study hours)</li> <li>3. Dual-tank water level cascade control experiment. (2 contact hours; 2 self-study hours)</li> <li>4. Single-loop flow ratio control system experiment. (2 contact hours; 2 self-study hours)</li> </ol>
Examination forms	Closed-book written exam
Study and examination requirements	<p>Process Control Systems is a required course for the Automation programme. The course assessment methods include: continuous assessment (40%, including course points 10% + midterm examination 10% + experiments 10% + assignments 10%) + final assessment (60%).</p> <ol style="list-style-type: none"> <li>1. Continuous Assessment (40%) Continuous assessment includes course points, assignment evaluations, experiments, and midterm examinations.</li> </ol> <ul style="list-style-type: none"> <li>● Course Points (10%): This mainly includes attendance, pre-class tests on Learning Through, and in-class interactive tests. (10 points)</li> <li>● Midterm Examination (10%): This mainly includes: <ul style="list-style-type: none"> <li>■ Knowledge section: ability to correctly answer basic knowledge about computer control systems, process control systems, principles of actuator and sensor selection, and related knowledge. (5 points)</li> <li>■ Skills section: ability to correctly analyze common process control system cases and evaluate their performance. (5 points)</li> </ul> </li> <li>● Experiments (10%): This mainly includes a clear understanding of the principles of various control schemes in process control systems, correct experimental procedures, and accurate analysis of experimental data and phenomena. (10 points)</li> <li>● Assignments (10%): Ability to use simulation tools to complete control system simulation tasks. (10 points)</li> </ul> <ol style="list-style-type: none"> <li>2. Final Assessment (60%) Closed-book Exam.</li> </ol>

	<ul style="list-style-type: none"> <li>● Understanding of the basic components and principles of computer control systems and process control systems; understanding of the performance indicators of process control systems and their meanings, as well as the dynamic characteristics and significance of the controlled objects. (18 points)</li> <li>● Mastery of the theory and methods for analyzing and synthesizing process control systems; ability to design appropriate process control schemes for various production processes and solve specific issues such as equipment selection, controller design, and parameter tuning. (42 points)</li> </ul>
Reading list	<p><b>1. Required books</b></p> <p>[1] Li Xiangshun. Computer Process Control Systems [M]. Beijing: Electronic Industry Press, 2019.</p> <p><b>2. Reference books</b></p> <p>[1] Huang Dexian. Process Control Systems [M]. Beijing: Tsinghua University Press, 2011.</p> <p>[2] Zheng Jiguang. Process Control Systems [M]. Beijing: Tsinghua University Press, 2012.</p>
Data of last amendment	April 2025

## Computer Control System

Module designation	Computer Control System
Semester(s) in which the module is taught	5 <sup>th</sup> semester
Person responsible for the module	Associate Professor Li Qinghua
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 90 hours Contact hours = 48 hours Self-study hours = 42 hours
Credit points	3.0
Required and recommended prerequisites for joining the module	Microcomputer Principle and Interface Technology, Automatic Control Theory
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Basic concepts and basic theories, characteristics of computer control systems.</li> <li>2. Discrete transformation of continuous systems, the discrete system stability, discrete system steady-state performance analysis and transient performance analysis.</li> <li>3. Mathematical description method of computer control systems, analytical design method and direct design method of digital controller.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Be able to understand basic concepts and basic theories, characteristics of computer control systems.</li> <li>2. Be able to understand the signal transformation problem of computer control systems, understand Shannon sampling theorem, and use mathematical methods of Z transformation and Z inverse transformation to describe the transformation process.</li> <li>3. Be able to understand the discrete system stability theorem, discrete system steady-state performance analysis and transient performance analysis methods.</li> <li>4. Be able to understand and apply the mathematical description methods of computer control systems, and be able to analyze the performance of the system based on the mathematical description of the system.</li> <li>5. Be able to understand and apply the analytical design methods and</li> </ol> </li> </ul>

	<p>direct design methods of digital controllers.</p> <ul style="list-style-type: none"> <li>● <b>Competence:</b></li> </ul> <ol style="list-style-type: none"> <li>1. Can comprehensively use the analysis and design methods of computer control systems to clearly describe the design tasks of automation systems.</li> <li>2. Can design the controller for the system, analyze and discuss the performance of the system, so as to have the ability to analyze complex engineering problems in the field of automation, cultivate and improve the ability to analyze and solve problems.</li> </ol>
Content	<p><b>Part A. Theoretical teaching</b> (36 contact hours; 36 self-study hours)</p> <p><b>Chapter 1 Overview of computer control system</b> (4 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Development and application of computer control systems.</li> <li>● Basic concepts of computer control systems.</li> <li>● Basic types of computer control systems.</li> <li>● Conversion between analog and digital signals.</li> </ul> <p><b>Chapter 2 Signal Transformation and Z Transformation</b> (8 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Signal conversion principle.</li> <li>● Sample signal recovery and holder.</li> <li>● Engineering technology of signal transformation.</li> <li>● Z Transformation.</li> <li>● Z-inverse transformation.</li> </ul> <p><b>Chapter 3 Mathematical description and performance analysis of computer control systems</b> (8 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Linear constant coefficient difference equation.</li> <li>● Pulse transfer function.</li> <li>● Stability analysis of computer control systems.</li> <li>● Algebraic stability criterion for computer control systems.</li> <li>● Analysis of steady-state process of computer control systems.</li> <li>● Analysis of transient process of computer control systems.</li> </ul> <p><b>Chapter 4 Analogization method of digital controller</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Basic principles of analytical design methods.</li> <li>● Discrete method of continuous controller.</li> <li>● Digital PID controller.</li> <li>● Smith Estimate Control.</li> </ul> <p><b>Chapter 5 Direct design method for digital controllers</b> (10 contact hours; 12 self-study hours)</p> <ul style="list-style-type: none"> <li>● Basic principles of direct design method.</li> <li>● Design method of Dad-beat controller.</li> <li>● Engineering improvements of Dad-beat controller.</li> <li>● Dahlin Algorithm.</li> </ul>

	<ul style="list-style-type: none"> <li>● Selection of key parameters in Dahlin Algorithm engineering application.</li> </ul> <p><b>Part B. Experiment teaching</b> (12 contact hours; 6 self-study hours)</p> <p>In order to help students better understand the concept and principle of computer control systems, master the methods of digital controller design, and improve their ability to analyze and solve problems in the field of automation system, the following six typical experimental classes will be arranged:</p> <ol style="list-style-type: none"> <li>1. Sampling and Maintenance Simulation. (2 contact hours; 1 self-study hours)</li> <li>2. Integral separation PID controller simulation. (2 contact hours; 1 self-study hours)</li> <li>3. Dad-beat ripple system simulation. (2 contact hours; 1 self-study hours)</li> <li>4. Dad-beat ripple-free system simulation. (2 contact hours; 1 self-study hours)</li> <li>5. Dahlin algorithm controller simulation. (2 contact hours; 1 self-study hours)</li> <li>6. Ringing elimination simulation on Dahlin algorithm controller (2 contact hours; 1 self-study hours)</li> </ol>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including assignments (20%) and experiment (20%).</p> <p>Final assessment (closed-book written exam) accounts for 60%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Liu Jianchang, Guan Shouping, Tan Shubin, etc. Computer Control System [M]. Beijing: Science Press, 2022.</p> <p><b>2. Reference books</b></p> <p>[1] Liu Chuanlai, Hu Naiping. Mechanical Automation Assembly Technology Computer Control Technology [M]. Beijing: Machinery Industry Press, 2015.</p> <p>[2] Yu Guangyun. Computer Control Technology [M]. Beijing: Electronics Industry Press, 2014.</p>
Data of last amendment	April 2025

## Sensor Principle and Detection Circuit Application

Module designation	Sensor Principle and Detection Circuit Application
Semester(s) in which the module is taught	4 <sup>th</sup> semester
Person responsible for the module	Lecturer Chen Xiaoyan
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 120 hours Contact hours = 64 hours Self-study hours = 56 hours
Credit points	4.0
Required and recommended prerequisites for joining the module	Advanced Mathematics I, Circuit Theory, Foundational of Analog Electronics
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Comprehend sensor definitions, classifications, static/dynamic characteristics, and error - handling methods.</li> <li>2. Grasp principles, features, and detection circuits of diverse sensors.</li> <li>3. Know common data - processing techniques for sensor - related data.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Select suitable sensors and design detection circuits for specific scenarios.</li> <li>2. Conduct experiments independently, analyze phenomena, and use simulation software.</li> <li>3. Operate virtual instrument platforms and engineering software proficiently.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Solve automation engineering problems in sensor - related aspects.</li> <li>2. Develop professional ethics like meticulousness and integrity.</li> <li>3. Adapt to technological changes and engage in lifelong learning.</li> </ol> </li> </ul>
Content	<p><b>Part A. Theoretical teaching</b> (48 contact hours; 48 self-study hours)</p> <p><b>Chapter 1 Introduction</b> (8 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● The meaning and types of sensors.</li> <li>● The future development trends of sensors.</li> <li>● The static and dynamic characteristics of sensors and their analysis methods.</li> </ul>

- The handling of measurement errors.

### **Chapter 2 Resistive sensors**

(12 contact hours; 12 self-study hours)

- Strain - type sensors: working principles and features of metal strain gauges. Teach the value of the craftsman spirit via the transverse effect.
- Strain-type sensors' detection & measurement circuits and applications.
- Piezoresistive sensors: semiconductor piezoresistive effect and circuit design.
- Thermoresistive sensors: metal & semiconductor types and their detection.

### **Chapter 3 Variable-impedance sensors**

(8 contact hours; 8 self-study hours)

- Working principles, output characteristics, measurement circuits and typical applications of self - inductance sensors.
- Differential transformers, covering working principles, main characteristics, and the design and application of detection and measurement circuits of self - inductance sensors like variable - air - gap, variable - area and solenoid types.
- Eddy - current sensors, including working principles, types, and the design and application of detection circuits.
- Capacitive sensors, involving working principles, main performances, equivalent circuits, and the design and application of detection circuits.

### **Chapter 4 Electromotive force sensors**

(8 contact hours; 8 self-study hours)

- Hall sensors: working principles, structures, basic circuits, main characteristic parameters, errors and compensation methods, and the design and application of detection circuits.
- Piezoelectric sensors: working principles, equivalent and conversion circuits, and the design and application of detection circuits.
- Thermocouple sensors: temperature - measuring principles, basic laws, cold - end treatment methods, and case applications.
- Magnetolectric sensors: working principles, moving - coil and magnetoresistive types, and dynamic characteristics of magnetolectric sensors.

### **Chapter 5 Photoelectric sensors**

(12 contact hours; 12 self-study hours)

- Photoelectric effect and photoelectric devices, mainly covering the basic principle of the photoelectric effect, external photoelectric effect and related devices (phototubes, photomultiplier tubes), and internal photoelectric effect and related devices (photoresistors, photodiodes, phototransistors, photovoltaic cells).
- CCD solid - state image sensors, including the working principle,

	<p>classification, and applications of CCDs.</p> <ul style="list-style-type: none"> <li>● Optical fiber sensors, involving the structure and light - guiding principle of optical fibers, main parameters of optical fibers, structural principles, classifications, characteristics, and applications of optical fiber sensors.</li> <li>● Optical code disks, mainly including the working principle, code disks and coding systems, applications of optical code disks, incremental encoders, and absolute encoders.</li> </ul> <p><b>Part B. Experiment teaching</b> (16 contact hours; 8 self-study hours)</p> <p>In order to help students better understand the concept and principle of Principles and Detection Circuit Applications of Sensors systems, master the processes of design, simulation, and machining of general engineering structures, and improve their practical skills, the following seven typical experimental classes will be arranged:</p> <ol style="list-style-type: none"> <li>1. Photoresistor Experiment. (2 contact hours; 1 self-study hours)</li> <li>2. Application of Strain Gauge DC Full - Bridge - Electronic Scale Experiment. (2 contact hours; 1 self-study hours)</li> <li>3. Vibration Measurement Experiment Using Piezoelectric Sensor. (2 contact hours; 1 self-study hours)</li> <li>4. Hall Sensor Experiment. (2 contact hours; 1 self-study hours)</li> <li>5. Thermocouple Temperature Measurement Experiment. (2 contact hours; 1 self-study hours)</li> <li>6. Encoder Experiment. (2 contact hours; 1 self-study hours)</li> <li>7. Comprehensive Design Experiment. (4 contact hours; 2 self-study hours)</li> </ol>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including assignments (20%) and experiment (20%).</p> <p>Final assessment (closed-book written exam) accounts for 60%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Hu Xiangdong. Sensors and Detection Technology [M]. Mechanical Industry Press, 2021.</p> <p>[2] Ye Ting Dong. Sensors and Detection Technology [M]. Beijing: Tsinghua University Press, 2021.</p> <p><b>2. Reference books</b></p> <p>[1] Xu Ke Jun. Sensors and Detection Technology ( V ) [M]. Beijing: Electronics Industry Press, 2022.</p> <p>[2] Liang Fu Ping. Sensors and Detection Technology( II ) [M]. Wuhan: Huazhong University of Science and Technology Press, 2018.</p> <p>[3] Yan Hui Juan. Principles and Applications of Sensors [M]. Beijing: China Machine Press,2017.</p>

Data of last amendment	April 2025
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## Digital Signal Processing

Module designation	Digital Signal Processing
Semester(s) in which the module is taught	5 <sup>th</sup> semester
Person responsible for the module	Associate Professor Wang Lei
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 90 hours Contact hours = 48 hours Self-study hours = 42 hours
Credit points	3.0
Required and recommended prerequisites for joining the module	Advanced Mathematics I, Signals and Systems
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Understand the fundamental concepts of digital signal processing.</li> <li>2. Analyze discrete-time signals and systems in both time and frequency domains.</li> <li>3. Apply discrete Fourier transform (DFT) and fast Fourier transform (FFT) techniques.</li> <li>4. Design and implement digital filters (IIR &amp; FIR).</li> <li>5. Utilize DSP in practical engineering applications.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Be able to apply mathematical tools to analyze digital signals and systems.</li> <li>2. Be able to develop and simulate DSP algorithms using MATLAB.</li> <li>3. Be able to design digital filters based on different methodologies.</li> <li>4. Be able to analyze and interpret frequency domain characteristics of signals.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Solve complex DSP problems in engineering applications.</li> <li>2. Evaluate the performance of different DSP techniques.</li> <li>3. Utilize modern DSP tools for signal analysis and filtering.</li> <li>4. Work in teams to solve practical engineering problems.</li> </ol> </li> </ul>
Content	<p><b>Theoretical teaching</b> (48 contact hours; 42 self-study hours)</p> <p><b>Chapter 1: Discrete-Time Signals and Systems</b> (6 contact hours, 6 self-study hours)</p>

	<ul style="list-style-type: none"> <li>● Introduction to DSP and its real-world applications</li> <li>● Discrete-time signals: classification, representation, and operations</li> <li>● Discrete-time systems: properties and classifications</li> <li>● Difference equations and system response analysis</li> </ul> <p><b>Chapter 2: Frequency Domain Analysis of Discrete-Time Signals</b> (6 contact hours, 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Fourier transform for discrete-time signals and its significance</li> <li>● Z-transform: definition, properties, and applications in system analysis</li> <li>● Frequency response of discrete-time systems and stability considerations</li> </ul> <p><b>Chapter 3: Discrete Fourier Transform (DFT)</b> (9 contact hours, 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Definition and computation of DFT</li> <li>● Properties of DFT and its practical significance</li> <li>● Frequency-domain sampling and spectral leakage</li> <li>● Applications of DFT in signal processing, filtering, and spectral analysis</li> </ul> <p><b>Chapter 4: Fast Fourier Transform (FFT)</b> (9 contact hours, 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Motivation for FFT and computational efficiency</li> <li>● Radix-2 DIT-FFT and DIF-FFT algorithms</li> <li>● Implementation of FFT in MATLAB and Python</li> </ul> <p><b>Chapter 5: Digital Filter Structures</b> (6 contact hours, 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Direct-form and cascade-form structures for IIR and FIR filters</li> <li>● Lattice filter structures and their applications</li> <li>● Signal flow graphs and realization of filters in digital hardware</li> </ul> <p><b>Chapter 6: IIR Digital Filter Design</b> (6 contact hours, 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Introduction to IIR filter design principles</li> <li>● Impulse invariance and bilinear transformation methods</li> <li>● Butterworth, Chebyshev, and Elliptic filter designs</li> </ul> <p><b>Chapter 7: FIR Digital Filter Design</b> (6 contact hours, 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Introduction to FIR filter design principles</li> <li>● Window method: rectangular, Hamming, Hanning, and Blackman windows</li> <li>● Frequency sampling method and its advantages</li> </ul>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance and assignments accounts for 10%. Experimental</p>

	report accounts for 20%. Final assessment (closed-book written exam) accounts for 70%.
Reading list	<p><b>1. Required books</b></p> <p>[1] Gao Xiquan, Ding Yumei. Digital Signal Processing (3rd Edition). Xidian University Press, 2010.</p> <p><b>2. Reference books</b></p> <p>[1] Oppenheim A.V., Schafer R.W. Discrete-Time Signal Processing. Pearson, 2010.</p> <p>[2] Proakis J.G., Manolakis D.G. Digital Signal Processing: Principles, Algorithms, and Applications. Pearson, 2007.</p> <p>[3] Mitra S.K. Digital Signal Processing: A Computer-Based Approach. McGraw-Hill, 2010.</p>
Data of last amendment	April 2025

## Modern Control Theory

Module designation	Modern Control Theory
Semester(s) in which the module is taught	5 <sup>th</sup> semester
Person responsible for the module	Lecturer Wu Di
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 90 hours Contact hours = 48 hours Self-study hours = 42 hours
Credit points	3.0
Required and recommended prerequisites for joining the module	Advanced Mathematics I, Linear Algebra, Complex Function and Integral Transformation, Automatic Control Theory
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. The fundamental concepts of modern control theory, including state-space models, controllability, observability, Lyapunov stability theory, pole placement, state observer design, and optimal control.</li> <li>2. The mathematical model establishment method of control system.</li> <li>3. The theoretical foundations of linear systems, including state-space descriptions, linear transformations, and the solutions to state equations.</li> <li>4. The principles of stability analysis, performance evaluation, and error analysis in control systems.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Be able to analyze control systems using state-space methods and frequency-domain analysis techniques.</li> <li>2. Be able to apply modern control theory to describe, analyze, and solve complex control problems in the field of automation.</li> <li>3. Be able to design state feedback controllers and state observers, and to implement these designs in practical control systems.</li> <li>4. Be able to use MATLAB for the modeling, analysis, design, and simulation of control systems.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Master the basic concepts, basic theories and basic methods of modern control theory.</li> <li>2. Master the mathematical modeling methods of the control system,</li> </ol> </li> </ul>

	<p>such as differential equation, transfer function and state space equation.</p> <p>3. Skilled in stability analysis, performance evaluation and error analysis of the control system.</p> <p>4. Skilled application of modern control theory to describe, analyze and solve complex control problems in the field of automation.</p>
Content	<p><b>Part A. Theoretical teaching</b> (42 contact hours; 33 self-study hours)</p> <p><b>Chapter 1 Introduction</b> (3 contact hours; 1.5 self-study hours)</p> <ul style="list-style-type: none"> <li>● The nature and task of control theory.</li> <li>● The development history of control theory.</li> <li>● The application of control theory.</li> <li>● The several basic steps to control a dynamic system.</li> </ul> <p><b>Chapter 2 State Space Description of Linear Control Systems</b> (12 contact hours; 9 self-study hours)</p> <ul style="list-style-type: none"> <li>● The mathematical description of linear systems.</li> <li>● The basic concepts of state space description.</li> <li>● Establishment of state space expression.</li> <li>● The solution of state equation.</li> <li>● Transfer function matrix of the system</li> <li>● Linear transformation of system state equation.</li> </ul> <p><b>Chapter 3 State Space Analysis of Linear Control Systems</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● The Basic concepts of state space description.</li> <li>● Linear transformation and normalization.</li> <li>● The solution of state transition matrix and state equation.</li> <li>● Controllability and observability analysis.</li> <li>● Design of state feedback control system.</li> <li>● Observer and observe-based compensator design.</li> </ul> <p><b>Chapter 4 Controllability and Observability of Linear Control Systems</b> (9 contact hours; 7.5 self-study hours)</p> <ul style="list-style-type: none"> <li>● The concept of controllability and observability.</li> <li>● The criterion of controllability and observability.</li> <li>● The structural decomposition of the linear continuous system.</li> <li>● Duality principle.</li> <li>● Controllable canonical form and observable canonical form.</li> </ul> <p><b>Chapter 5 Stability Analysis of Control System</b> (6 contact hours; 4.5 self-study hours)</p> <ul style="list-style-type: none"> <li>● The definition of Lyapunov stability.</li> <li>● Lyapunov stability theorem.</li> <li>● Lyapunov stability analysis of linear systems.</li> <li>● Application of tools such as MATLAB.</li> </ul> <p><b>Chapter 6 Synthesis of Linear Time-Invariant Systems</b> (6 contact hours; 4.5 self-study hours)</p> <ul style="list-style-type: none"> <li>● The basic structure of linear feedback control system.</li> </ul>

	<ul style="list-style-type: none"> <li>● Pole assignment of closed-loop system.</li> <li>● System stabilization problem.</li> <li>● Decoupling of linear control systems.</li> <li>● Design and application of state observer.</li> </ul> <p><b>Part B. Experiment teaching</b> (6 contact hours; 9 self-study hours)</p> <p>In order to help students better understand the concepts and principles involved in modern control theory, master the corresponding design and simulation methods, and improve students' practical skills, the following two typical experimental classes will be arranged:</p> <ol style="list-style-type: none"> <li>1. Design of linear quadratic optimal controller. (3 contact hours; 4.5 self-study hours)</li> <li>2. Design of state feedback and state observer. (3 contact hours; 4.5 self-study hours)</li> </ol>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including class performance (20%), assignments (10%) and experiment (10%).</p> <p>Final assessment (closed-book written exam) accounts for 60%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Fu Zhumu. Modern Control Theory (3rd Edition) [M]. Beijing: China Machine Press, 2023.</p> <p><b>2. Reference books</b></p> <p>[1] Zeng Jianping. Foundation of Modern Control Theory [M]. Beijing: China Machine Press, 2020.</p> <p>[2] Liu Peijin. Modern Control Theory and Engineering Application cases [M]. Xi'an: Xidian University Press, 2021.</p> <p>[3] Song Lirong. Modern Control Theory (2nd Edition) [M]. Beijing: China Electric Power Press, 2015.</p> <p>[4] Yan Maode. Modern Control Theory [M]. Beijing: China Machine Press, 2016.</p> <p>[5] Shi Haibin. Modern Control Theory [M]. Beijing: Tsinghua University Press, 2015.</p>
Data of last amendment	April 2025

## Power Electronic Technology

Module designation	Power Electronic Technology
Semester(s) in which the module is taught	5 <sup>th</sup> semester
Person responsible for the module	Lecturer Ma Hongyu
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 90 hours Contact hours = 48 hours Self-study hours = 42 hours
Credit points	3.0
Required and recommended prerequisites for joining the module	Circuit Theory, Foundational of Analog Electronics, Foundational of Digital Electronics, Automatic Control Theory
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Understand the working principles of power electronic devices (e.g., diodes, thyristors, MOSFETs, IGBTs).</li> <li>2. Master the topologies, operating principles, and control methods of rectifier, inverter, DC-DC, and AC-AC conversion circuits.</li> <li>3. Analyse key factors affecting power electronic system performance (e.g., harmonics, power factor).</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Be able to design and simulate power electronic circuits using MATLAB.</li> <li>2. Be able to calculate parameters, select components, and validate designs through experiments</li> <li>3. Be able to interpret waveforms and evaluate system efficiency.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Develop solutions for real-world power electronic applications (e.g., motor drives, renewable energy systems).</li> <li>2. Critically assess technical solutions using theoretical and experimental approaches.</li> </ol> </li> </ul>
Content	<p><b>Part A. Theoretical teaching</b> (36 contact hours; 33 self-study hours)</p> <p><b>Chapter 1 Introduction</b> (3 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● The concept of power electronics.</li> <li>● The development history of power electronics.</li> </ul>

	<ul style="list-style-type: none"> <li>● The applications of power electronics</li> </ul> <p><b>Chapter 2 Power Electronic Devices</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview and classification of power electronic devices.</li> <li>● Working principles and characteristics of uncontrollable devices.</li> <li>● Working principles and characteristics of semi-controlled devices.</li> <li>● Working principles and characteristics of fully controlled devices.</li> </ul> <p><b>Chapter 3 AC/DC Rectifier Circuits</b> (9 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Single-phase controlled rectifier circuits</li> <li>● Three-phase controlled rectifier circuits</li> <li>● Harmonics and power factor of rectifier circuits</li> <li>● Active inversion state of rectifier circuits</li> <li>● Phase control of rectifier circuits</li> </ul> <p><b>Chapter 4 DC/AC Inverter Circuits</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Half-bridge and full-bridge inverter circuits</li> <li>● Multi-level inverter circuits</li> <li>● Current-type inverter circuits</li> </ul> <p><b>Chapter 5 AC/AC Conversion Circuits</b> (3 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● AC voltage regulation circuits</li> <li>● AC-AC frequency conversion circuits</li> <li>● Matrix frequency conversion circuits</li> </ul> <p><b>Chapter 6 C DC/DC Conversion Circuits</b> (3 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Phase-controlled and chopping principles</li> <li>● Buck and boost chopping circuits</li> <li>● Buck-boost chopping circuits</li> <li>● The relationship and evolution of chopping circuits</li> </ul> <p><b>Chapter 7 PWM Control and Applications of Power Electronics</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Basic principles of PWM modulation</li> <li>● SPWM inverter circuit control technology</li> <li>● Common issues in the application of power electronic devices</li> <li>● Applications of power electronics</li> </ul> <p><b>Part B. Experiment teaching</b> (12 contact hours; 9 self-study hours)</p> <ol style="list-style-type: none"> <li>1. Simulation of rectifier circuits using MATLAB. (3 contact hours; 3 self-study hours)</li> <li>2. Analysis of inverter circuits under different control strategies. (3 contact hours; 3 self-study hours)</li> <li>3. Design and simulation of DC-DC converters. (3 contact hours; 3 self-study hours)</li> <li>4. PWM-controlled inverter circuit design. (3 contact hours)</li> </ol>
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Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignments shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including homework (10%), quizzes (10%), and experiments (20%).</p> <p>Final assessment (closed-book written exam) accounts for 60%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Liu Jinjun, Wang Zhao'an. Power Electronic Technology (6th Edition) [M]. Beijing: Mechanical Industry Press, 2024.</p> <p><b>2. Reference books</b></p> <p>[1] Ruan Xinbo. Power Electronic Technology [M]. Beijing: Mechanical Industry Press, 2024.</p> <p>[2] He Yikang, Pan Zaiping. Power Electronic Technology [M]. Beijing: Science Press, 2019.</p> <p>[3] Chen Wu. Tracing Power Electronics [M]. Beijing: Mechanical Industry Press, 2024.</p>
Data of last amendment	April 2025

### Data Communications and Networking

Module designation	Data Communications and Networking
Semester(s) in which the module is taught	5 <sup>th</sup> semester
Person responsible for the module	Lecturer Yin Chuanyang
Language	Chinese
Relation to curriculum	Elective
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	<p>Total workload = 60 hours</p> <p>Contact hours = 32 hours</p> <p>Self-study hours = 28 hours</p>
Credit points	2.0
Required and recommended prerequisites for joining the module	Computer Programming(C Language), Fundamentals of Digital Circuit Technology, Principles and Interface Technology of Microcomputers
Module	Learning outcomes:

<p>objectives/intended learning outcomes</p>	<ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Understand the basics knowledge of data communication, data transmission technologies, and the concept of data communication networks in data communication.</li> <li>2. Master the comprehensive and systematic understanding of the architecture and functional protocols of computer networks.</li> <li>3. Be able to analyze and solve problems related to the decomposition and integration of complex computer communication network systems.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Be able to establish appropriate mathematical models for engineering problems in computer communication networks.</li> <li>2. Be able to analyze and judge critical aspects of computer communication network protocols and draw effective conclusions.</li> <li>3. Be able to use professional knowledge to describe and analyze the data transmission process in computer communication networks.</li> <li>4. Familiar with the technical standards related to computer communication networks.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Master the experimental methods and general procedures of data communication systems, and conduct basic training on experimental skills safely and correctly.</li> <li>2. Be able to carry out tasks such as data communication, networking, installation, program writing and debugging in small groups.</li> <li>3. Capable of assuming the roles of individual, member, and leader in a group, able to effectively communicate with team members, and carry out work independently or collaboratively.</li> </ol> </li> </ul>
<p>Content</p>	<p><b>Part A. Theoretical teaching</b></p> <p>(24 contact hours; 20 self-study hours)</p> <p><b>Chapter 1 Introduction</b></p> <p>(2 contact hours; 1 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of Data Communication.</li> <li>● Data Communication System and Network.</li> <li>● Overview of Computer Networks.</li> <li>● Standards and Their Developing Organizations</li> </ul> <p><b>Chapter 2 Fundamentals of data communication</b></p> <p>(2 contact hours; 1 self-study hours)</p> <ul style="list-style-type: none"> <li>● Message and Information, Data and Signal.</li> <li>● Transmission Modes and Transmission Rate.</li> <li>● Transmission Impairments and Transmission Quality.</li> <li>● Communication Coding.</li> </ul>

### **Chapter 3 Data Transmission Channel**

(2 contact hours; 1 self-study hours)

- Overview of Channels.
- Transmission Media.

### **Chapter 4 Data Transmission Technology**

(2 contact hours; 2 self-study hours)

- Analog Signal Digitalization Transmission Technology.
- Digital Baseband Transmission Technology.
- Digital Frequency Band Transmission Technology.
- Channel Access Technology.
- Synchronization Control Technology.
- Digital Switching Technology.

### **Chapter 5 Physical Layer**

(2 contact hours; 2 self-study hours)

- Overview of the Physical Layer.
- Characteristics of the Physical Layer Interface.
- Common Standards for the Physical Layer.
- Digital Transmission Systems.
- Broadband Access Technologies.

### **Chapter 6 Data Link Layer**

(4 contact hours; 4 self-study hours)

- Overview of the Data Link Layer.
- Overview of the Data Link Layer.
- Three Basic Issues of Point-to-Point Channels.
- Data Link Layer Protocols for Point-to-Point Channels.
- Data Link Layer for Broadcast Channels.
- Ethernet Using Broadcast Channels.
- Extended Ethernet.
- High-Speed Ethernet.

### **Chapter 7 Network Layer**

(4 contact hours; 4 self-study hours)

- Overview of the Network Layer.
- Internet Protocol Version 4 (IPv4).
- Routing Protocols for the Internet.
- Internet Control Message Protocol (ICMP).
- IP Multicast and Its Protocols.
- Mobile IP and Its Protocols.
- Network Layer Protocols for the Next-Generation Internet.

### **Chapter 8 Transport Layer**

	<p>(2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of the Transport Layer.</li> <li>● User Datagram Protocol (UDP).</li> <li>● Transmission Control Protocol (TCP).</li> </ul> <p><b>Chapter 9 Application Layer</b></p> <p>(4 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of the Application Layer.</li> <li>● Domain Name System (DNS).</li> <li>● World Wide Web (WWW).</li> <li>● Electronic Mail (Email).</li> <li>● Dynamic Host Configuration Protocol (DHCP).</li> <li>● Communication Between Application Processes.</li> </ul> <p><b>Part B. Experiment teaching</b></p> <p>(8 contact hours; 8 self-study hours)</p> <p>In order to help students better understand the principles of data communication and computer network, master network design methods, and improve their practical skills, we will arrange the following four typical experimental classes:</p> <ol style="list-style-type: none"> <li>1. Basic Knowledge of Computer Networks. (2 contact hours; 2 self-study hours)</li> <li>2. Basic Usage of Network Commands. (2 contact hours; 2 self-study hours)</li> <li>3. Router Configuration. (2 contact hours; 2 self-study hours)</li> <li>4. Socket Programming. (2 contact hours; 2 self-study hours)</li> </ol>
Examination forms	Course Essay
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including assignments (10%), experiment (15%), class performance (15%).</p> <p>Final assessment (course essay) accounts for 60%.</p>
Reading list	<p><b>1.Required books</b></p> <p>[1] Yang Xinqiang. Data Communications and Computer Networks (5th Edition), Electronic Industry Press, 2018.</p> <p><b>2.Reference books</b></p> <p>[1] Gao Chuanshan. Data Communications and Computer Networks (2nd</p>

	Edition), Higher Education Press, 2007. [2] Xing Yanchen. Data Communications and Computer Networks (2nd Edition), People's Posts and Telecommunications Press, 2015.
Data of last amendment	April 2025

## Innovative System Design and Engineering Practice

Module designation	Innovative System Design and Engineering Practice
Semester(s) in which the module is taught	6 <sup>th</sup> semester
Person responsible for the module	Professor Huang Jun
Language	Chinese
Relation to curriculum	Elective
Teaching methods	Using lecturing as a primary teaching method, in combination with classroom exercises and discussion
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	Foundational of Analog Electronics, Foundational of Digital Electronics, Microcomputer Principle and Interface Technology, Sensor Principle and Detection Circuit Application
Requirements according to the examination regulations	Only students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Proficient in using electronic circuit design software such as Protel or Altium Designer.</li> <li>2. Understand the design methods of analog electronic systems, digital electronic systems, and mixed-signal electronic systems.</li> <li>3. Understand the design methods of microcontroller-based intelligent control systems.</li> </ol> </li> <li>● <b>Skills:</b> <ol style="list-style-type: none"> <li>1. Ability to design and debug circuit boards.</li> <li>2. Ability to design and debug analog circuits, digital circuits, and mixed-signal circuits.</li> <li>3. Ability to develop and debug microcontroller application systems.</li> </ol> </li> <li>● <b>Qualities:</b></li> </ul>

	<p>1. Scientific spirit and craftsmanship.</p> <p>2. Shaping socialist core values.</p> <p>3. Possessing the quality of lifelong learning.</p>
Content	<p><b>Stage 1 Understanding Printed Circuit Boards (PCB)</b></p> <p><b>Stage 2: Integrated Component Library Design</b>  Creation and Design of Schematic Component Libraries  Creation and Design of PCB Component Footprint Libraries</p> <p><b>Stage 3: Circuit Schematic Design</b></p> <p><b>Stage 4: Printed Circuit Board Design</b></p> <p><b>Stage 5: Analog and Digital Electronic System Design</b></p> <p><b>Stage 6: Microcontroller-Based Intelligent Control System Design</b></p>
Study and examination requirements and forms examination	<p>This course organizes students into groups of 3-5 members. Based on collaborative discussions, students will divide tasks and work together to complete the system design project, fostering teamwork spirit. During the design process, students are encouraged to independently design and actively innovate to develop creative thinking.</p> <p>The final grade for this course consists of three components: daily performance, course design report, and course defense. The daily performance accounts for 20% of the total grade, the course design report accounts for 40%, and the course defense accounts for 40%.</p>
Reading list	<p><b>1. Required books</b></p> <p>Yu Tianhe, Xue Nan. Case-Based Electronic System Design and Practice, Tsinghua University Press, December 2021.</p> <p><b>2. Reference books</b></p> <p>[1] Xu Cheng, Zhang Hongjie, et al. Fundamental Technical Training Tutorial for Electronic System Design and Innovation, Tsinghua University Press, October 2022.</p> <p>[2] Guo Yufeng. Electronic System Design and Practice Tutorial, People's Posts and Telecommunications Press, August 2022.</p> <p>[3] Jia Lixin. Electronic System Design and Practice, Tsinghua University Press, December 2018.</p>
Data of last amendment	April 2025

## Flexible Manufacturing with MES Systems

Module designation	Flexible Manufacturing with MES Systems
Semester(s) in which the module is taught	6 <sup>th</sup> semester
Person responsible for the module	Associate Professor Li Qinghua
Language	Chinese
Relation to curriculum	Elective
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	Motor Drive and Movement Control System, Sensor Principle and Detection Circuit Application
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. The concepts of flexible manufacturing system, intelligent warehousing, information management system, etc.</li> <li>2. Basic knowledge of industrial robots.</li> <li>3. Application of various sensors in flexible manufacturing systems.</li> <li>4. Drawing method of sequential control flow chart, programming method of assertion/reset.</li> <li>5. Application of fieldbus technology, Application of control motors and control system components used in flexible manufacturing systems.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Be able to understand the concepts of flexible manufacturing system, intelligent warehousing, information management system, etc.</li> <li>2. Be able to understand basic knowledge of industrial robots.</li> <li>3. Be able to understand the sensors in flexible manufacturing systems.</li> <li>4. Master the drawing method of sequential control flow chart and the programming method of assertion/reset.</li> </ol> </li> </ul>

	<p>5. Be able to understand fieldbus technology and apply human-computer interface configuration software, master simple interface design and be able to communicate, and be able to understand control motors and control system components used in flexible manufacturing systems.</p> <p>● <b>Competence:</b></p> <p>1. Be familiar with the basic components of the flexible manufacturing system, the logistics transmission link and the information monitoring link.</p> <p>2. Master the basic operations and basic applications of programmable controllers in the flexible manufacturing system, and initially form the ability to solve practical production problems.</p> <p>3. Improve students' professional qualities and lay a solid foundation for in-depth study and application of subsequent courses, while team collaboration ability, communication ability, organizational coordination ability are exercised.</p>
Content	<p><b>Part A. Theoretical teaching</b> (24 contact hours; 24 self-study hours)</p> <p><b>Chapter 1 Literacy Cognitive Learning</b></p> <p>(4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● FMS, FMC, FML, intelligent warehousing and other related concepts.</li> <li>● ERP, MES, FCS concepts.</li> </ul> <p><b>Chapter 2 Overview of MES Theory</b></p> <p>(4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● The composition of MES.</li> <li>● Functions of MES.</li> </ul> <p><b>Chapter 3 Introduction to the six functional modules of MES</b></p> <p>(4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Contents of each module of MES.</li> <li>● Relationship between MES modules.</li> </ul> <p><b>Chapter 4 Workshop scheduling module</b></p> <p>(4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Workshop scheduling issues.</li> <li>● Flow shop-type scheduling issues.</li> </ul> <p><b>Chapter 5 Workshop Planning Module</b></p> <p>(4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● The main functions included in the workshop planning module.</li> </ul>

	<ul style="list-style-type: none"> <li>● Case Study and Solutions of the workshop planning module.</li> </ul> <p><b>Chapter 6 Equipment Management and Process Management Module</b></p> <p>(4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● The main functions included in the equipment management and process management module.</li> <li>● The process of processing technology generation.</li> </ul> <p><b>Part B. Experiment teaching</b> (8 contact hours; 4 self-study hours)</p> <p>In order to help students better understand the basic composition of the flexible manufacturing system; master the application of each sensor in the flexible manufacturing system; master the wiring and debugging of programmable controllers in the flexible manufacturing system; master the application of pneumatic components in the flexible manufacturing system, namely the connection of pneumatic control loops; master the application of MES in flexible manufacturing systems, the following four typical experimental classes will be arranged:</p> <ol style="list-style-type: none"> <li>1. Flexible production line. (2 contact hours; 1 self-study hours)</li> <li>2. Pneumatic control process simulation. (2 contact hours; 1 self-study hours)</li> <li>3. Sensors in flexible manufacturing systems. (2 contact hours; 1 self-study hours)</li> <li>4. Motor and electrical control in flexible manufacturing systems. (2 contact hours; 1 self-study hours)</li> </ol>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including assignments (20%) and experiment (20%).</p> <p>Final assessment (closed-book written exam) accounts for 60%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Wang Aimin. Principles and Technology of Implementation of Manufacturing Execution System (MES) [M]. Beijing: Institute of Technology Press, 2014.</p> <p><b>2. Reference books</b></p> <p>[1] Zhao Rujia. Introduction to Advanced Manufacturing Systems [M]. Beijing: Machinery Industry Press, 2003.</p> <p>[2] Jiang Pingyu. Theory and Technology of Networked</p>

	Manufacturing Electronic Services [M]. Beijing: Science Press, 2004. [3] Li Peigen, Zhang Jie. Reconstruction and Control of Agile Intelligent Manufacturing Systems. Beijing: Machinery Industry Press, 2003.
Data of last amendment	April 2025

## Image Processing and Machine Vision

Module designation	Image Processing and Machine Vision
Semester(s) in which the module is taught	5 <sup>th</sup> semester
Person responsible for the module	Lecturer Li Ziqi
Language	Chinese
Relation to curriculum	Elective
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	Advanced Mathematics, Linear Algebra, Probability and Statistics, Signals and Systems, Computer Programming
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <p><b>Knowledge:</b></p> <ol style="list-style-type: none"> <li>1. Basic theories of image processing and computer vision, including concepts, principles, and problem-solving methods.</li> <li>2. Key technologies in image processing and target recognition, such as image operations, gray-scale mapping, histogram processing, and Fourier transform.</li> <li>3. Typical applications of intelligent image processing technologies and the basic composition and application fields of machine vision systems.</li> </ol> <p><b>Skill:</b></p> <ol style="list-style-type: none"> <li>1. Be able to apply image processing techniques to solve practical problems in intelligent detection, recognition, and control.</li> <li>2. Be able to use image enhancement methods, including spatial domain filtering and frequency domain enhancement, to improve image quality.</li> <li>3. Be able to design and implement basic machine vision systems for specific tasks.</li> </ol> <p><b>Competence:</b></p>

	<p>1. Apply principles of image processing and machine vision to analyze and solve complex problems in measurement and control technology and instruments.</p> <p>2. Master advanced knowledge in image processing and machine vision to comprehensively evaluate technical solutions.</p> <p>3. Cultivate independent thinking, innovation, and problem-solving abilities to adapt to the development of the discipline.</p>
Content	<p><b>Part A. Theoretical teaching</b> (20 contact hours; 21 self-study hours)</p> <p><b>Chapter 1 Introduction</b> (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● National policies (e.g., policies from the State Council, the Ministry of Education)The development history of CAD/CAM systems.</li> <li>● Disciplinary frontiers (the relationships between related disciplines of digital image processing)</li> </ul> <p><b>Chapter 2 Fundamentals of Image Technology</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● The relationship between images and pixels.</li> <li>● Pixel domains, adjacency, connectivity, and distance (Euclidean, city-block, chessboard)</li> <li>● Spatial sampling (spatial resolution) and gray-scale quantization (amplitude resolution)</li> <li>● Calculation of image storage and unit conversion.</li> <li>● Image coordinate transformations (translation, scaling, rotation, and cascading)</li> <li>● Hierarchies of image technology (processing, analysis, understanding)</li> </ul> <p><b>Chapter 3 Image Enhancement Techniques</b> (10 contact hours; 10 self-study hours)</p> <ul style="list-style-type: none"> <li>● Image arithmetic and logical operations.</li> <li>● Image gray-scale mapping (e.g., image inversion, contrast stretching, dynamic range compression)</li> <li>● Histogram equalization and specification.</li> <li>● Spatial convolution enhancement (linear and nonlinear smoothing and sharpening)</li> <li>● Fourier transform and frequency-domain enhancement.</li> <li>● Principles and interconnections of various filters.</li> </ul> <p><b>Chapter 4 Machine Vision Systems</b> (2 contact hours; 3 self-study hours)</p>

	<ul style="list-style-type: none"> <li>● Definition and basic components of machine vision.</li> <li>● Typical application fields of machine vision systems.</li> </ul> <p><b>Part B. Experiment teaching</b> (12 contact hours; 7 self-study hours)</p> <p>To help students better understand the concepts and principles of image processing and machine vision, master the processes of image processing and analysis, and enhance their practical skills, the following six experimental classes will be arranged:</p> <ol style="list-style-type: none"> <li>1. Basic Digital Image Processing Experiment. (2 contact hours; 1 self-study hours)</li> <li>2. Image Algebraic Operations Experiment. (2 contact hours; 1 self-study hours)</li> <li>3. Image Grayscale Transformation Experiment. (2 contact hours; 1 self-study hours)</li> <li>4. Image Enhancement - Histogram Transformation Experiment. (2 contact hours; 2 self-study hours)</li> <li>5. Image Enhancement - Spatial Domain Filtering Experiment. (2 contact hours; 1 self-study hours)</li> <li>6. Image Fourier Transform Experiment. (2 contact hour; 1 self-study hour)</li> </ol>
Examination forms	Assessment (Final Project)
Study and examination requirements	<p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including Classroom Interactive Discussion and Attendance Performance (20%) and In-class Exercises and Homework (20%).</p> <p>Final assessment (Final Project) accounts for 60%.</p>
Reading list	<p><b>1. Recommended books</b></p> <p>[1] Zhang Yujin. Image Processing and Analysis Technology (3rd Edition) [M]. Beijing: Higher Education Press, 2014.</p> <p><b>2. Reference books</b></p> <p>[1] Gonzales (US). Digital Image Processing [M]. Beijing: Electronic Industry Press, 2004.</p>
Data of last amendment	April 2025

## PLC and Its Application

Module designation	<b>PLC and Its Application</b>
Semester(s) in which the module is taught	4 <sup>th</sup> semester
Person responsible for the module	Lecturer Sun Fengyong
Language	Chinese
Relation to curriculum	Elective
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	C Language Programming (1)
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Understand the basic hardware composition, functions, and installation and maintenance requirements of PLCs.</li> <li>2. Comprehend the commonly used basic instructions of PLCs.</li> <li>3. Familiarize oneself with the structure of PLC programming.</li> <li>4. Implement PLC program design for common scenarios using sequential control.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Master the construction and control operations of commonly used PLC control systems.</li> <li>2. Be able to apply specific PLC instructions to analyze and solve engineering problems.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Understand the concept and implementation methods of structured programming.</li> <li>2. Master the design of Function Charts (FC) and Function Block Diagrams (FBD) for PLC programs.</li> </ol> </li> </ul>

	3. Be able to use FC and FBD to implement PLC program design for common scenarios.
Content	<p><b>Part A. Theoretical teaching</b> (24 contact hours; 20 self-study hours)</p> <p><b>Chapter 1 Introduction</b></p> <p>(2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understanding PLCs: The origin of PLCs, development trends, working principles, main features, and application fields.</li> <li>● Understanding the Siemens PLC Family.</li> <li>● S7-1200 Development Environment.</li> <li>● Bit Logic Instructions.</li> <li>● Creating Project Files, Writing Ladder Diagram Programs, and Ladder Diagram Simulation.</li> <li>● Siemens Cup China Intelligent Manufacturing Competition.</li> </ul> <p><b>Chapter 2 Motor Control</b></p> <p>(3 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Inputs and Outputs: Define start and stop buttons as input signals, and the motor as the output control object.</li> <li>● Touchscreen Interface: Design start and stop buttons on the touchscreen and display the motor's operating status.</li> <li>● Function Implementation: Pressing the start button starts the motor; pressing the stop button stops the motor.</li> <li>● Forward-Reverse Control: Use forward, stop, and reverse buttons to control the forward and reverse operation of a three-phase asynchronous motor. Implement short-circuit and overload protection functions.</li> <li>● Switching Restrictions: Do not allow direct switching from forward to reverse during forward operation, and vice versa.</li> </ul> <p><b>Chapter 3 Running Water Light Control</b></p> <p>(4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Button and LED Control: Use PLC to control 8 buttons for 8 LED lights, with corresponding buttons and indicators on the touchscreen.</li> <li>● Flowing Light Effect: Use PLC to create a flowing light effect with 16 LED lights, controlled by start and stop buttons on the touchscreen.</li> <li>● Neon Light and Stage Lighting: Design a neon light system with 10 LED segments (6 arcs and 4 letters: WXXY) that flash in a specific sequence at 2Hz. The sequence is "outer-middle-inner-W-X-X-Y" and then "Y-X-X-W-inner-middle-outer," repeating 3 times each. Include start and stop buttons on the touchscreen to control the sequence.</li> </ul>

- Assembly Line Control: Use PLC to control an assembly line with processes A, B, C, D, E, F, G, and final storage H, ensuring smooth operation and coordination. Industrial control computers.

#### **Chapter 4 Traffic Light Control**

(4 contact hours; 4 self-study hours)

- Traffic Light Timing: Define reduced time intervals for traffic light phases: 0-10s, 10-12s, 12-14s, 14-28s for east-west direction and 0-14s, 14-24s, 24-26s, 26-28s for north-south direction.
- Light Sequences: Control the sequence of green, yellow, and red lights for both directions, including flashing green lights and constant yellow lights during transition periods.
- Start and Stop Control: Use start and stop buttons to initiate and halt the traffic light system, with all lights turning off when stopped.
- Touchscreen Interface: Design a touchscreen interface to simulate a crossroad traffic light system, with start and stop buttons for control.

#### **Chapter 5 Round-Trip Operation of Material Transportation Trolleys**

(3 contact hours; 3 self-study hours)

- Control Logic: Use start and stop buttons to control the cart's movement. The cart pauses for 1 second at each sensor and reverses direction when it reaches sensors SQ1 or SQ4.
- Timer Instructions: Implement timer instructions to manage the 1-second pause at each sensor.
- Function Block (FB) Programming: Create and program a Function Block (FB) to handle the cart's movement and sensor interactions.
- Data Block (DB) Variables: Use Data Block (DB) variables to store and manage the cart's state and sensor data.

#### **Chapter 6 Automated Production Line**

(6 contact hours; 2 self-study hours)

- Process Analysis: Analyze the production line's process flow to determine the functions and operational steps of each workstation.
- Engineering Design: Design the control system using a Siemens S7-1200 PLC, covering six workstations: main part feeding, defective part sorting, rotation, orientation adjustment, product assembly, and product sorting.
- On-Site Execution and Debugging: Install and debug the system in the actual production environment to ensure that all workstations operate efficiently and in coordination.

#### **Chapter 7 Factory IO**

(2 contact hours; 2 self-study hours)

	<ul style="list-style-type: none"> <li>● Scene Setup: Open a conveyor belt system scene in the Factory IO library, as shown in Figure 7-1.</li> <li>● PLC Programming: Write a program for the Siemens S7-1200 PLC in TIA Portal to control the conveyor belt system using PLCSIM software.</li> <li>● System Requirements: The scene includes two connected conveyor belts: Conveyor Belt 1 on the left and Conveyor Belt 2 on the right. A start button controls Conveyor Belt 1 to move from left to right. Conveyor Belt 2 has sensors at both ends. When a box from Conveyor Belt 1 reaches the start position of Conveyor Belt 2, the start sensor detects it and starts Conveyor Belt 2. When the box reaches the end position, the end sensor stops Conveyor Belt 2. Pressing the stop button at any time will also stop Conveyor Belt 2.</li> </ul> <p><b>Part B. Experiment teaching</b> (8 contact hours; 8 self-study hours)</p> <p>To help students better understand the fundamental concepts of PLC, this course includes the following four experiments:</p> <ol style="list-style-type: none"> <li>1. Assembly Line System: Wiring, programming, and system implementation of the assembly line. (2 contact hours; 2 self-study hours)</li> <li>2. Four-Section Conveyor System: Wiring, programming, and system implementation of the four-section conveyor system. (2 contact hours; 2 self-study hours)</li> <li>3. Traffic Light System: Wiring, programming, and system implementation of the traffic light system. (2 contact hours; 2 self-study hours)</li> <li>4. Material Handling Cart System: Wiring, programming, and system implementation of the material handling cart system. (2 contact hours; 2 self-study hours)</li> </ol>
Examination forms	Book report
Study and examination requirements	<p>The course "PLC and Its Application" is an elective course for the Automation major. The course assessment includes continuous assessment (40%, comprising 15% for course participation, 15% for homework, and 10% for experiments) and summative assessment (60%).</p> <p>1. Continuous Assessment (40%)</p> <p>Continuous assessment including course participation, homework, and experiments.</p> <ul style="list-style-type: none"> <li>● Course Participation (15%): Engage in various course activities, attend classes on time without being late, and complete assigned tasks on schedule. (15 points)</li> </ul>

	<ul style="list-style-type: none"> <li>● Homework (15%): Complete the required number of homework assignments on time, including programming and simulation results, and meet the functional requirements. (15 points)</li> <li>● Experiments (10%): Demonstrate a clear understanding of each experimental task, follow the correct experimental procedures, achieve the system's functionality, and provide accurate analysis of the experimental phenomena. (10 points)</li> </ul> <p>2. Final Assessment (60%)</p> <p>Evaluation through project testing and design report.</p> <ul style="list-style-type: none"> <li>● Project Testing (10%). <ul style="list-style-type: none"> <li>■ Successfully implement the lower-level ladder diagram design and simulation according to the design task. (10 points)</li> </ul> </li> <li>● Design Report (50%). <ul style="list-style-type: none"> <li>■ Task Analysis, I/O Ports, and Electrical Wiring Diagrams (15%): Clearly and completely describe the task analysis, input/output ports, and electrical wiring diagrams in the design report. The charts and diagrams should be visually appealing and clear, and the text should be detailed and clear. (15 points)</li> <li>■ Variable Table and Ladder Diagram Program Design (20%): Clearly and completely present the lower-level variable table design and ladder diagram program design in the design report. The charts and diagrams should be visually appealing and clear, and the text should be detailed and clear. (20 points)</li> <li>■ System Function Testing and Analysis (15%): Provide complete test results and analysis for all system functions in the design report. The charts and diagrams should be visually appealing and clear, and the text should be detailed and clear. (15 points)</li> </ul> </li> </ul>
Reading list	<p><b>1. Required books</b></p> <p>[1] Zhou Wenjun. Siemens S7-1200/1500 PLC Project-Based Tutorial—Based on SCL and LAD Programming [M]. Beijing: Electronic Industry Press, 2023.</p> <p><b>2. Reference books</b></p> <p>[1] Liao Changchu. S7-1200 PLC Programming and Applications (4th Edition) [M]. Beijing: China Machine Press, 2021.</p> <p>[2] Wu Fanhong. Siemens S7-1200 PLC Application Technology Project Tutorial (2nd Edition) [M]. Beijing: Electronic Industry Press, 2021.</p> <p>[3] Li Fangyuan. S7-1200 PLC Application Technology [M]. Beijing: Electronic Industry Press, 2023.</p>
Data of last amendment	April 2025

## Python Language Programming

Module designation	Python Language Programming
Semester(s) in which the module is taught	3 <sup>rd</sup> semester
Person responsible for the module	Lecturer Li Ziqi
Language	Chinese
Relation to curriculum	Elective
Teaching methods	Theoretical teaching, experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	Fundamentals of Computer-Aided Design, Computer Programming
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Python language features, development environment, and core syntax.</li> <li>2. Programming paradigms: procedural, functional, and OOP.</li> <li>3. Standard libraries and practical applications.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Be able to understand how to program using Python.</li> <li>2. Be able to use Python for basic purposes, such as develop Python programs using control structures and data types.</li> <li>3. Be able to write Python programs, master solving real-world problems through comprehensive coding projects, and verify the accuracy of the techniques through experiments.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Apply the basic principles of python to analyse and calculate.</li> <li>2. Master the use of Python for programming and how to debug and optimize program performance</li> <li>3. Master the cutting-edge knowledge and skills of program design, and</li> </ol> </li> </ul>

	<p>be able to comprehensively evaluate technical solutions through theoretical knowledge and experience.</p>
<p>Content</p>	<p><b>Part A. Theoretical teaching</b> (24 contact hours; 22 self-study hours)</p> <p><b>Chapter 1 Introduction</b></p> <p>(1 contact hours; 1 self-study hours)</p> <ul style="list-style-type: none"> <li>● The concept of Programming language.</li> <li>● The concept of Python.</li> <li>● Development environment setup of Python.</li> <li>● Application case</li> </ul> <p><b>Chapter 2 Basic Grammatical Element Analysis.</b></p> <p>(4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● The format framework of the program.</li> <li>● Variable naming rules and reserved words</li> <li>● The concept of basic I/O functions</li> <li>● Operator precedence and expression formation</li> </ul> <p><b>Chapter 3 Basic Data Types</b></p> <p>(4 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● The concept of Numeric types.</li> <li>● The concept of String manipulation.</li> <li>● Boolean logic and type conversion mechanisms,.</li> <li>● Type checking.</li> </ul> <p><b>Chapter 4 Program Flow Control</b></p> <p>(6 contact hours; 5 self-study hours)</p> <ul style="list-style-type: none"> <li>● Program control structure.</li> <li>● Common operations that result in boolean values.</li> <li>● Branching structures, looping structures, and exception handling in programs.</li> <li>● Exception handling in programming.</li> </ul> <p><b>Chapter 5 The Type of Composite Data</b></p> <p>(3 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● The concept of Composite Data.</li> <li>● The concept of List, Tuple, Dictionary and Set.</li> <li>● List Operations and Management.</li> </ul> <p><b>Chapter 6 Function</b></p> <p>(4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● The concept of Function.</li> <li>● The method of parameter passing.</li> </ul>

	<ul style="list-style-type: none"> <li>● The scope of the variable.</li> <li>● The concept of Lambda Functions, Recursive Functions, and Procedural vs. Functional Programming.</li> </ul> <p><b>Part B. Experiment teaching</b> (8 contact hours; 6 self-study hours)</p> <p>In order to help students better understand the concept and principle of Python, master solving real-world problems through comprehensive coding projects, and verify the accuracy of the techniques through experiments, and improve their practical skills, the following four typical experimental classes will be arranged:</p> <ol style="list-style-type: none"> <li>1. Fundamentals of programming design. (2 contact hours; 2 self-study hours)</li> <li>2. Program flow control. (2 contact hours; 2 self-study hours)</li> <li>3. Composite data type. (2 contact hours; 2 self-study hours)</li> <li>4. By writing programs using functions. (2 contact hours; 2 self-study hours)</li> </ol>
Examination forms	Assignment and Essay
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including Assignments (25%) and Performance (15%).</p> <p>Final Essay accounts for 60%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Jin Ying. Python Programming: Applied Tutorial[M]. Shanghai: SJTU Press, 2024.</p> <p><b>2. Reference books</b></p> <p>[1] Dong Fuguo. Python Programming Fundamentals[M]. Beijing: Tsinghua Press, 2023.</p>
Data of last amendment	April 2025

### Robot Operating System (ROS)

Module designation	Robot Operating System (ROS)
Semester(s) in which the module is taught	4 <sup>th</sup> semester

Person responsible for the module	Lecturer Yin Chuanyang
Language	Chinese
Relation to curriculum	Elective
Teaching methods	Theoretical teaching, experiment teaching.
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	College Physics, Computer Programming (C Language), Fundamentals of Machinery/Mechanical Engineering Basics, Electric Drive and Motion Control,
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Understand ROS architecture and communication mechanisms, be familiar with key concepts such as Nodes, Topics, Services, Parameter Server, and Actions, and be able to understand and utilize these elements to work.</li> <li>2. Master using various built-in debugging and visualization tools, such as rviz, rospy, and roscpp, which can help develop and manage ROS projects more efficiently.</li> <li>3. Master basic knowledge and skill requirements, such as proficiency in C++/Python programming, a good grasp of basic Linux system operations, and a basic understanding of robotics.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Be able to design and implement complex robotic systems, proficient in ROS can apply it to a variety of projects, ranging from simple educational projects to complex industrial applications.</li> <li>2. Be able to grasp the development trends of the main research directions in the field of robotics based on the global and Chinese manufacturing trends.</li> <li>3. Be able to write complex ROS packages, and, when necessary, modify existing ones to suit specific needs, while ensuring code quality and maintainability.</li> </ol> </li> <li>● <b>Competence:</b></li> </ul>

	<p>1. Have the ability to analyze hardware and software problems in the field of robotics, and carry out experimental research by combining basic knowledge of frontiers of robotics.</p> <p>2. By understanding the development trends in the field of robotics, students can realize the close connection between robotics, manufacturing power and AI, establish the concept of independent learning, and continuously adapte to social development.</p>
Content	<p><b>Part A. Theoretical teaching</b> (24 contact hours; 20 self-study hours)</p> <p><b>Chapter 1 Fundamentals of ROS Robotics</b></p> <p>(2 contact hours; 1 self-study hours)</p> <ul style="list-style-type: none"> <li>● The Era of Robotics and the Birth of ROS.</li> <li>● Introduction to ROS</li> <li>● Installation and Testing of ROS</li> <li>● Installing Educational Packages</li> <li>● Binary Packages vs. Source Code Packages.</li> </ul> <p><b>Chapter 2 ROS System Architecture</b></p> <p>(2 contact hours; 1 self-study hours)</p> <ul style="list-style-type: none"> <li>● ROS File System.</li> <li>● ROS Communication Architecture.</li> </ul> <p><b>Chapter 3 Common ROS Components and Development Tools</b></p> <p>(2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Gazebo Simulation Tool.</li> <li>● Rviz Visualization Platform</li> <li>● rqt Visualization Tool</li> <li>● rosbag Functionality Package</li> <li>● RoboWare Studio Integrated Development Environment</li> <li>● Code Management with Git.</li> </ul> <p><b>Chapter 4 ROS Programming</b></p> <p>(2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Introduction to Client Libraries.</li> <li>● roscpp</li> <li>● rospy.</li> </ul> <p><b>Chapter 5 Coordinate Transformation (TF) and Programming</b></p> <p>(3 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understanding TF.</li> <li>● Principles of TF and TF Messages</li> <li>● Fundamentals of TF Programming</li> <li>● TF in C++</li> </ul>

- TF in Python
- TF-related Tools and Commands.

### **Chapter 6 Robot Modeling and Simulation**

(4 contact hours; 4 self-study hours)

- URDF Model of a Robot.
- Creating and Displaying a URDF Model
- Adding Collision and Physical Properties
- Simplifying URDF Models with xacro Files
- Adding Sensor Models
- ArbotiX + Rviz Robot Motion Simulation
- ros\_control
- Robot Simulation in Gazebo.

### **Chapter 7 Robot Vision Development Technologies**

(3 contact hours; 2 self-study hours)

- ROS Image Data.
- Camera Calibration
- OpenCV Library and Face Recognition
- QR Code Recognition
- Object Detection.

### **Chapter 8 Robot Speech Development Technologies**

(2 contact hours; 2 self-study hours)

- Speech Recognition.
- Speech Playback
- Controlling a Robot via Voice
- Using iFLYTEK on ROS
- Intelligent Voice Conversation.

### **Chapter 9 Robot SLAM and Autonomous Navigation Development Technologies**

(4 contact hours; 4 self-study hours)

- Theoretical Foundation.
- Gmapping Algorithm
- Hector Algorithm
- Cartographer Algorithm
- Autonomous Navigation
- costmap and map\_server
- AMCL Localization Algorithm.

### **Part B. Experiment teaching**

(8 contact hours; 8 self-study hours)

In order to help students better understand the principles of Robot

	<p>Operating System (ROS), master programming methods, and improve their practical skills, we will arrange the following four typical experimental classes :</p> <ol style="list-style-type: none"> <li>1. Fundamentals of ROS. (2 contact hours; 2 self-study hours)</li> <li>2. ROS Architecture and Concepts. (2 contact hours; 2 self-study hours)</li> <li>3. Visualization and Debugging Tools. (2 contact hours; 2 self-study hours)</li> <li>4. 3D Modeling and Simulation. (2 contact hours; 2 self-study hours)</li> </ol>
Examination forms	Course Essay
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including assignments(10%), experiment (15%), class performance (15%).</p> <p>Final assessment (course essay) accounts for 60%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1]Jiang Changjiang et al., Fundamentals of ROS Robot Development Technology, Chemical Industry Press, 2022.</p> <p><b>2. Reference books</b></p> <p>[1] Zhang Xinyu et al., ROS Robotics: Theory and Practice, Tsinghua University Press, 2023.</p> <p>[2] Zhang Ruilei, ROS Robot Programming(Third Edition), Mechanical Industry Press, 2017.</p> <p>[3] Lentin Joeeph, Robot Operating System for Absolute Beginners, Mechanical Industry Press , 2020.</p>
Data of last amendment	April 2025

## Engineering Ethics

Module designation	Engineering Ethics
Semester(s) in which the module is taught	2 <sup>th</sup> semester
Person responsible for the module	Lecturer Shao Liren
Language	Chinese
Relation to curriculum	Elective
Teaching methods	Theoretical teaching
Workload (incl. contact hours, self-study hours)	Total workload = 30 hours Contact hours = 16 hours Self-study hours = 14 hours
Credit points	1.0
Required and recommended prerequisites for joining the module	Ideological and moral cultivation and basic law education
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Adapt to the requirements of the economy and society, understand the professional ethics and ethical responsibilities of engineers, master the ethical guidelines of the profession and the applicable laws and safety standards of the profession</li> <li>2. To analyze practical problems by comprehensive use of ethics knowledge, so as to strengthen students' sense of professional mission and moral responsibility.</li> <li>3. Strengthen the literacy of humanities and social sciences, consciously abide by the engineering professional ethics and norms in the future engineering practice, and fulfill the social responsibility of engineers for public safety and environmental protection.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Through the teaching of the basic knowledge of engineering ethics and the analysis of case problems in different engineering fields, the students' vision is broadened and the basic background knowledge of engineering is helped to be mastered.</li> <li>2. Through in-depth discussion and study of cases in class, students are helped to master the basic norms of engineering ethics, improve</li> </ol> </li> </ul>

	<p>students 'humanities and social science literacy and social responsibility, so that students can understand and abide by engineering professional ethics and norms in practice oriented to automation, and perform social responsibility.</p> <p>3. Through group discussion and cooperation, group report and display and other course links, students 'project management, effective communication and teamwork skills are cultivated.</p> <p>● <b>Competence:</b></p> <p>1. Enhance students' understanding of the social, health, safety, legal and cultural impacts of professional engineering practice and solutions to complex engineering problems, and understand the responsibilities to be assumed.</p> <p>2. Students are trained to pay attention to, understand and evaluate the problems of environmental protection, social harmony, economic sustainability, ecological sustainability and human sustainable development in engineering practice.</p> <p>3. Cultivate students' critical thinking ability, the ability to coordinate and deal with complex contradictions, and comprehensively improve students' ability to analyze and solve engineering ethical problems, decision-making ability and way of thinking.</p>
Content	<p><b>Theoretical teaching</b> (16 contact hours; 14 self-study hours)</p> <p><b>Chapter 1 Introduction</b></p> <p>(4 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● How to understand engineering.</li> <li>● How to understand ethics.</li> <li>● Ethical issues in engineering practice.</li> <li>● How to deal with ethical issues in engineering practice.</li> </ul> <p><b>Chapter 2 Engineering risk</b></p> <p>(4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Source and prevention of engineering risks.</li> <li>● Ethical assessment of engineering risks.</li> <li>● Ethical responsibility in engineering risks.</li> </ul> <p><b>Chapter 3 Engineering value</b></p> <p>(4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● The value and characteristics of the project.</li> <li>● The object and accessibility served by the project.</li> <li>● Stakeholders and social costs in engineering practice.</li> <li>● The realization of the principle of justice in engineering.</li> </ul>

	<p><b>Chapter 4 Principles and techniques of creation</b></p> <p>(4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Establishment of environmental ethics concept in engineering activities.</li> <li>● Environmental values and ethical principles in engineering activities.</li> <li>● The engineer's environment.</li> <li>● Engineering profession.</li> <li>● Engineering ethics.</li> <li>● Code of ethics for engineers.</li> </ul>
Examination forms	Examine
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including attendance (10%), class performance (10%), assignments (10%) and class lecture (10%).</p> <p>Final assessment (examine) accounts for 60%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Li Zhengfeng, Cong Hangqing, Wang Qian. Engineering Ethics (2nd edition) [M]. Beijing: Tsinghua University Press, 2019.</p> <p><b>2. Reference books</b></p> <p>[1] Charles E. Harris and others. Translated by Cong Hangqing, Shen Qi et al. Concepts and Cases of Engineering Ethics [M], Beijing: Beijing Institute of Technology Press, 2006.</p> <p>[2] Li Shixin. Introduction to Engineering Ethics [M]. Beijing: China Social Sciences Press, 2008.</p> <p>[3] Michael W. Martin and others. Translated by Li Shixin. Engineering Ethics [M], Beijing: Capital Normal University Press, 2010.</p>
Data of last amendment	April 2025

## Engineering Economics

Module designation	Engineering Economy
Semester(s) in which the module is taught	6 <sup>th</sup> semester
Person responsible for the module	Professor Song Zhiqiang
Language	Chinese
Relation to curriculum	Elective
Teaching methods	Theoretical teaching
Workload (incl. contact hours, self-study hours)	Total workload = 30 hours Contact hours = 16 hours Self-study hours = 14 hours
Credit points	1.0
Required and recommended prerequisites for joining the module	Basic mathematical knowledge
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Master the basic theory and methods of engineering economics.</li> <li>2. Understanding the importance of the direction of control systems, equipment and information processing in the field of automation in engineering management and economic decision-making.</li> <li>3. Master the principles of engineering management and economic decision-making methods.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Master the ability of flexibly applying the basic principles and methods of engineering economics to carry out economic analysis and evaluation of engineering and technical programmes.</li> <li>2. Master the ability of reasonably evaluating the impact on the environment and sustainable development of society in the light of the complex issues involved in the management of construction projects.</li> <li>3. Master the ability of applying the economic evaluation methods learned to make trade-offs between individual investment projects and multiple alternative investment options, as well as to conduct economic analyses of equipment purchase and leasing decisions and replacement</li> </ol> </li> </ul>

	<p>decisions.</p> <ul style="list-style-type: none"> <li>● <b>Competence:</b></li> </ul> <ol style="list-style-type: none"> <li>1. Able to accurately express his/her views on professional issues in the field of intelligent manufacturing automation technology, verbally, in manuscripts, diagrams, etc., responding to challenges and understanding the differences in communication with industry peers and the public.</li> <li>2. Able to analyse and evaluate the social, health, safety, legal and cultural impacts of professional engineering practice in a targeted manner in the light of practical application scenarios of engineering projects involved in the development of smart manufacturing oriented fields, as well as the impacts of these constraints on the implementation of engineering projects involved in control systems, equipment and information processing for smart manufacturing processes, and to understand the responsibilities to be assumed.</li> </ol>
Content	<p>(16 contact hours; 14 self-study hours)</p> <p><b>Chapter 1 Fundamentals of Engineering Economics</b></p> <p>(3 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of engineering economics.</li> <li>● Fundamentals of engineering economic analysis.</li> <li>● Principles of engineering economic analysis.</li> </ul> <p><b>Chapter 2 Essential elements of engineering economic analysis</b></p> <p>(3 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Project cash flows and their components.</li> <li>● Project investment components and estimation methods.</li> <li>● Project production and operating costs.</li> </ul> <p><b>Chapter 3 Calculation of the time value of investments</b></p> <p>(3 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Cash flow;</li> <li>● Time value of money.</li> <li>● Nominal and real interest rates.</li> </ul> <p><b>Chapter 4 Equipment speed control technology</b></p> <p>(3 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of risk and uncertainty.</li> <li>● Analysis of break-even.</li> <li>● Analysis of sensitivities.</li> <li>● Analysis of probability.</li> <li>● Risk decision-making.</li> </ul>

	<p><b>Chapter 5 Feasibility studies for construction projects</b></p> <p>(4 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of the feasibility study.</li> <li>● Basis, phases and steps of the feasibility study.</li> <li>● Elements of a feasibility study.</li> </ul>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 40%, including assignments (20%), engineering case studies (20%).</p> <p>Final assessment (closed-book written exam) accounts for 60%.</p>
Reading list	<p><b>1.Required books</b></p> <p>[1] Liu Xia and You Xiaoming. Engineering Economics [M]. Nanjing: Hohai University Press, 2022.</p> <p><b>2.Reference books</b></p> <p>[1] Research Centre for the Proposition of Constructor Professional Qualification Examination. Construction Engineering Economics [M]. Beijing: Beijing University of Technology Press, 2016.</p> <p>[2] Liu Xiaojun. Engineering Economics [M]. Beijing: China Construction Industry Press, 2017.</p> <p>[3] Wang Shaowen and Shao Weixing. Engineering Economics [M]. Beijing: Beijing University of Technology Press, 2017.</p>
Data of last amendment	April 2025

## Theme Series of Automatic New Technology

Module designation	Theme Series of Automatic New Technology
Semester(s) in which the module is taught	1 <sup>st</sup> semester
Person responsible for the module	Lecturer Gong Mian
Language	Chinese
Relation to curriculum	Elective
Teaching methods	Theoretical teaching
Workload (incl. contact hours, self-study hours)	Total workload = 30 hours Contact hours = 16 hours Self-study hours = 14 hours
Credit points	1.0
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Enable students to have a certain understanding of the main concepts and knowledge systems of the latest developments in automation technology;</li> <li>2. Enable students to understand the digital development achievements of modern automation technology, the intelligent development achievements of automation technology, the distributed development achievements of automation technology, and the networked development achievements of automation technology.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Enable students to understand the latest developments in their major and cultivate their ability to acquire cutting-edge knowledge;</li> <li>2. Cultivate students' scientific methods and thinking abilities, improve their ability to analyze and solve problems, self-study, and summarize and generalize.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Motivate students' innovative spirit and lay the necessary theoretical and practical foundation for future participation in the field of</li> </ol> </li> </ul>

	<p>automation;</p> <p>2. Having the spirit of exploration, cooperation, and science.</p>
Content	<p><b>Theoretical teaching</b> (16 contact hours; 14 self-study hours)</p> <p><b>Chapter 1 The Digital Development Achievements of Automation Technology</b></p> <p>(4 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Digital achievements in controller, signal processing, remote terminal equipment, sensor control, and communication.</li> </ul> <p><b>Chapter 2 The Digital Development Achievements of Automation Technology</b></p> <p>(4 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● The application of artificial intelligence technology and electronic technology in the intelligentization of instruments and equipment, including intelligent algorithms, intelligent hardware, and other achievements</li> </ul> <p><b>Chapter 3 Achievements of Distributed Development of Automation Technology</b></p> <p>(4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Distributed modern automation technology based on network technology and microcomputers;</li> <li>● Distributed connections and distributed systems.</li> </ul> <p><b>Chapter 4 Development Achievements of Automation Technology Networking</b></p> <p>(4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● The networked characteristics of automation technology</li> <li>● The integration of network technology and automation technology</li> </ul>
Examination forms	Course Report
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 15%; Course assignments account for 15%.</p> <p>Final assessment (Course report) accounts for 70%.</p>
Reading list	<p><b>1. Required books</b></p> <p>None</p>

	<b>2. Reference books</b> None
Data of last amendment	April 2025

## General English (1)

Module designation	General English (1)
Semester(s) in which the module is taught	1 <sup>st</sup> semester
Person responsible for the module	Lecturer Wei wen
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lesson
Workload (incl. contact hours, self-study hours)	Total workload = 90 hours Contact hours = 48 hours Self-study hours = 42 hours
Credit points	3.0
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. The basic vocabulary required for Level 1 of General English, as well as the commonly used phrases composed of these words.</li> <li>2. The basic grammar knowledge at the discourse level.</li> <li>3. Articles with difficulty level 1 in General English.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Be able to understand English short conversations, reports, and lectures.</li> <li>2. Be able to smoothly read general articles with moderate language difficulty.</li> <li>3. Be able to express oneself in the English language and writing, adapting to the needs of China's development and international communication.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Enhance cultural perception and understanding.</li> <li>2. Understand the humanistic connotations of college English courses, and form a scientific outlook on life, world, and values.</li> <li>3. Have cross-cultural communication skills and skills in international cooperation.</li> </ol> </li> </ul>
Content	<p><b>Theoretical teaching</b></p> <p>(48 contact hours; 42 self-study hours)</p> <p><b>Chapter 1 Fresh start (Reading and writing)</b></p>

**Small Actions, Big Results (Viewing, listening and speaking)**

(9 contact hours; 9 self-study hours)

Reading and writing:

- (1) Master the meanings and usage of new words and expressions.
- (2) Study Text A and understand the main idea of the text.
- (3) Understand the structure of the text and the devices for developing it.
- (4) Get command of the language points in Text A.
- (5) Understand the profound meaning of college life.
- (6) Master reading skills—Previewing in Section B.

Viewing, listening and speaking:

- (1) Master listening skill—Listen for numbers and statistics, and listen for numerical information.
- (2) Master speaking skill—Give tips or suggestions.
- (3) Master pronunciation skill—Syllable stress.
- (4) Get familiar with words or expressions concerning conserving resources.
- (5) Do listening and speaking practice

**Chapter 2 Digital Campus (Reading and writing)**

**Connecting to Nature (Viewing, listening and speaking)**

(9 contact hours; 9 self-study hours)

Reading and writing:

- (1) Master the meanings and usage of new words and expressions.
- (2) Study Text A and understand the main idea of the text.
- (3) Understand the structure of the text and the devices for developing it.
- (4) Get command of the language points in Text A.
- (5) Understand digital education.
- (6) Master reading skills —Distinguishing between facts and opinions in Section B.

Viewing, listening and speaking:

- (1) Master listening skill—Recognize a speaker's tone and feeling, and listen for a name's category.
- (2) Master speaking skill—Use descriptive language.
- (3) Master pronunciation skill—Thought groups and pausing.
- (4) Get familiar with words or expressions concerning nature.
- (5) Do listening and speaking practice.

**Chapter 3 Heroes of Our Time (Reading and writing)**

**Going Places (Viewing, listening and speaking)**

(9 contact hours;9 self-study hours)

Reading and writing:

	<ul style="list-style-type: none"> <li>● (1) Master the meanings and usage of new words and expressions.</li> <li>● (2) Study Text A and understand the main idea of the text.</li> <li>● (3) Understand the structure of the text and the devices for developing it.</li> <li>● (4) Get command of the language points in Text A.</li> <li>● (5) Understand what a hero is.</li> <li>● (6) Master reading skills —Scanning in Section B.</li> </ul> <p>Viewing, listening and speaking:</p> <ul style="list-style-type: none"> <li>● (1) Master listening skill—Listen for signposts, and listen for a problem and its solution.</li> <li>● (2) Master speaking skill—Use listing signals.</li> <li>● (3) Master pronunciation skill—Statement intonation.</li> <li>● (4) Get familiar with words or expressions concerning traveling.</li> <li>● (5) Do listening and speaking practice.</li> </ul> <p><b>Chapter 4 Winning Is Not Everything (Reading and writing)</b>  <b>Music, Music Everywhere (Viewing, listening and speaking)</b>  ( 9 contact hours; 9 self-study hours)</p> <p>Reading and writing:</p> <ul style="list-style-type: none"> <li>● (1) Master the meanings and usage of new words and expressions.</li> <li>● (2) Study Text A and understand the main idea of the text.</li> <li>● (3) Understand the structure of the text and the devices for developing it.</li> <li>● (4) Get command of the language points in Text A.</li> <li>● (5) Understand winning is not everything.</li> <li>● (6) Master reading skills—Skimming in Section B.</li> </ul> <p>Viewing, listening and speaking:</p> <ul style="list-style-type: none"> <li>● (1) Master listening skill—Listen for reasons and the structure of a news report about <ul style="list-style-type: none"> <li>● Scientific research.</li> </ul> </li> <li>● (2) Master speaking skill—Give reasons.</li> <li>● (3) Master pronunciation skill—Contractions with be.</li> <li>● (4) Get familiar with words or expressions concerning music.</li> <li>● (5) Do listening and speaking practice.</li> </ul> <p><b>College English Test Band 4 Tutoring</b>  (12 contact hours; 6 self-study hours)</p> <p>In order to help students to master the knowledge required to pass College English Test Band 4 (CET-4), the following classes will be arranged:</p> <ol style="list-style-type: none"> <li>1. Specific practice of listening, speaking, reading and writing skills. (8 contact hours; 4 self-study hours)</li> <li>2. Simulated tests for College English Test Band 4. (4 contact hours; 2 self-study hours)</li> </ol>
Examination forms	Closed-book written exam

Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 10%, assignments account for (10%) and phase exam accounts for (30%).</p> <p>Final assessment (closed-book written exam) accounts for 50%.</p>
Reading list	<p><b>1.Required books</b></p> <p>[1] Zheng Shutang, Ding Yaping, Wu Yong, etc. New Horizons College English Reading and Writing Tutorial 1 (3rd Edition) (Ideological and Political Wisdom Edition), [M]. Beijing: Foreign Language Teaching and Research Press, 2020.</p> <p>[2] Lida Baker, Wang Minhua, etc. A New Edition of College English Audio Visual and Oral Tutorial 1 (1st Edition), [M]. Shanghai: Shanghai Foreign Language Education Press, 2023.</p> <p><b>2.Reference books</b></p> <p>[1] Zheng Shutang, Ding Yaping, Wu Yong, etc. New Horizons College English Reading and Writing Tutorial 1 Teacher's Book (3rd Edition), [M]. Beijing: Foreign Language Teaching and Research Press, 2020.</p> <p>[2] Lida Baker, Wang Minhua, etc. A New Edition of College English Audio Visual and Oral Tutorial 1 Teacher's Handbook (1st Edition), [M]. Shanghai: Shanghai Foreign Language Education Press, 2023.</p>
Data of last amendment	April 2025

## General English (2)

Module designation	General English (2)
Semester(s) in which the module is taught	2 <sup>nd</sup> semester
Person responsible for the module	Lecturer Wei Wen
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lesson
Workload (incl. contact hours, self-study hours)	<p>Total workload = 60 hours</p> <p>Contact hours = 32 hours</p> <p>Self-study hours = 28 hours</p>
Credit points	2.0
Required and recommended	General English (1)

prerequisites for joining the module	
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Vocabulary, phrases, idiomatic expressions and sentence structures required in CET-2.</li> <li>2. Sentence structures, accuracy and complexity as well as text structures to meet higher requirements of English learning.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. To be able to read and understand English articles on general topics and professional fields.</li> <li>2. To be able to understand daily English conversations, and audio-visual materials on general topics; understand professional courses in English and be able to communicate professional problems in English.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Master cross-cultural communication skills required for career development.</li> <li>2. Be able to think critically and form a positive and correct outlook on the world, life and values.</li> </ol> </li> </ul>
Content	<ul style="list-style-type: none"> <li>● <b>Theoretical teaching</b> (32 contact hours; 28 self-study hours)</li> <li>● <b>Chapter 1 Language in Mission (Reading and Writing) , Secret Wishes (Viewing, Listening and Speaking)</b></li> <li>● (6 contact hours; 5 self-study hours)</li> <li>● Master the meaning and usage of new words and expressions.</li> <li>● Study section A and understand the main idea of the text.</li> <li>● Computer processing technology for engineering data tables.</li> <li>● Calculation of transformation matrix for graphics.</li> <li>● The basic operational logic of data structures.</li> <li>● Master listening skill—Listen for examples.</li> <li>● Master speaking skill—Agree and disagree.</li> <li>● Master pronunciation skill—Stress content words.</li> <li>● Get familiar with words or expressions concerning secrets.</li> <li>● <b>Chapter 2 College—The Ladder to Success? (Reading and writing) Changing Climate, Changing Minds (Viewing, Listening and Speaking)</b></li> <li>● (6 contact hours; 5 self-study hours)</li> <li>● Master the meanings and usage of new words and expressions.</li> <li>● Study Section A and understand the main idea of the text.</li> <li>● Understand the structure of the text and the devices for developing it.</li> <li>● Get command of the language points in Text A.</li> <li>● Understand humanities.</li> <li>● Master reading skills—Reading for major details in Section B.</li> <li>● listening skill—Listen for details and speakers' attitudes.</li> </ul>

- speaking skill—Talk about causes and effects.
- pronunciation skill—Reduced vowels.
- Get familiar with words or expressions concerning climate change.
- **Chapter 3 Discovery of A New Life Stage (Reading and Writing) Unexpected Discoveries (Viewing, Listening and Speaking)**
- (5 contact hours; 4 self-study hours)
- Master the meanings and usage of new words and expressions.
- Study Section A and understand the main idea of the text.
- Understand the structure of the text and the devices for developing it.
- Get command of the language points in Text A.
- Understand filial piety.
- Master reading skills:Understanding figurative language in Section B.
- listening skill—Listen for inferring meaning and scientific terms.
- Get familiar with words or expressions concerning discoveries.
- Do listening and speaking practice.
- **Chapter 4 Dance with Love (Reading and Writing) The Business of Style (Viewing, Listening and Speaking)**
- (5 contact hours; 5 self-study hours)
- Master the meanings and usage of new words and expressions.
- Study Section A and understand the main idea of the text.
- Understand the structure of the text and the devices for developing it.
- Get command of the language points in Text A.
- Understand what love is.
- Master reading skills:Understanding idiomatic expressions in Section B.
- listening skill—Listen for making predictions and reasons.
- Get familiar with words or expressions concerning business.
- Do listening and speaking practice.
- **Chapter 5 The Money Game (Reading and Writing) Engineered by Nature (Viewing, Listening and Speaking)**
- (5 contact hours; 5 self-study hours)
- Master the meanings and usage of new words and expressions.
- Study Section A and understand the main idea of the text.
- Understand the structure of the text and the devices for developing it.
- Get command of the language points in Text A.
- Understand Silk Road.
- Master reading skills—Understanding denotation and connotation in Section B.
- Listening skill—Listen for recognizing references to key terms and key points in news about an invention.
- Get familiar with words or expressions concerning nature.

	<ul style="list-style-type: none"> <li>● Do listening and speaking practice.</li> <li>● <b>Chapter 6 Less is More (Reading and Writing) Lending a Hand (Viewing, Listening and Speaking)</b></li> <li>● (5 contact hours; 4 self-study hours)</li> <li>● Master the meanings and usage of new words and expressions.</li> <li>● Study Section A and understand the main idea of the text.</li> <li>● Understand the structure of the text and the devices for developing it.</li> <li>● Get command of the language points in Text A.</li> <li>● Understand less is more.</li> <li>● Master reading skills: Reading between the lines in Section B.</li> <li>● Master listening skill—Listen to recognizing facts and opinions and time references.</li> <li>● Get familiar with words or expressions concerning poverty.</li> <li>● Do listening and speaking practice.</li> </ul>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 50%, including assignments (20%) and class progress test (30%).</p> <p>Final assessment (closed-book written exam) accounts for 50%.</p>
Reading list	<p><b>1.Required books</b></p> <p>[1] Zheng Shutang. New Horizon College English (2) [M]. Beijing: Foreign Language Teaching and Research Press, 2022.</p> <p>[2] Lynn Bonesteel,Wang Minhua. Viewing, Listening and Speaking (2) [M]. Shanghai: Shanghai Foreign Language Education Press, 2022.</p> <p><b>2.Reference books</b></p> <p>[1] Zheng Shutang. New Horizon College English (2) Reading and Writing Teachers Book [M]. Beijing: Foreign Language Teaching and Research Press, 2021.</p> <p>[2] Lynn Bonesteel, Wang Minhua. Viewing, Listening and Speaking (2) Teacher’s Guide [M]. Shanghai: Shanghai Foreign Language Education Press, 2021.</p>
Data of last amendment	April 2025

### General English (3)

Module designation	General English (3)
Semester(s) in which the module is taught	3 <sup>rd</sup> semester
Person responsible for the module	Lecturer Wei Wen
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lesson
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	General English (2)
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Vocabulary, phrases, idiomatic expressions and sentence structures required in CET-3.</li> <li>2. Complex English sentence structures and common text structures to meet higher requirements of English learning.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. To be able to find and read professional English literature with fast reading skills and reading strategies; To be able to read materials of medium length and difficulty such as articles on general topics published in English newspapers and periodicals.</li> <li>2. To be able to understand everyday English conversation, to understand audio-visual materials in English on general topics, long length and medium speaking speed on radio, television and other platforms, to be able to understand professional courses in English and be able to communicate professional problems in English.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Have cross-cultural communication skills required for career development.</li> <li>2. Be able to think critically and form a positive and correct outlook on the world, life and values.</li> </ol> </li> </ul>
Content	<p><b>Theoretical teaching</b> (32 contact hours; 28 self-study hours)</p> <p style="text-align: center;"><b>Chapter 1 The Way to Success (Reading and Writing), Bringing Dreams to Life. (Viewing, listening and speaking)</b></p>

	<p>(12 contact hours; 10 self-study hours)</p> <p>Section A New Words and Expressions.</p> <p>Section A Text: Never, Ever Give up!</p> <p>Section A Exercises: Vocabulary, Sentence Structure, Translation.</p> <p>Section B Reading Skills: Understanding denotation and connotation.</p> <p>Listening: Bringing dreams to life—Passages and lecture.</p> <p>Listening skill: Follow the Chronological Order in Listening.</p> <p>Pronunciation skill: Intonation and Pauses: Continuing and Concluding.</p> <p>Speaking skill: Use a Story for Example.</p> <p><b>Chapter 2 Life Stories (Reading and Writing), To the Rescue! (Viewing, listening and speaking)</b></p> <p>(10 contact hours; 10 self-study hours)</p> <p>Section A New Words and Expressions.</p> <p>Section A Text: Audrey Hepburn—A True Angel in This World.</p> <p>Section A Exercises: Vocabulary, Sentence Structure, Translation.</p> <p>Section A Writing Skills: Further develop a narrative essay.</p> <p>Section B Reading Skills: Distinguishing between facts and opinions.</p> <p>Listening: To the Rescue—Passages and lecture.</p> <p>Listening skill: Listen for Rhetorical Questions.</p> <p>Pronunciation skill: Syllable Stress.</p> <p>Speaking skill: Give Reasons.</p> <p><b>Chapter 3 When Work Is a Pleasure (Reading and writing), Stress: Friend or Foe?(Viewing, listening and speaking)</b></p> <p>(10 contact hours; 8 self-study hours)</p> <p>Section A New Words and Expressions.</p> <p>Section A Text: Will You Be a Worker or Laborer?</p> <p>Section A Exercises: Vocabulary, Sentence Structure, Translation.</p> <p>Section A Writing Skills: Develop a comparison /contrast essay.</p> <p>Section B Reading Skills: Recognizing signal words.</p> <p>Listening: Stress: Friend or Foe—Passages.</p> <p>Listening skill: Listen for advantage and disadvantage.</p> <p>Speaking skill: Talk about cause and effect.</p>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 50%, including assignments (20%) and class progress test (30%).</p> <p>Final assessment (closed-book written exam) accounts for 50%.</p>
Reading list	<p><b>1.Required books</b></p> <p>[1] Zheng Shutang. New Horizon College English (3) [M]. Beijing: Foreign Language Teaching and Research Press, 2022.</p>

	<p>[2] Lynn Bonesteel, Wang Minhua. Viewing, Listening and Speaking (3) [M]. Shanghai: Shanghai Foreign Language Education Press, 2022.</p> <p><b>2.Reference books</b></p> <p>[1] Zheng Shutang. New Horizon College English (3) Reading and Writing Teachers Book [M]. Beijing: Foreign Language Teaching and Research Press, 2022.</p>
Data of last amendment	April 2025

## General English (4)

Module designation	General English (4)
Semester(s) in which the module is taught	4 <sup>th</sup> semester
Person responsible for the module	Lecturer Wei Wen
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lesson
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	General English (3)
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. To be able to further consolidate and improve their grammar, vocabulary, textual and pragmatic knowledge and basic English language skills such as listening, speaking, reading, writing and translation.</li> <li>2. To be able to master the correct linguistic methods, lay a good foundation in the language, and be able to apply English practically. Students will be able to meet the high requirements of the General English stage, deeply grasp the rational understanding of the English language as a tool, and enhance the scientific spirit.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Have cross-cultural awareness, understand the common knowledge of English-speaking countries such as society, politics, economy, culture, history, etc., as well as the basic knowledge of English literature.</li> <li>2. To be able to increase knowledge, expand their horizons, enhance cultural perception and understanding, have certain cross-cultural communication skills, compare different cultures, think deeply about problems, and become talents with a sense of social responsibility, international vision and innovative spirit.</li> </ol> </li> </ul>

	<p>● <b>Competence:</b></p> <ol style="list-style-type: none"> <li>1. Students will be able to develop their comprehensive quality in an all-round way, understand the humanistic connotation of college English courses, expand their horizons of understanding problems, shape their correct values.</li> <li>2. Be able to see individuals, society and the world from multiple perspectives, have a correct world view, outlook on life and values, and improve students' critical thinking, innovative thinking and ability to solve practical problems.</li> </ol>
Content	<p><b>Theoretical teaching</b> (32 contact hours; 28 self-study hours)</p> <p><b>Chapter 1</b></p> <p><b>Life and Logic (Reading and writing)</b></p> <p><b>Viewing, listening and speaking</b> (10 contact hours; 10 self-study hours)</p> <p>Reading and writing:</p> <ol style="list-style-type: none"> <li>(1) Master the meanings and usage of new words and expressions.</li> <li>(2) Study Passage A and understand the main idea of the text.</li> <li>(3) Understand the structure of the text and the devices for developing it.</li> <li>(4) Get command of the language points in Passage A.</li> <li>(5) Understand the profound meaning of language learning.</li> <li>(6) Master reading skills — Reading for the key ideas in sentences in Section B.</li> </ol> <p>Viewing, listening and speaking:</p> <p>Master listening skill.</p> <ol style="list-style-type: none"> <li>(2) Master speaking skill.</li> <li>(3) Master pronunciation skill.</li> <li>(4) Get familiar with words or expressions concerning secrets.</li> <li>(5) Do listening and speaking practice.</li> </ol> <p>Reading and writing:</p> <ol style="list-style-type: none"> <li>(1) New vocabulary.</li> <li>(2) Main idea and structure of the text.</li> <li>(3) Understand the language points of the text.</li> <li>(4) Translation—Calligraphy.</li> <li>(5) Reading skills—Reading for the key ideas in sentences.</li> </ol> <p>Viewing, listening and speaking:</p> <ol style="list-style-type: none"> <li>(1) Listening skill.</li> <li>(2) Speaking skill.</li> <li>(3) Pronunciation skill.</li> <li>(4) Words and expressions.</li> </ol> <p>Reading and writing:</p> <p>Cultivate the ability to think and set up the correct values. Let students learn they should develop a proper viewpoint of justice and interests. Friendship and true love should be obtained by honesty and sincerity.</p>

College students should highly value our friends and have the right attitude about giving and taking in our relationships.

## **Chapter 2**

### **Secrets to Beauty (Reading and writing)**

#### **Viewing, listening and speaking**

(10 contact hours; 8 self-study hours)

Reading and writing:

- (1) Master the meanings and usage of new words and expressions.
- (2) Study Passage A and understand the main idea of the text.
- (3) Understand the structure of the text and the devices for developing it.
- (4) Get command of the language points in Passage A.
- (5) Understand true love.
- (6) Master reading skills—Identifying the topic sentence.

Viewing, listening and speaking:

Viewing, listening and speaking:

- (1) Master listening skill.
- (2) Master speaking skill.
- (3) Master pronunciation skill.
- (4) Get familiar with words or expressions.
- (5) Do listening and speaking practice.

Reading and writing:

- (1) New vocabulary.
- (2) Main idea and structure of the text.
- (3) Understand the language points of the text.
- (4) Translation.
- (5) Reading skills—Identifying the topic sentence.

Viewing, listening and speaking:

Master listening skill.

- (2) Master speaking skill.
- (3) Master pronunciation skill.
- (4) Get familiar with words or expressions.
- (5) Do listening and speaking practice.

Reading and writing:

Carry out the socialist core values and carry forward the true, the good and the beautiful. Let students learn beauty can be generally divided into inner beauty and external beauty. Beauty outside catches the eyes but the real beauty that lies within captures the heart.

## **Chapter 3**

### **Why Culture Counts (Reading and writing)**

#### **Viewing, listening and speaking**

(12 contact hours; 10 self-study hours)

Reading and writing:

- (1) Master the meanings and usage of new words and expressions.

	<p>(2) Study Passage A and understand the main idea of the text.</p> <p>(3) Understand the structure of the text and the devices for developing it.</p> <p>(4) Get command of the language points in Passage A.</p> <p>(5) Master reading skills—Finding out words' meanings.</p> <p>Viewing, listening and speaking:</p> <p>(2) Master listening skill.</p> <p>(2) Master speaking skill.</p> <p>(3) Master pronunciation skill.</p> <p>(4) Get familiar with words or expressions concerning secrets.</p> <p>(5) Do listening and speaking practice.</p> <p>Reading and writing:</p> <p>(1) New vocabulary.</p> <p>(2) Main idea and structure of the text.</p> <p>(3) Understand the language points of the text.</p> <p>(4) Translation.</p> <p>(5) Reading skills—Finding out words' meanings.</p> <p>Viewing, listening and speaking:</p> <p>(1) Master listening skill.</p> <p>(2) Master speaking skill.</p> <p>(3) Master pronunciation skill.</p> <p>(4) Get familiar with words or expressions.</p> <p>(5) Do listening and speaking practice.</p> <p>Reading and writing:</p> <p>Compare Different Cultures and build up cultural confidence. Let students learn the spirit of Entrepreneurs. Entrepreneurs should promote entrepreneurship and seek self-improvement in terms of patriotism, innovation, integrity, social responsibility and global vision, in order to lead enterprises out of the immediate plight and toward a brighter future.</p>
Examination forms	Closed-book written exam
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Usual performance accounts for 50%, including assignments (20%) and class progress test (30%).</p> <p>Final assessment (closed-book written exam) accounts for 50%.</p>
Reading list	<p><b>1.Required books</b></p> <p>[1] Zheng Shutang. New Horizon College English (4) [M]. Beijing: Foreign Language Teaching and Research Press, 2022.</p> <p>[2] Lynn Bonesteel, Wang Minhua. Viewing, Listening and Speaking (4) [M]. Shanghai: Shanghai Foreign Language Education Press, 2022.</p> <p><b>2.Reference books</b></p> <p>[1] Zheng Shutang. New Horizon College English (4) Reading and Writing</p>

	Teachers Book [M]. Beijing: Foreign Language Teaching and Research Press, 2022.
Data of last amendment	April 2025

### Situation & Policy

Module designation	Situation & Policy
Semester(s) in which the module is taught	1 <sup>st</sup> to 8 <sup>th</sup> semester
Person responsible for the module	Qu Hua
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	This course primarily adopts thematic instruction, case-based teaching, and practice-oriented learning approaches. A variety of multimedia teaching materials will be developed using digital and online technologies, supplemented appropriately with video-based content to enhance the appeal of the course, increase student engagement, and ensure teaching quality.
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	Ideology, Morality and the Rule of Law; Modern Chinese History; Marxism Basic Theory; Introduction to Mao Zedong Thought and Theory of Socialism with Chinese Characteristics; Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era
Module objectives/intended learning outcomes	The ‘Situation & Policy’ course primarily teaches the latest achievements in the Party’s theoretical innovations, the vivid practices of upholding and developing socialism with Chinese characteristics in the new era, Marxist perspectives on national and international situations and policies, the Party’s guidelines and policies, fundamental national conditions, and current major domestic and international issues. It aims to help students accurately understand contemporary Chinese Marxism, deeply grasp the historic achievements and challenges faced by the Party and the nation, and guide university students to correctly perceive

	<p>the overarching trends in global and national development.</p> <p>The course also fosters an understanding of the uniqueness of the Chinese path in comparison with international models, a clear awareness of their responsibilities in the current era, and a grounded pursuit of long-term aspirations. Through this course, students are expected to develop a broad understanding of significant domestic and international events, comprehensively recognize and correctly interpret the Party’s fundamental guidelines, policies, and strategies, understand the current context and national tasks, and keep pace with the pulse of the times.</p> <p>Additionally, the course aims to inspire patriotism, enhance national confidence and social responsibility, promote the value of national stability, disseminate the central policies of the Communist Party of China, firmly establish the ‘Four Consciousnesses’ (political consciousness, overall awareness, core consciousness, and alignment consciousness), strengthen the ‘Four Self-confidences’ (confidence in the path, theory, system, and culture of socialism with Chinese characteristics), and cultivate a new generation of youth ready to shoulder the great task of national rejuvenation.</p>
Content	<p><b>Topic One: Forging the Consciousness of the Chinese National Community and Writing a New Chapter of Working Together to Realize the Chinese Dream</b></p> <p>This chapter corresponds to Course Objectives 1, 2, and 3, and Ideological and Political Indicator Points 1, 2, and 3.</p> <p><b>1. Teaching Content</b></p> <p>National unity is the lifeline of people of all ethnic groups in China, and the consciousness of the Chinese national community is the foundation of national unity. The history of China is a history of the integration of various ethnic groups into the multi-ethnic Chinese nation, and a history of the common creation, development, and consolidation of a unified great motherland by all ethnic groups. Forging the consciousness of the Chinese national community is the main thread of the Party’s ethnic work in the new era, as well as the main thread of all work in ethnic regions. Economic, political, cultural, social, ecological civilization construction, and Party building in ethnic regions must all closely revolve around and never deviate from this main thread.</p> <p><b>Topic Two: Correctly Understanding the Historical Logic and Theoretical Logic of Chinese-Style Modernization</b></p> <p>This chapter corresponds to Course Objectives 1, 2, and 3, and Ideological and Political Indicator Points 1, 2, and 3.</p>

	<p><b>1. Teaching Content</b></p> <p>The Communist Party of China has united and led the Chinese people to successfully advance the construction of Chinese-style modernization, creating a new form of human civilization. After a century of exploration, the Communist Party of China has forged a development path different from Western modernization. It is a path with distinct national characteristics, in line with China’s national conditions, and focused on the common progress and development of China and the world. It is also the only successful modernization path explored independently by a developing country so far, based on its own culture and not dependent on Western civilization. China will always provide opportunities for world development with the achievements of Chinese-style modernization, offer new solutions for humanity’s exploration of modernization paths, and make new contributions to the innovation of modernization theory and practice in human society. The continuous advancement of Chinese-style modernization will inject more positive energy and provide more new impetus for world development.</p> <p><b>Topic 3: Studying Xi Jinping’s Cultural Thought and Taking on the New Cultural Mission</b></p> <p>This chapter corresponds to Course Objectives 1, 2, and 3, and Ideological and Political Indicator Points 1, 2, and 3.</p> <p><b>1. Teaching Content</b></p> <p>Since the 18th National Congress of the Communist Party of China, the CPC Central Committee with Comrade Xi Jinping at its core has strategically coordinated the overall landscape of the great rejuvenation of the Chinese nation and the profound global changes unseen in a century. It has accurately grasped the global trends of ideological and cultural interaction and the profound transformations in China’s social thinking. From a strategic and comprehensive perspective, the Central Committee has systematically planned and deployed ideological and cultural work.</p> <p>General Secretary Xi Jinping has placed ideological and cultural work in a central position in the governance of the country. Centered on cultural development in the new era, he has put forward a series of new ideas, views, and judgments, which collectively form the cultural component of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, and have developed into what is now known as Xi Jinping’s Cultural Thought.</p> <p><b>Topic 4: The Situation in China’s Ideological Field in the New Era and</b></p>
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	<p><b>Safeguarding China’s Ideological Security</b></p> <p>This chapter corresponds to Course Objectives 1, 2, and 3, and Ideological and Political Indicator Points 1, 2, and 3.</p> <p><b>1. Teaching Content</b></p> <p>General Secretary Xi Jinping has issued the important directive of the ‘Seven Priorities’ for ideological and cultural work, one of which is ‘to focus on building a socialist ideology with strong cohesion and leadership’. Since the 18th National Congress of the Communist Party of China, the Party Central Committee has, from an overall and strategic height, made systematic plans and deployments for ideological and cultural work, promoting historic achievements in the cause of publicity, ideology, and culture in the new era. The situation in the ideological field has undergone comprehensive and fundamental transformations. The cultural confidence of the entire Party and people of all ethnic groups across the country has been significantly strengthened, and the spiritual outlook has become more vigorous and uplifted.</p>
Examination forms	evaluation-based
Study and examination requirements	The ‘Situation & Policy’ course is a compulsory course for all majors in the university. The assessment methods include: Pre-class online learning (20%) + In-class discussion and feedback (20%) + Outcome-based assessment (60%).
Reading list	<ol style="list-style-type: none"> <li>1. Teaching guidelines for the ‘Situation &amp; Policy’ course issued semiannually by the Department of Social Sciences of the Ministry of Education.</li> <li>2. Documents from major central conferences and important speeches by central leadership.</li> <li>3. Current Affairs Report (University Student Edition), Current Affairs Report VCDs.</li> <li>4. Visual and audio materials for situation education issued irregularly by the Ministry of Education and other relevant departments.</li> <li>5. People’s Daily, Banyuetan, Current Affairs Data Handbook, etc.</li> <li>6. University Students’ Guide to Contemporary Ideological Issues.</li> </ol>
Data of last amendment	August 2024

## Ideology, Morality and the Rule of Law

Module designation	Ideology, Morality and the Rule of Law
Semester(s) in which the module is taught	1 <sup>st</sup> semester
Person responsible for the module	Lecturer Zhang Yue
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	<p>1.Theoretical Lectures: Mainly delivered through lectures.</p> <p>2.Multimedia Instruction: Appropriate use of multimedia for video demonstrations and showing educational films related to the course content.</p> <p>3.Discussions: Conducted through teacher-guided group discussions to cultivate students' abilities in independent thinking and collaborative learning.</p> <p>4.Practical Teaching: Completed in groups and presented in class; organizing reading activities where students recommend a good book they have read.</p>
Workload (incl. contact hours, self-study hours)	<p>Total workload = 90 hours</p> <p>Contact hours = 48 hours</p> <p>Self-study hours = 42 hours</p>
Credit points	3.0
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	<p>The main objective of this course is to address the practical issues and concerns faced by contemporary university students. Through theoretical study and practical experience, with a focus on education in correct outlooks on life, values, moral concepts, and legal concepts, the course aims to help students form noble ideals and beliefs, uphold the great patriotic spirit, establish correct outlooks on life and values, firmly establish the core socialist values, cultivate good moral and legal qualities, further enhance their ability to distinguish right from wrong, good from evil, and beauty from ugliness, and strengthen their self-cultivation. This will lay a solid foundation in morality and law for students to gradually become qualified builders and reliable successors</p>

	<p>for the great cause of socialism with Chinese characteristics, achieving all-round development in morality, intelligence, physical fitness, and aesthetics.</p>
<p>Content</p>	<p><b>Introduction: Shouldering the Responsibility of National Rejuvenation and Achieving Success as New-Era Individuals</b></p> <p>This chapter corresponds to sub-objectives 1.1, 2.1, 3.1, and 3.2 of the course teaching objectives.</p> <p><b>1. Teaching Content</b></p> <p>‘Ideology, Morality and the Rule of Law’ is an ideological and political theory course that integrates ideology, politics, science, theory, and practicality. This course addresses the ideological, moral, and legal issues faced by college students during their growth, providing education on the Marxist worldview, outlook on life, values, moral concepts, and legal concepts. It aims to help college students enhance their ideological and moral qualities and legal literacy, enabling them to grow into new talents who consciously shoulder the great responsibility of national rejuvenation. Learning this course will assist students in comprehending the true meaning of life, grasping the direction of life, pursuing lofty ideals, firming up noble beliefs, inheriting fine traditions, promoting the Chinese spirit, cultivating and practicing socialist core values. It will also help students abide by moral norms, forge moral character, integrate correct moral cognition, conscious moral cultivation, and active moral practice, thereby leading good social trends. Furthermore, it will enable students to learn legal thoughts, develop legal thinking, and consciously respect, study, abide by, and apply the law, thus equipping them with excellent ideological and moral qualities and legal literacy.</p> <p><b>Chapter 1: Understanding the True Meaning of Life and Grasping the Direction of Life</b></p> <p>This chapter corresponds to sub-objectives 1.1, 2.1, 3.1, and 3.2 of the course teaching objectives.</p> <p><b>2. Teaching Content</b></p> <p>This chapter first guides college students to learn Marx’s theory on the essence of human beings, clarifying that social attributes are the essential attributes of human beings, thereby grasping the dialectical relationship between the individual and society. It elucidates that the outlook on life encompasses three aspects: the purpose of life, attitude towards life, and the value of life, with a focus on explaining the dialectical relationship between the self-value and social value of life. It also emphasizes the significance for college students to establish a</p>

correct 'three views' (worldview, outlook on life, and values), highlighting their meanings and mutual relationships. Secondly, based on an in-depth study of Marx's basic theories on life issues, this chapter clarifies what the purpose of life, attitude towards life, and the value of life should be for college students in terms of their outlook on life, urging them to firmly establish a scientific and noble purpose of life that 'serves the people and contributes to society', cultivate a serious, pragmatic, optimistic, and enterprising attitude towards life, and learn to correctly evaluate the value of life, thereby truly realizing the value of college students' lives. Finally, this chapter also applies Marx's theory on the essence of human beings to analyze various life contradictions and difficulties that college students may encounter on their life journeys, advocating that students establish correct views on gain and loss, hardship and happiness, adversity and prosperity, life and death, and honor and disgrace, recognizing the harmfulness of erroneous outlooks on life such as money worship, hedonism, and extreme individualism, and striving to be in line with history, march with the motherland, and stay with the people, thus achieving a brilliant life for college students.

### **Chapter 2: Pursuing Lofty Ideals and Firming up Noble Beliefs**

This chapter corresponds to sub-objectives 1.2, 2.2, 3.1 and 3.2 of the course teaching objectives.

#### **1. Teaching Content**

In the long journey of life, only by striving forward and working hard can one navigate through the rapids and reach the other shore of ideals. Scientific ideals and beliefs are both the lighthouse guiding people through the fog to identify their course and the sails inspiring them to brave the winds and waves and sail the vast ocean. University is a place for cultivating talents and nurturing virtues, where young people learn knowledge, enhance their abilities, and fulfill their dreams. Pursuing lofty ideals and firming up noble beliefs, and realizing personal ideals in the process of striving for the common ideal of socialism with Chinese characteristics, is not only a practical need for students' own growth but also the earnest expectation of the country and the people.

### **Chapter 3: Inheriting Fine Traditions and Promoting the Chinese Spirit**

This chapter corresponds to sub-objectives 1.3, 2.3, 3.1 and 3.2 of the course teaching objectives.

#### **2. Teaching Content**

To realize the Chinese Dream of the great rejuvenation of the Chinese nation, it is essential to promote the Chinese spirit, which refers to the national spirit centered on patriotism and the spirit of the times

centered on reform and innovation. Through the teaching and reflection in this chapter, students can deeply understand the value and content of the Chinese spirit, profoundly recognize the basic requirements of patriotism in the new era, realize that patriotism has always been the spiritual bond that firmly unites the Chinese nation, and that reform and innovation have always been the spiritual force driving reform, opening up, and socialist modernization. This chapter guides college students to combine their lofty personal ideals with a high sense of responsibility and mission towards the motherland, shoulder the era mission of national rejuvenation, strive to be loyal patriots and progressive individuals of the times, and showcase the youthful charm of the Chinese spirit through practical actions.

#### **Chapter 4: Clarifying Value Requirements and Practicing Value Norms**

This chapter corresponds to sub-objectives 1.4, 2.4, 3.1 and 3.2 of the course teaching objectives.

##### **2. Teaching Content**

The history of human social development shows that the most enduring and profound force for a nation and a country is the core values commonly recognized by the whole society. The socialist core values are the concentrated expression of the contemporary Chinese spirit, the value expression of the path, theory, system, and culture of socialism with Chinese characteristics, and embody the common value pursuit of the entire people. College students should deeply comprehend the important significance and scientific connotation of the socialist core values, fasten the buttons of life, start from daily details and subtle aspects, and become firm believers, active disseminators, and exemplary practitioners of the socialist core values.

#### **Chapter 5: Abiding by Moral Norms and Forging Moral Character**

This chapter corresponds to sub-objectives 1.5, 2.5, 3.1 and 3.2 of the course teaching objectives.

##### **2. Teaching Content**

For contemporary college students, the cultivation of moral qualities and the formation of excellent personalities are particularly important. Firstly, contemporary college students should learn the basic theories of morality, establish a Marxist moral outlook, and promote socialist morality. Secondly, in practice, they should consciously inherit the fine traditional virtues of the Chinese nation and the revolutionary virtues of China; in terms of space, they should consciously absorb and learn from the excellent moral achievements of humanity. Finally, they should transform morality into practice, specifically dividing it into four

	<p>practical fields according to the basic principle of gradually expanding practice scope: abiding by social morality, adhering to professional ethics, promoting family virtues, and forging personal character.</p> <p><b>Chapter 6: Learning Legal Thoughts and Enhancing Legal Literacy</b></p> <p>This chapter corresponds to sub-objectives 1.6, 2.6, 3.1 and 3.2 of the course teaching objectives.</p> <p><b>2. Teaching Content</b></p> <p>The rule of law is an important symbol of human civilization and progress and a fundamental way of governing the country. When the rule of law thrives, the country thrives; when the rule of law is strong, the country is strong. In the process of comprehensively governing the country according to law and building a country under the rule of law, college students should learn Marxist legal theories, especially Xi Jinping Thought on the Rule of Law, deeply understand the essential characteristics and operational mechanisms of socialist law, grasp the essence of the socialist legal system with Chinese characteristics as a whole, respect and uphold the authority of the Constitution and laws, continuously enhance their legal literacy, and strive to be exemplary models in respecting, studying, abiding by, and applying the law.</p>
Examination forms	Closed-book written exam
Study and examination requirements	The Ideology, Morality and the Rule of Law course is a compulsory course. Forms of the course assessment include discussion in class and feedback after class (40%) + result-based assessment (60%).
Reading list	<p>1.Recommended Textbook: <i>Ideology, Morality, and Rule of Law</i>, compiled by the book writing team, Higher Education Press in 2023;</p> <p>2.Reference Books and Literature:</p> <p>[1] <i>Excerpts from Xi Jinping's Discourses on Youth and Communist Youth League Work</i>, compiled by the Research Office of the Central Committee of the Communist Party of China, Central Party Literature Press in 2017.</p> <p>[2] <i>Xi Jinping and College Students</i>, compiled by the book's editorial team, China Youth Press in 2020.</p> <p>[3] <i>Speech at the Ceremony Commemorating the 200th Anniversary of Marx's Birth</i>, by Xi Jinping, People's Publishing House in 2018.</p> <p>[4] <i>Xi Jinping: The Governance of China</i>, by Xi Jinping, Foreign Languages Press in 2022.</p> <p>3.Online Learning Resources: Chaoxing Learning Platform, China University MOOC.</p>

Data of last amendment	August 2024
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## Modern Chinese History

Module designation	Modern Chinese History
Semester(s) in which the module is taught	1 <sup>st</sup> semester
Person responsible for the module	Lecturer Li Qiannan
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Lectures, lessons
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	Ideology, Morality and the Rule of Law
Module objectives/intended learning outcomes	The course aims to enable students to understand the historical process and inherent laws of China's social development, revolution, construction, and reform in modern and contemporary times. It helps students gain insights into the history and national conditions of China, and comprehend how history and the people have chosen Marxism, the Communist Party of China, the socialist path, and reform and opening up. By doing so, the course assists students in establishing the belief that 'only socialism can save China, and only socialism with Chinese characteristics can develop China', thereby encouraging them to firmly uphold and develop socialism with Chinese characteristics.
Content	<p><b>Introduction: Overview of Modern and Contemporary Chinese History</b></p> <p><b>1. Teaching Content</b></p> <p>(1) The importance of studying modern and contemporary Chinese history</p> <p>(2) An overview of modern and contemporary Chinese history</p> <p>(3) The purpose and requirements of studying the 'Outline of Modern and Contemporary History in China'</p> <p>(4) Establishing and adhering to a scientific historical perspective</p>

	<p><b>Chapter 1: The Tribulations and Struggles of the Chinese Nation After Entering Modern Times</b></p> <p>This chapter corresponds to course objectives 1 and 2, and ideological and political indicators 1 and 2.</p> <p><b>1. Teaching Content</b></p> <p>(1) How did China and the world change before and after the Opium War?</p> <p>(2) What impact did the invasion of capital-imperialism bring to China?</p> <p>(3) How should we view the anti-invasion struggles of the Chinese people in modern times?</p> <p>(4) How was the dream of the great rejuvenation of the Chinese nation proposed?</p> <p><b>Chapter 2: Early Explorations by Different Social Forces for the Way Forward for the Country</b></p> <p>This chapter corresponds to course objectives 1, 2, and 3, and ideological and political indicators 1 and 2.</p> <p><b>1. Teaching Content</b></p> <p>(1) Why did the “Taiping Heavenly Kingdom Dream” of the peasant class fail?</p> <p>(2) Why did the ‘self-strengthening and wealth-seeking dream’ of the landlord class’s Westernization faction fall through?</p> <p>(3) Why did the ‘reform and constitutional dream’ of the bourgeois reformists come to an abrupt end?</p> <p><b>Chapter 3: The Xinhai Revolution and the End of the Monarchical System</b></p> <p>This chapter corresponds to course objectives 1 and 3, and ideological and political indicators 1 and 3.</p> <p><b>1. Teaching Content</b></p> <p>(1) The outbreak of the Xinhai Revolution was historically inevitable</p> <p>(2) The successes and failures of the Xinhai Revolution</p> <p>(3) The bourgeois republic scheme was unworkable in China</p> <p><b>Chapter 4: The Founding of the Communist Party of China and a New Situation in the Chinese Revolution</b></p> <p>This chapter corresponds to course objectives 1 and 2, and ideological</p>
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	<p>and political indicators 1 and 2.</p> <p><b>1. Teaching Content</b></p> <p>(1) The outbreak of the Xinhai Revolution was historically inevitable (repeated from Chapter 3, but relevant to this chapter's context)</p> <p>(2) The successes and failures of the Xinhai Revolution (repeated from Chapter 3, but relevant to this chapter's context)</p> <p>(3) The bourgeois republic scheme was unworkable in China (repeated from Chapter 3, but relevant to this chapter's context)</p> <p><b>Chapter 5: The New Path of the Chinese Revolution</b></p> <p>This chapter corresponds to course objectives 1 and 2, and ideological and political indicators 1 and 3.</p> <p><b>1. Teaching Content</b></p> <p>(1) The New Culture Movement and the May Fourth Movement</p> <p>(2) The widespread spread of Marxism and the birth of the Communist Party of China</p> <p>(3) A new situation in the Chinese revolution</p> <p>(4) How to understand that the founding of the Communist Party of China was historically inevitable</p> <p>(5) Why is it said that the founding of the Communist Party of China brought a new look to the Chinese revolution?</p> <p>(6) How to understand that the founding and struggles of the Communist Party of China profoundly changed China and the world?</p> <p><b>Chapter 6: The War of Resistance Against Japanese Aggression of the Chinese Nation</b></p> <p>This chapter corresponds to course objectives 2 and 3, and ideological and political indicators 1 and 2.</p> <p><b>1. Teaching Content</b></p> <p>(1) How was the great wall of flesh and blood of the nationwide war of resistance built?</p> <p>(2) How should we view the role of the Kuomintang and the frontline battlefield during the war of resistance?</p> <p>(3) Why is it said that the Communist Party of China was the mainstay of the Chinese nation's war of resistance against Japanese aggression?</p> <p>(4) How to understand that the Chinese people's war of resistance</p>
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	<p>against Japanese aggression was the main eastern battlefield of the World Anti-Fascist War?</p> <p>(5) How to understand that the victory of the war of resistance opened up a bright prospect for the great rejuvenation of the Chinese nation?</p> <p><b>Chapter 7: Struggling for the Establishment of New China</b></p> <p>This chapter corresponds to course objectives 2 and 3, and ideological and political indicators 1 and 2.</p> <p><b>1. Teaching Content</b></p> <p>(1) What efforts did the Communist Party of China make to strive for peace and democracy?</p> <p>(2) Why could the Communist Party of China win the victory of the Liberation War?</p> <p>(3) Why did history choose the people's republic scheme?</p> <p>(4) What were the reasons, significance, and basic experiences of the victory of the Chinese New Democratic Revolution?</p> <p><b>Chapter 8: The Founding of the People's Republic of China and the Exploration of China's Socialist Construction Path</b></p> <p>This chapter corresponds to course objectives 1 and 2, and ideological and political indicators 2 and 3.</p> <p><b>1. Teaching Content</b></p> <p>(1) The founding of the People's Republic of China and the consolidation of the new people's regime</p> <p>(2) The Party's general line for the transition period and its implementation</p> <p>(3) The preliminary establishment of the basic socialist system</p> <p>(4) A good start for the comprehensive construction of socialism</p> <p>(5) The arduous exploration and tortuous development of the socialist path</p> <p><b>Chapter 9: Reform and Opening Up and the Pioneering and Development of Socialism with Chinese Characteristics</b></p> <p>This chapter corresponds to course objectives 2 and 3, and ideological and political indicators 1 and 2.</p> <p><b>1. Teaching Content</b></p> <p>(1) A historic great turning point and the beginning of reform and</p>
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	<p>opening up</p> <p>(2) A new situation in reform and opening up and socialist modernization construction</p> <p>(3) Advancing socialism with Chinese characteristics into the 21st century</p> <p>(4) Upholding and developing socialism with Chinese characteristics under new circumstances</p> <p><b>Chapter 10: Socialism with Chinese Characteristics Entering a New Era</b></p> <p>This chapter corresponds to course objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.</p> <p><b>1. Teaching Content</b></p> <p>(1) Opening up broader prospects for the development of socialism with Chinese characteristics</p> <p>(2) Continuously advancing socialism with Chinese characteristics in the new era</p> <p>(3) Embarking on a new journey of comprehensively building a socialist modernized country</p>
Examination forms	Closed-book written exam
Study and examination requirements	The course 'Outline of Modern and Contemporary History in China' is a public compulsory course. The assessment methods for this course include: attendance (16%) + five regular assignments (12%) + in-class performance (12%) + final examination (60%).
Reading list	<p>[1] <i>Selected Works of Mao Zedong (Volumes 1-4)</i>. Beijing: People's Publishing House, 1991.</p> <p>[2] <i>Selected Works of Deng Xiaoping (Volumes 1-3)</i>. Beijing: People's Publishing House, 1994.</p> <p>[3] Jiang Zemin. <i>On Party Building</i>. Beijing: Central Party Literature Press, 2001.</p> <p>[4] Research Office of Central Party Literature. <i>Selected Important Documents Since the Founding of the People's Republic of China</i>. Beijing: Central Party Literature Press, 1988-1995.</p> <p>[5] John King Fairbank. <i>The Cambridge History of China: Republican China 1912-1949</i>. Shanghai: Shanghai People's Publishing House, 1991.</p> <p>[6] Zhang Qizhi. <i>Chinese History: Late Qing and Republican Period</i>. Beijing: Higher Education Press, 2001.</p>

	<p>[7] Chen Xulu. <i>Metabolism in Modern Chinese Society</i>. Shanghai: Shanghai People's Publishing House, 1992.</p> <p>[8] John King Fairbank. <i>The Cambridge History of China: The People's Republic of China 1949-1965</i>. Shanghai: Shanghai People's Publishing House, 1992.</p> <p>[9] Jiang Tingfu. <i>A Modern History of China</i>. Shanghai: Shanghai Ancient Books Publishing House, 1999.</p> <p>[10] Hu Sheng. <i>From the Opium War to the May Fourth Movement</i>. Beijing: Hongqi Publishing House, 1983.</p> <p>[11] Lin Huaguo. <i>A Panoramic View of Modern History</i>. Beijing: Peking University Press, 2005.</p> <p>[12] Chow Tse-tsung. <i>The May Fourth Movement: Intellectual Revolution in Modern China</i>. Changsha: Yuelu Publishing House, 2000.</p> <p>[13] Mao Haijian. <i>The Collapse of the Celestial Empire: A Re-examination of the Opium War</i>. Beijing: SDX Joint Publishing Company, 2005.</p> <p>[14] Li Xin. <i>History of the Republic of China</i>. Beijing: Zhonghua Book Company, 1987.</p> <p>[15] Li Shiyue and Hu Bin. <i>From Seclusion to Opening Up: A Perspective on the "Westernization Movement" in the Late Qing Dynasty</i>. Beijing: People's Publishing House, 1988.</p> <p>[16] Paul A. Cohen. <i>History in Three Keys: The Boxers as Event, Experience, and Myth</i>. Nanjing: Jiangsu People's Publishing House, 2000.</p> <p>[17] John King Fairbank. <i>The Great Chinese Revolution, 1800-1985</i>. Beijing: World Affairs Press, 2000.</p> <p>[18] Robert Lawrence Kuhn. <i>He Changed China: The Life and Legacy of Jiang Zemin</i>. Shanghai: Shanghai Century Publishing Group and Shanghai Translation Publishing House, 2005.</p> <p>[19] Pang Xianzhi and Jin Chongji. <i>Mao Zedong: A Biography (1949-1976)</i>. Beijing: Central Party Literature Press, 2003.</p> <p>[20] Dick Wilson (UK). <i>Zhou Enlai</i>. Beijing: Central Party Literature Press, 2000.</p> <p>[21] Hu Sheng. <i>Seventy Years of the Communist Party of China</i>. Beijing: Party History Publishing House, 1991.</p> <p>[22] Karl Marx. <i>The History of the Opium Trade</i>. People's Publishing House, 1997.</p> <p>[23] John King Fairbank. <i>The Cambridge History of China: The Late Ch'ing</i></p>
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	<p>1800-1911. Shanghai: Shanghai People's Publishing House, 1992.</p> <p>[24] Sun Yat-sen. <i>The International Development of China</i>. Huaxia Publishing House, 2002.</p> <p>[25] Xi Jinping. <i>Speech at the First Plenary Session of the 12th National People's Congress</i>, 2013.</p> <p>[26] Publicity Department of the Central Committee of the Communist Party of China. <i>Reader on a Series of Important Speeches by General Secretary Xi Jinping</i>. Learning Press and People's Publishing House, 2016.</p>
Data of last amendment	August 2024

### **Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era**

Module designation	Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era
Semester(s) in which the module is taught	4 <sup>th</sup> semester
Person responsible for the module	Associate Professor Qu Wentao
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Lectures, multimedia teaching, thematic discussion, and case study
Workload (incl. contact hours, self-study hours)	<p>Total workload = 90 hours</p> <p>Contact hours = 48 hours</p> <p>Self-study hours = 42 hours</p>
Credit points	3.0
Required and recommended prerequisites for joining the module	Ideological and Moral Cultivation and Legal Basis, Outline of Modern Chinese History
Module objectives/intended learning outcomes	This course serves as a crucial measure to thoroughly advance the integration of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era into textbooks, classrooms, and students' minds. It can more effectively assist college students in systematically grasping the main content and spiritual essence of Xi Jinping Thought on

	<p>Socialism with Chinese Characteristics for a New Era, enabling them to more consciously arm their minds, guide their practices, and facilitate their learning with this thought. By nurturing students' souls with Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, it aims to guide students in firmly establishing the 'Four Consciousnesses', strengthening the 'Four-Sphere Confidence', and resolutely upholding the 'Two Maintenances'. Ultimately, the course seeks to cultivate generation after generation of talented individuals who support the Communist Party of China and China's socialist system, and are committed to dedicating their lives to the cause of socialism with Chinese characteristics.</p>
<p>Content</p>	<p><b>Introduction: A New Leap in the Sinicization of Marxism</b></p> <p>This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.</p> <p><b>1. Teaching Content</b></p> <p>(1) The scientific system and main content of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, and its historical significance.</p> <p><b>Chapter 1: Adhering to and Developing Socialism with Chinese Characteristics in the New Era</b></p> <p>This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.</p> <p><b>1. Teaching Content</b></p> <p>(1) Socialism with Chinese Characteristics is the choice of history and the people.</p> <p>(2) Socialism with Chinese Characteristics is socialism, not any other form of ism.</p> <p>(3) Firmly maintain confidence in the path, theory, system, and culture of socialism with Chinese characteristics.</p> <p>(4) The new era of socialism with Chinese characteristics is the new historical orientation for China's development.</p> <p>(5) The transformation of the principal contradiction in society is a historic change that impacts the overall situation.</p> <p>(6) The great changes of the new era and their milestone significance.</p> <p>(7) Adhering to and developing socialism with Chinese characteristics in the new era must be consistent and continuous.</p> <p>(8) Coordinating the promotion of the "Five-in-One" overall layout and</p>

	<p>the “Four Comprehensive” strategic layout.</p> <p>(9) Advancing socialism with Chinese characteristics to continue its progress.</p> <p><b>Chapter 2: Advancing the Great Rejuvenation of the Chinese Nation through Chinese-style Modernization</b></p> <p>This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.</p> <p><b>1. Teaching Content</b></p> <p>(1) The greatest dream of the Chinese nation since modern times.</p> <p>(2) Chinese-style modernization is the only correct path for building a strong country and realizing national rejuvenation.</p> <p>(3) Advancing Chinese-style modernization in a stable and long-term manner.</p> <p><b>Chapter 3: Upholding the Party’s Comprehensive Leadership</b></p> <p>This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.</p> <p><b>1. Teaching Content</b></p> <p>(1) The leadership of the Communist Party of China (CPC) is the most essential characteristic of socialism with Chinese characteristics.</p> <p>(2) Upholding the Party's leadership over all work.</p> <p>(3) Improving and perfecting the system of Party leadership.</p> <p><b>Chapter 4: Upholding a People-Centered Approach</b></p> <p>This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.</p> <p><b>1. Teaching Content</b></p> <p>(1) Why must we adhere to a people-centered approach?</p> <p>(2) What does it mean to uphold a people-centered approach?</p> <p>(3) How should we uphold a people-centered approach?</p> <p><b>Chapter 5: Comprehensively Deepening Reform and Opening Up</b></p> <p>This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.</p> <p><b>1. Teaching Content</b></p>
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	<p>(1) Reform and opening up in the new era is a profound revolution.</p> <p>(2) Adhering to the correct direction for comprehensively deepening reform and opening up.</p> <p>(3) The general goals of comprehensively deepening reform.</p> <p>(4) The correct methodology for comprehensively deepening reform and opening up.</p> <p><b>Chapter 6: Promoting High-Quality Development</b></p> <p>This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.</p> <p><b>1. Teaching Content</b></p> <p>(1) Fully, accurately, and comprehensively implement the new development philosophy.</p> <p>(2) Adhere to and improve the socialist basic economic system.</p> <p>(3) Accelerate the construction of a new development pattern.</p> <p><b>Chapter 7: Education, Science, and Talent Strategy for Socialist Modernization</b></p> <p>This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.</p> <p><b>1. Teaching Content</b></p> <p>(1) Understanding the major significance of the strategy of revitalizing the country through education, science, and technology in the new era.</p> <p>(2) How to accelerate the construction of a strong educational nation.</p> <p>(3) How to accelerate the construction of a strong technological nation.</p> <p>(4) How to deeply implement the strategy of building a strong country through talent in the new era.</p> <p><b>Chapter 8: Developing Whole-Process People’s Democracy</b></p> <p>This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.</p> <p><b>1. Teaching Content</b></p> <p>(1) Firmly adhere to the path of political development with Chinese characteristics.</p> <p>(2) Whole-process people’s democracy is an essential attribute of socialist democratic politics.</p>
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(3) The main content of the system of people being the masters of the country.

(4) The significance of consolidating and developing the patriotic united front in the new era.

### **Chapter 9: Comprehensive Rule of Law in China**

This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.

#### **1. Teaching Content**

(1) The significance of comprehensively advancing the rule of law in China.

(2) The core essence and basic principles of the socialist rule of law with Chinese characteristics.

(3) The main content of the socialist rule of law system with Chinese characteristics.

(4) The primary tasks in accelerating the construction of a rule-of-law-based China.

### **Chapter 10: Building a Socialist Cultural Power**

This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.

#### **1. Teaching Content**

(1) Cultural confidence is a powerful spiritual force for the great rejuvenation of the Chinese nation.

(2) The fundamental system of maintaining the guiding position of Marxism in the ideological field.

(3) The basic requirements for cultivating and practicing the core socialist values.

(4) The prominent characteristics of Chinese civilization.

### **Chapter 11: Strengthening Social Construction with a Focus on People's Well-being**

This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.

#### **1. Teaching Content**

(1) Enhancing people's well-being through development.

(2) Key focal points for improving people's quality of life.

(3) The significance and requirements of strengthening and innovating social governance.

### **Chapter 12: Building Socialist Ecological Civilization**

This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.

#### **1. Teaching Content**

- (1) Why build ecological civilization?
- (2) How to build ecological civilization?
- (3) Proposing China's plan for "Building a Global Ecological Civilization."

### **Chapter 13: Safeguarding and Shaping National Security**

This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.

#### **1. Teaching Content**

- (1) Why is guaranteeing national security considered a top priority?
- (2) What is the concept of overall national security?
- (3) How to advance the modernization of the national security system and capabilities?

### **Chapter 14: Strengthening National Defense and Building a Strong People's Army**

This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.

#### **1. Teaching Content**

- (1) The significant importance of strengthening national defense and building a powerful People's Army.
- (2) The Party's military goals in the new era.
- (3) Adhering to the fundamental principle and system of the Party's absolute leadership over the People's Army.

### **Chapter 15: Adhering to "One Country, Two Systems" and Advancing National Reunification**

This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.

#### **1. Teaching Content**

- (1) The scientific connotation and significant importance of 'One

	<p>Country, Two Systems’.</p> <p>(2) The successful practice of ‘One Country, Two Systems’ in Hong Kong and Macau in the new era.</p> <p>(3) The overall strategy of the Party in resolving the Taiwan issue in the new era.</p> <p><b>Chapter 16: Major-Country Diplomacy with Chinese Characteristics and Promoting the Building of a Community with a Shared Future for Mankind</b></p> <p>This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.</p> <p><b>1. Teaching Content</b></p> <p>(1) The impact of the unprecedented global changes in a century on China's foreign policy.</p> <p>(2) The principles and layout of comprehensively advancing major-country diplomacy with Chinese characteristics.</p> <p>(3) The basic content of major-country diplomacy with Chinese characteristics.</p> <p>(4) The rich connotation and value concept of building a community with a shared future for mankind.</p> <p>(5) The practical achievements in building a community with a shared future for mankind.</p> <p><b>Chapter 17: Comprehensive and Strict Governance of the Party</b></p> <p>This chapter corresponds to course teaching objectives 1, 2, and 3, and ideological and political indicators 1, 2, and 3.</p> <p><b>1. Teaching Content</b></p> <p>(1) The inevitability and significance of comprehensively and strictly governing the Party in the new era.</p> <p>(2) The main content of comprehensively and strictly governing the Party in the new era.</p> <p>(3) Resolutely advancing the fight against corruption.</p> <p>(4) Using the Party’s self-revolution to break free from the historical cycle.</p> <p>(5) Leading great social revolution through great self-revolution.</p>
Examination forms	Closed-book written exam

Study and examination requirements	<p>The course is a required foundational course. The assessment method for the course includes: Regular performance (40%) + Final assessment (60%).</p> <p>Regular performance components:</p> <ul style="list-style-type: none"> <li>(1) Attendance (25%)</li> <li>(2) Classroom participation and homework (25%)</li> <li>(3) One mid-term exam (50%)</li> </ul>
Reading list	<ul style="list-style-type: none"> <li>[1] Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, Compilation Group, Higher Education Press.</li> <li>[2] The Governance of China by Xi Jinping, Foreign Languages Press, 2017 Edition.</li> <li>[3] The Governance of China by Xi Jinping, Foreign Languages Press, 2018 Edition.</li> <li>[4] The Governance of China by Xi Jinping, Foreign Languages Press, 2020 Edition.</li> <li>[5] Xi Jinping: Speech at the Ceremony Commemorating the Bicentenary of the Birth of Marx, People's Publishing House, 2018 Edition.</li> <li>[6] Xi Jinping: Speech at the Ceremony Marking the Centenary of the Communist Party of China, People's Publishing House, 2021 Edition.</li> <li>[7] Thirty Lectures on Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, XUE XI CHU BAN SHE, 2018 Edition.</li> <li>[8] Outline for Learning Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, XUE XI CHU BAN SHE &amp; People's Publishing House, June 2019.</li> <li>[9] Explanatory Reader on the Resolution of the CPC Central Committee on the Major Achievements and Historical Experience of the Party's Centennial Struggle, People's Publishing House, November 2021.</li> <li>[10] Xi Jinping: Hold High the Great Banner of Socialism with Chinese Characteristics and Strive in Unity to Build a Modern Socialist Country in All Respects — Report to the 20th National Congress of the Communist Party of China (October 16, 2022).</li> <li>[11] Q&amp;A on Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, XUE XI CHU BAN SHE &amp; People's Publishing House, February 2021.</li> </ul>

	<p>[12] Shared Online Course on Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era via Chaoxing Learning Platform.</p> <p>[13] Xinhua News Agency: <a href="http://www.xinhuanet.com/">http://www.xinhuanet.com/</a>.</p> <p>[14] People’s Daily Online: <a href="http://www.people.com.cn/">http://www.people.com.cn/</a>.</p> <p>[15] Online Resources such as “Xuexi Qiangguo”: <a href="https://www.xuexi.cn/">https://www.xuexi.cn/</a>.</p>
Data of last amendment	August 2024

## Marxism Basic Theory

Module designation	Marxism Basic Theory
Semester(s) in which the module is taught	5 <sup>th</sup> semester
Person responsible for the module	Lecturer Jiao Xin
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Lectures, multimedia teaching, thematic discussion, and case study
Workload (incl. contact hours, self-study hours)	Total workload = 90 hours Contact hours = 48 hours Self-study hours = 42 hours
Credit points	3.0
Required and recommended prerequisites for joining the module	Ethics and the Rule of Law, Outline of Modern Chinese History, Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era.
Module objectives/intended learning outcomes	To realize political identity, national identity and cultural identity through the teaching and learning of the Fundamental Principles of Marxism, and then to help students deeply realize the significance of adhering to and developing socialism with Chinese characteristics, and to enhance the 'Four Confidences' and the 'Four Consciousnesses'. Through the teaching of the Marxism Basic Theory, students are guided to form ideological concepts in line with the core socialist values, and are equipped with the basic ability to identify and analyze real problems.
Content	<p><b>Introduction</b></p> <p>This chapter corresponds to the course objectives 2, 3 and 4, and corresponds to the Civics indicator points 1, 2 and 4.</p> <p><b>1. Teaching content</b></p> <p>(1) What is Marxism</p> <p>(2) The emergence and development of Marxism</p> <p>(3) Distinctive features of Marxism</p> <p>(4) Contemporary values of Marxism</p> <p>(5) Conscious study and application of Marxism</p>

### **Chapter 1: The Materiality of the World and the Laws of Development**

This chapter corresponds to course objectives 1, 2 and 3, and corresponds to Civics index points 1, 2, 3 and 4.

#### **1. Teaching content**

- (1) The material unity of the world
- (2) The dialectical unity of subjective initiative and objective regularity.
- (3) The universality of connection and development
- (4) The basic laws of connection and development
- (5) The dialectical unity of matter and consciousness
- (6) material dialectics is a scientific method of knowledge

### **Chapter 2: Practice and cognition and their laws of development**

This chapter corresponds to course objectives 1, 2 and 3, and corresponds to Civics index points 1, 2, 3 and 4.

#### **1. Teaching content**

- (1) The scientific concept of practice and its significance
- (2) The nature and basic structure of practice
- (3) The nature and development law of cognition
- (4) Objectivity, absoluteness and relativity of truth
- (5) Dialectical unity of truth and value
- (6) Epistemology and line of thought
- (7) Realization of positive interaction between theoretical and practical innovation

### **Chapter 3: The Materiality of the World and the Laws of Development**

This chapter corresponds to course objectives 1, 2 and 3, and corresponds to Civics index points 1, 2, 3 and 4.

#### **1. Teaching content**

- (1) The dialectical relationship between social existence and social consciousness.
- (2) Basic social contradictions and their laws of motion
- (3) The formation and development of world history
- (4) Social progress and human development

- (5) Civilization and its diversity
- (6) The driving force of social and historical development
- (7) The role of the masses and individuals in social history
- (8) Relationship between masses, classes, political parties and leaders

#### **Chapter 4 The Nature and Laws of Capitalism**

This chapter corresponds to course objectives 1, 2 and 3, and corresponds to Civic and Political Indicator Points 1, 2, 3 and 4.

##### **1. Teaching content**

- (1) The basic contradictions of the commodity economy on the basis of private ownership.
- (2) The labor theory of value and its significance
- (3) The theory of surplus value and its significance
- (4) Basic contradictions of capitalism and economic crisis
- (5) Capitalist political system and its essence
- (6) Capitalist ideology and its essence.

#### **Chapter 5: The Materiality of the World and the Laws of Development**

This chapter corresponds to course objectives 1, 2 and 3, and corresponds to Civics index points 1, 2, 3 and 4.

##### **1. Teaching content**

- (1) The formation and characteristics of private monopoly capitalism.
- (2) Characteristics and essence of state monopoly capitalism
- (3) Manifestations of economic globalization and its impact
- (4) Changes in capitalism after the Second World War and their substance
- (5) New features of the changes in contemporary capitalism
- (6) Contradictions and conflicts of capitalism in the context of major world changes
- (7) The historical status of capitalism and its historical inevitability to be replaced by socialism.

#### **Chapter 6: Development and Laws of Socialism**

This chapter corresponds to course objectives 1, 2 and 3, and corresponds to Civics index points 1, 2, 3 and 4.

	<p><b>1. Teaching content</b></p> <p>(1) The historical progress of socialism over the past 500 years.</p> <p>(2) Basic principles of scientific socialism</p> <p>(3) Basic principles of scientific socialism and socialism with Chinese characteristics</p> <p>(4) The long-term nature of the process of socialist construction</p> <p>(5) Diversity of socialist development paths</p> <p>(6) The vitality of socialism in China</p> <p><b>Chapter 7: The High Ideal of Communism and Its Ultimate Realization</b></p> <p>This chapter corresponds to course objectives 1, 2 and 3, and corresponds to Civics index points 1, 2, 3 and 4.</p> <p><b>1. Teaching content</b></p> <p>(1) Methodological principles of foreseeing the future society</p> <p>(2) Basic characteristics of communist society</p> <p>(3) The inevitability of the realization of the communist ideal</p> <p>(4) The long-term nature of the realization of the communist ideal</p> <p>(5) The relationship between the ideal of communism and the common ideal of socialism with Chinese characteristics.</p>
Examination forms	Closed-book written exam
Study and examination requirements	<p>The course of Marxism Basic Theory is a compulsory public foundation course, and the course assessment method includes: usual grade (40%) + result-based assessment (60%)</p> <p>Composition of ordinary grades: attendance (25%) + classroom performance and after-class assignments (25%) + two midterm examinations (50%).</p>
Reading list	<p>[1] Introduction to the Marxism Basic Theory (2021 Edition), the writing group of this book, Higher Education Press.</p> <p>[2] Selected Works of Marx and Engels, People's Publishing House, 2012 edition.</p> <p>[3] Selected Works of Vladimir Lenin, People's Publishing House, 2012 edition.</p> <p>[4] Selected Works of Mao Zedong, People's Publishing House, 1991 edition.</p>

	<p>[5] Selected Writings of Deng Xiaoping, People's Publishing House, 1993 and 1994 editions.</p> <p>[6] Selected Writings of Jiang Zemin, People's Publishing House, 206th edition.</p> <p>[7] Selected Writings of Hu Jintao, People's Publishing House, 2016 edition.</p> <p>[8] Xi Jinping on the Governance of the Country, Foreign Languages Press, 2018, 2017, 2020 editions.</p> <p>[9] Xi Jinping, Speech at the Conference Commemorating the 200th Anniversary of the Birth of Marx, People's Publishing House, 2018 edition.</p> <p>[10] Xi Jinping, Speech at the Conference to Celebrate the 100th Anniversary of the Founding of the Communist Party of China, People's Publishing House, 2021 edition.</p>
Data of last amendment	August 2024

## Introduction to Mao Zedong Thought and Theory of Socialism with Chinese Characteristics

Module designation	Introduction to Mao Zedong Thought and Theory of Socialism with Chinese Characteristics
Semester(s) in which the module is taught	6 <sup>th</sup> semester
Person responsible for the module	Lecturer Li Yaqian
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Combining classroom lectures with social practice teaching
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	Ideology, Morality and the Rule of Law, Marxism Basic Theory, Modern Chinese History
Module objectives/intended learning outcomes	By studying this course, students will understand the main content, historical status, and guiding significance of Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics. Students will learn to apply the positions, viewpoints, and methods of socialism with Chinese characteristics to correctly recognize, analyze, and solve problems encountered in the economic and social development of socialism with Chinese characteristics in the new era, thereby better becoming builders and successors of the cause of socialism with Chinese characteristics in the new era.
Content	<b>Introduction: The Historical Process and Theoretical Outcomes of the Sinicization of Marxism (2 hours)</b>  <b>1.Course Content</b>  (1) What is Marxism?  (2) Why did China choose Marxism?  (3) The connotation of the Sinicization and modernization of Marxism  (4) The historical process of the Sinicization and modernization of

	<p>Marxism</p> <p>(5) The theoretical outcomes and their relationships of the Sinicization and modernization of Marxism</p> <p>(6) Requirements and methods for studying this course</p> <p><b>Chapter 1: Mao Zedong Thought and Its Historical Status (4 hours)</b></p> <p><b>1.Course Content</b></p> <p>(1) The formation and development of Mao Zedong Thought</p> <p>(2) The main content and living soul of Mao Zedong Thought</p> <p>(3) The historical status of Mao Zedong Thought</p> <p><b>Chapter 2: Theory of New Democratic Revolution (6 hours)</b></p> <p><b>1.Course Content</b></p> <p>(1) The national conditions of modern China and the characteristics of the Chinese revolution</p> <p>(2) The practical basis of the theory of new democratic revolution</p> <p>(3) The general line of the new democratic revolution</p> <p>(4) The basic program of the new democracy</p> <p>(5) The road of the new democratic revolution</p> <p>(6) The three major magic weapons of the new democratic revolution</p> <p>(7) The significance of the theory of the new democratic revolution</p> <p><b>Chapter 3: Theory of Socialist Transformation (3 hours)</b></p> <p><b>1.Course Content</b></p> <p>(1) New democratic society as a transitional society</p> <p>(2) The Party's general line during the transitional period and its theoretical basis</p> <p>(3) The road of socialist transformation suitable for Chinese characteristics</p> <p>(4) The historical experience of socialist transformation</p> <p>(5) The establishment of the basic socialist system and its theoretical basis</p> <p>(6) The great significance of the establishment of the basic socialist system</p> <p><b>Chapter 4: Theoretical Achievements of the Preliminary Exploration of</b></p>
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	<p><b>the Socialist Construction Road (3 hours)</b></p> <p><b>1.Course Content</b></p> <ol style="list-style-type: none"> <li>(1) Mobilizing all positive factors to serve the socialist cause</li> <li>(2) Correctly understanding and handling the contradictions in socialist society</li> <li>(3) The idea of following the path of Chinese industrialization</li> <li>(4) Other theoretical achievements of the preliminary exploration</li> <li>(5) The significance of the preliminary exploration</li> <li>(6) The experiences and lessons of the preliminary exploration</li> </ol> <p><b>Chapter 5: The Formation and Development of the Theoretical System of Socialism with Chinese Characteristics (2 hours)</b></p> <p><b>1.Course Content</b></p> <ol style="list-style-type: none"> <li>(1) The socio-historical conditions for the formation and development of the theoretical system of socialism with Chinese characteristics</li> <li>(2) The formation of the theoretical system of socialism with Chinese characteristics</li> <li>(3) The cross-century development of the theoretical system of socialism with Chinese characteristics</li> <li>(4) The new development of the theoretical system of socialism with Chinese characteristics in the new stage of the new world</li> <li>(5) The new chapter of the theoretical system of socialism with Chinese characteristics in the new era</li> </ol> <p><b>Chapter 6: Deng Xiaoping Theory (6 hours)</b></p> <p><b>1.Course Content</b></p> <ol style="list-style-type: none"> <li>(1) The fundamental and primary question answered by Deng Xiaoping Theory</li> <li>(2) The essence of Deng Xiaoping Theory</li> <li>(3) The main content of Deng Xiaoping Theory</li> <li>(4) The historical status of Deng Xiaoping Theory</li> </ol> <p><b>Chapter 7: The Important Thought of "Three Represents" (3 hours)</b></p> <p><b>1.Course Content</b></p> <ol style="list-style-type: none"> <li>(1) The formation conditions of the important thought of 'Three</li> </ol>
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	<p>Represents'</p> <p>(2) The formation process of the important thought of 'Three Represents'</p> <p>(3) The core viewpoint of the important thought of 'Three Represents'</p> <p>(4) The main content and historical status of the important thought of 'Three Represents'</p> <p><b>Chapter 8: Scientific Outlook on Development (3 hours)</b></p> <p><b>1.Course Content</b></p> <p>(1) The formation conditions of Scientific Outlook on Development</p> <p>(2) The formation process of Scientific Outlook on Development</p> <p>(3) The scientific connotation of Scientific Outlook on Development</p> <p>(4) The main content and historical status of Scientific Outlook on Development</p>
Examination forms	Closed-book written exam
Study and examination requirements	The course 'An Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics' is a compulsory public course. The assessment methods include attendance (10%), 5 regular assignments (20%), class performance (10%), and a final exam (60%).
Reading list	<p><b>Recommended Textbooks</b></p> <p>[1] An Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics, 8th Edition, February 2023, Higher Education Press.</p> <p>[2] Reference Books and Literature.</p> <p>[3] Marx and Engels: Selected Works of Marx and Engels, Volume 1 and Volume 4, 2012, People's Publishing House.</p> <p>[4] Lenin: Selected Works of Lenin, Volume 2, 2012, People's Publishing House.</p> <p>[5] Mao Zedong: Selected Works of Mao Zedong, Volumes 1-4, 1991, People's Publishing House.</p> <p>[6] The Central Documentation Research Office of the CPC: The Complete Works of Mao Zedong, Volumes 1-8, 1999, People's Publishing House.</p> <p>[7] Deng Xiaoping: Selected Works of Deng Xiaoping, Volumes 1-3, 1994, People's Publishing House.</p>

	<p>[8] The Central Documentation Research Office of the CPC: The Collected Works of Deng Xiaoping (1949-1974) (Volumes I, II, III), 2014, People's Publishing House.</p> <p>[9] Jiang Zemin: Selected Works of Jiang Zemin, Volumes 1-3, 2006, People's Publishing House.</p> <p>[10] The Editing Committee of the Central Documents of the CPC: Selected Works of Hu Jintao, Volumes 1-3, 2016, People's Publishing House.</p> <p>[11] (Additional titles omitted for brevity, following the same format as above).</p> <p><b>Online Learning Resources</b></p> <p>[1] The An Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics resource sharing course on Learning Tong.</p> <p>[2] Xinhuanet: <a href="http://www.xinhuanet.com/">http://www.xinhuanet.com/</a></p> <p>[3] People's Daily Online: <a href="http://www.people.com.cn/">http://www.people.com.cn/</a></p> <p>[4] Learning Power and other online resources: <a href="https://www.xuexi.cn/">https:// www.xuexi.cn/</a></p>
Data of last amendment	August 2024

## Military Theory

Module designation	Military Theory
Semester(s) in which the module is taught	1 <sup>st</sup> semester
Person responsible for the module	Lecturer Ma Qianlu
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	<p>(1) Elaborate on fundamental concepts and delve deeply into knowledge interpretation.</p> <p>(2) Combine situational analysis with case studies.</p> <p>(3) Integrate summarization of patterns with forward-thinking reflection.</p> <p>(4) Combine systematic video lectures with recommended readings.</p>
Workload (incl. contact hours, self-study hours)	<p>Total workload = 60 hours</p> <p>Contact hours = 36 hours</p> <p>Self-study hours = 24 hours</p>
Credit points	2.0
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	Through the teaching of military theory courses, students are guided to deeply study key knowledge such as national defense history and China's national defense system, accurately grasp the national security situation and challenges, and strengthen national defense awareness and patriotism. Students are trained to use military thinking to analyze war examples, comprehend the characteristics of information warfare, reasonably construct a cognitive framework for modern military, effectively improve strategic thinking and comprehensive national defense quality, and become promising young people with family and country feelings and national defense literacy.
Content	<p><b>Chapter 1 International Strategic Environment and National Security</b></p> <p><b>1.1 Overview of National Security</b></p>

	<p>(1) Basic Connotation of National Security</p> <p>(2) Analysis of the Current National Security Situation in China</p> <p>(3) Reflections on Safeguarding China’s National Security</p> <hr/> <p><b>1.2 China's Peripheral Security</b></p> <p>(1) Opportunities Facing China's Peripheral Security</p> <p>(2) Challenges and Threats to China's Peripheral Security</p> <p>(3) Sino-US Relations and Sino-Japanese Relations</p> <hr/> <p><b>Chapter 2 China’s National Defense</b></p> <hr/> <p><b>2.1 Overview of National Defense</b></p> <p>(1) Definition of National Defense</p> <p>(2) History of National Defense</p> <p>(3) Defense Policy</p> <p>(4) A Prosperous Country Strengthens the Military, and a Strong Military Protects the Country</p> <p>(5) Focusing on Strengthening Patriotism Education</p> <p>(6) Building Elite Forces and Advanced Equipment to Fortify National Defense</p> <hr/> <p><b>2.2 National Defense Laws and Regulations</b></p> <p>(1) Characteristics of National Defense Laws and Regulations</p> <p>(2) National Defense Laws and Regulations System</p> <p>(3) Citizens’ National Defense Obligations</p> <p>(4) Citizens’ National Defense Rights</p> <p>(5) The Relationship between Citizens’ National Defense Obligations and Rights</p> <hr/> <p><b>2.3 National Defense Mobilization</b></p> <p>(1) Strategic Position of National Defense Mobilization</p> <p>(2) Basic Content of National Defense Mobilization</p> <p>(3) Responsibilities and Obligations of Citizens in National Defense Mobilization</p> <hr/> <p><b>2.4 China’s Armed Forces</b></p>
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	<p>(1) Overview of China’s Armed Forces</p> <p>(2) Composition and Differentiation of China’s Armed Forces - The Army</p> <p>(3) Composition and Differentiation of China’s Armed Forces - The Navy, Air Force, and Rocket Force</p> <p>(4) Composition and Differentiation of China’s Armed Forces - Information Support Force, Military Space Force, Cyberspace Force, Joint Logistics Support Force, and Reserve Forces</p> <p>(5) Composition and Differentiation of China’s Armed Forces - The Armed Police Force and the Militia</p> <p>(6) Missions of China’s Armed Forces</p> <p>(7) Equipment of China’s Armed Forces</p> <p><b>Chapter 3 History of Warfare and Military Thought</b></p> <hr/> <p><b>3.1 <i>The Art of War</i> by Sun Tzu</b></p> <p>(1) The Emergence and Major Influence of The Art of War</p> <p>(2) Theoretical Essence of The Art of War (Part I)</p> <p>(3) Theoretical Essence of The Art of War (Part II)</p> <hr/> <p><b>3.2 <i>On War</i></b></p> <p>(1) Carl von Clausewitz and His Book On War</p> <p>(2) Main Essence of On War (Part I)</p> <p>(3) Main Essence of On War (Part II)</p> <hr/> <p><b>3.3 The New Military Revolution in the World</b></p> <p>(1) The Emergence of the New Military Revolution in the World</p> <p>(2) Progress of the New Military Revolution in the World - Formation of Information-Based Weaponry Systems</p> <p>(3) Progress of the New Military Revolution in the World - Comprehensive Renewal of Operational Methods</p> <p>(4) Progress of the New Military Revolution in the World - Continuous Innovation in Military Theories</p> <p>(5) Progress of the New Military Revolution in the World - Profound Changes in Military Organizational Structures</p> <p>(6) Trends of the New Military Revolution in the World</p> <hr/>
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### **3.4 Information-Based Warfare**

- (1) Formation and Evolution of Information-Based Warfare
- (2) Basic Characteristics of Information-Based Warfare
- (3) Main Operational Styles of Information-Based Warfare
- (4) Preparing to Win Information-Based Warfare

## **Chapter 4 Operational Practices and Theoretical Development of the Chinese People's Liberation Army**

### **4.1 Mao Zedong's Military Thought**

- (1) Mao Zedong's Great Influence and the Definition of Mao Zedong's Military Thought
- (2) Theory on Building the People's Army
- (3) Thought on People's War and Its Strategic and Tactical Principles

### **4.2 Xi Jinping's Thinking on Strengthening the Military**

- (1) Establishment and Basis of the Goal of Strengthening the Military in the New Era
- (2) Scientific Connotation of the Goal of Strengthening the Military in the New Era (Part I)
- (3) Scientific Connotation of the Goal of Strengthening the Military in the New Era (Part II)

## **Chapter 5 Information-Age Weaponry and Basic Tactical Applications**

### **5.1 Development of Naval Weaponry and Its Impact on Operations**

- (1) New Developments in Aircraft Carriers
- (2) New Developments in the Combat Capabilities of Surface Ships
- (3) Impact of New Developments in Weaponry on Operational Concepts and Styles

### **5.2 Information-Based Operational Platforms**

- (1) Development of Information-Based Operational Platforms - Land Warfare Platforms
- (2) Development of Information-Based Operational Platforms - Air Warfare Platforms
- (3) Development of Information-Based Operational Platforms - Naval Warfare Platforms
- (4) Development of Information-Based Operational Platforms - Space

	<p>Warfare Platforms</p> <p>(5) Impact of the Development of Information-Based Operational Platforms on Modern Warfare</p> <p>(6) Future Development Trends of Information-Based Platforms</p>
Examination forms	Online Test
Study and examination requirements	<p>Military Theory is mainly assessed through process-based assessment and final exams, according to the course assessment plan.</p> <p>The overall grade for online learning = General Performance (30 points) + Scores of Chapter Test scores (10 points) + Scores for Face-to-face Class (20 points) + final exam (40 points).</p> <p>General Performance = Learning Progress (10 points) + Learning Habit (10 points) + Learning Interaction (10 points).</p> <p>(1) Learning Progress: Students shall obtain full points for learning progress by completing all tutorial videos and chapter tests before the deadline.</p> <p>(2) Learning Habit: Students can obtain daily learning habit points by studying tutorial videos for at least 25 minutes in a single day (a recommended study duration of 25-30 minutes is advised).</p> <p>(3) Learning Interaction: The question-and-answer score is composed of three parts, which are the number of valid questions asked, the number of valid answers given, and the number of valid answers received.</p>
Reading list	1. Textbook For College Military Education, edited by He Ping, Xu Chuanguang, and Wang Junhui, National University of Defense Technology Press, May 2021.
Data of last amendment	September, 2024

## Career Development

Module designation	Career Development
Semester(s) in which the module is taught	1 <sup>st</sup> semester
Person responsible for the module	Lecturer Su Daxun
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Lecture discussion-based teaching, case-based teaching, etc.
Workload (incl. contact hours, self-study hours)	Total workload = 30 hours Contact hours = 16 hours Self-study hours = 14 hours
Credit points	1
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	<ol style="list-style-type: none"> <li>1. Starting from the meaning and theme of career development in the context of the new era, guide students to think about career and current academic planning from the perspective of life planning;</li> <li>2. From the exploration of the professional world, guide students to gain insight into new career trends and obtain environmental resources to promote growth;</li> <li>3. Explore self-characteristics from the four dimensions of interest, personality, ability, and values, and conduct preliminary career positioning;</li> <li>4. From the study of career decision-making methods, help students learn process management and improve career adaptability;</li> <li>5. Through the interpretation of the connotation of professional qualities, students are inspired to aspire to become talents, improve their comprehensive qualities and abilities in a targeted manner, and actively combine their personal ideals with the needs of national and social development, so as to bravely shoulder the mission of the times and realize the value of life.</li> </ol>
Content	<b>Chapter 1 Inquiry</b>

	<p><b>1. Teaching content</b></p> <p>(1) The basic ideas and content structure of this course.</p> <p>(2) The importance of career development to individual life.</p> <p>(3) The steps and process of career development.</p> <p><b>Chapter 2: Investigation</b></p> <p><b>1. Teaching content</b></p> <p>(1) Understand the classification of occupations, the relationship between majors and occupations, and the career development path of the majors studied.</p> <p>(2) The basic coordinates of the career map and new trends in career development,</p> <p>(3) Understand the workplace and the world of work; master the methods of obtaining career information.</p> <p>(4) The colorful choices of college students. (Exploration of graduation paths - studying in China, studying abroad, employment, entrepreneurship; exploration of growth resources - campus exploration, family exploration, social resource exploration)</p> <p><b>Chapter 3: Self-establishment</b></p> <p><b>1. Teaching content</b></p> <p>(1) Analyze the importance of professional interests, guide students on how to discover and cultivate professional interests, and understand the relationship between interests and career development.</p> <p>(2) Explain the classification of professional personality and the corresponding types of professions, introduce the evaluation methods and improvement means of professional personality.</p> <p>(3) Introduce professional abilities and their classification, and teach methods to explore, develop and improve professional abilities.</p> <p>(4) Explain the definition and significance of professional values, and introduce the evaluation methods and development paths of professional values.</p> <p><b>Chapter 4: Investigation II</b></p> <p><b>1. Teaching content</b></p> <p>(1) Introduce the decision-making style and principles of career; analyze the challenges faced by career decision-making, and teach the correct way to deal with challenges.</p>
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	<p>(2) Guide students to make a good transition and connection between academic career and career; master the correct goal setting method, be able to set long-term and short-term goals for their career development and make corresponding action plans.</p> <p>(3) Write a complete career development book based on their own reality.</p> <p><b>Chapter 5: Pursuit of Excellence</b></p> <p><b>1. Teaching content</b></p> <p>Analyze the connotation and necessity of professional cultivation; teach the basic meaning and function of self-development; combine cases to guide students to establish and improve career goals and realize their life ideals.</p>
Examination forms	Examination (open-book, closed-book, etc.) or assessment (interview, short essay, etc.)
Study and examination requirements	The course 'Career Development' is a compulsory public course. The course assessment methods include: classroom learning discussion and course assignments (30%) + final assignments (70%).
Reading list	<p>[1] Huang Tianzhong: Career Experience - Career Development and Planning [M]. Beijing: Higher Education Press, 2015.8.</p> <p>[2] Zhou Ying: Research on Innovation in Cultivating Socialist Core Values of College Students in the New Era [M]. China Book Publishing House, 2019.7.</p> <p>[3] Zhong Gulan and Yang Kai: College Students' Career Development and Planning, East China Normal University Press, 2016, 2nd edition.</p> <p>[4] Yin Fengxia: Professional Ethics and Professional Quality [M]. Beijing: Machinery Industry Press, 2012.4.</p> <p>[5] Mou Degang, "Self-cultivation and Serving the Country - A Reader of Socialist Core Values for College Students" [M]. Zhejiang University Press, 2015.9.</p> <p>[6] Zhao Jian, "Research on the Career Outlook Education of College Students" [M]. Wuhan University Press, 2017.1.</p> <p>[7] Wang Xianfang, Cheng Yanli, "University Career Design and Career Development Planning" [M]. Shanghai Jiaotong University Press, 2017.8.</p> <p>[8] Su Chunhai, "University Career Development Reader" [M]. Nanjing: Jiangsu Phoenix Education Press, 2018.</p> <p>[9] Wang Lu, Li Cuiping, Zhu Xiufen, "University Career Development" [M].</p>

	<p>Beijing: Higher Education Press, 2018.</p> <p>[10] Gu Xueying, "University Career Development and Employment Guidance" [M]. Nanjing: Nanjing University Press, 2018.</p> <p>[11] Jia Jie, "Live Clearly: Eighteen Typical Career Counseling", Peking University Press, 2015 2016 edition.</p> <p>[12] Classical book: "Tearing Down the Walls in the Mind", Beijing United Publishing Company, 2016 edition.</p>
Data of last amendment	July 2024

## Psychological Health Education

Module designation	Psychological Health Education
Semester(s) in which the module is taught	2 <sup>nd</sup> semester
Person responsible for the module	Lecturer Li Baohui
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Theory teaching, case study
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 32 hours Self-study hours = 28 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	Enhance students' awareness of psychological health. Recognize the importance of psychological health for overall well-being, understand the harm of psychological problems to physical and psychological health, and clearly acknowledge the possibility of their own psychological issues. Cultivate students' good psychological literacy, including self-awareness, emotional management, interpersonal communication skills, etc. Through the course, learn to better cope with various pressures in life and study, maintain an optimistic attitude, establish a healthy lifestyle, and fundamentally prevent the occurrence of psychological problems. Psychological health education is not only about solving current psychological problems, but also about guiding college students to actively pursue psychological health and happiness, and achieve the value of life. Through psychological health education, college students can better enhance their self-esteem and self-confidence, shape a positive life attitude, and achieve spiritual growth.
Content	<b>Chapter 1 Starting from the "Heart"—Overview of College Students' Psychological Health</b>  <b>1. Teaching Content</b>

	<p>(1) Understand psychological health</p> <p>(2) Analysis of common psychological problems among college students</p> <p>(3) Approach to psychological counseling</p> <p><b>Chapter 2 Integrating into College—Psychological Adaptation of College Students</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Overview of psychological adaptation</p> <p>(2) Adaptation problems of freshmen</p> <p>(3) Approaches and methods to solve adaptation problems</p> <p><b>Chapter 3 Knowing Oneself—Self-Consciousness of College Students</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Overview of self-consciousness</p> <p>(2) Characteristics and common problems in the development of self-consciousness among college students</p> <p>(3) Shaping a sound self-consciousness</p> <p><b>Chapter 4 Master of Emotions—Emotional Management for College Students</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Understanding emotions</p> <p>(2) Common emotional disorders among college students</p> <p>(3) Tips for emotional management</p> <p><b>Chapter 5 Charisma of Personality—Healthy Personality and Its Shaping for College Students</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Overview of personality</p> <p>(2) Common personality development defects and adjustments among college students</p> <p>(3) Shaping a sound personality</p> <p><b>Chapter 6 Breaking Through Adversity—Coping with Stress and Frustration for College Students</b></p> <p><b>1. Teaching Content</b></p>
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	<p>(1) Correct understanding of stress</p> <p>(2) Analysis of stress among college students</p> <p>(3) Improving frustration resistance</p> <p><b>Chapter 7 Wisdom in Social Interaction—Interpersonal Communication of College Students</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Overview of interpersonal communication among college students</p> <p>(2) Psychological misunderstandings and adjustments in interpersonal communication of college students</p> <p>(3) Establishing and improving good interpersonal relationships among college students</p> <p><b>Chapter 8 Encountering Love—Love and Sexual Psychology of College Students</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Overview of love and sexual psychology</p> <p>(2) Common love and sexual psychological problems among college students</p> <p>(3) Adjustment of healthy love and sexual psychology for college students</p> <p><b>Chapter 9 Wise Use of the Internet—Internet Psychology of College Students</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Understanding internet psychology</p> <p>(2) Common internet psychological problems</p> <p>(3) Cultivating healthy internet psychology and behavior</p> <p><b>Chapter 10 Beauty of Life—Life Education and Crisis Intervention for College Students</b></p> <p><b>1. Teaching Content</b></p> <p>(1) Overview of life education for college students</p> <p>(2) Psychological crises of college students</p> <p>(3) Psychological crisis intervention</p>
Examination forms	Closed-book written exam

Study and examination requirements	The Psychological Health Education course is a public compulsory course. The assessment methods of the course include: in-class learning discussions and course assignments (30%) + summative assessment (70%).
Reading list	<p>1. Recommended Textbook:</p> <p><i>General Psychology</i>, compiled by Peng Danling, Beijing Normal University Press, 2018.</p> <p>2. Reference Books and Literatures:</p> <p>[1] <i>College Students' Psychological Health Education</i> (3rd Edition), compiled by Fang Xiaoyi, Posts &amp; Telecom Press, 2022.</p> <p>[2] <i>College Students' Psychological Health Education</i> (3rd Edition), compiled by Zhou Li, Renmin University of China Press, 2020.</p> <p>[3] <i>College Students' Psychological Health Education</i> (3rd Edition), compiled by Huang Xiting, East China Normal University Press, 2020.</p> <p>3. Online Learning Resources:</p> <p>MOOC of China University of Mining and Technology:</p> <p><a href="https://www.icourse163.org/course/CUMT-1466066208?from=searchPage&amp;outVendor=zw_mooc_pcsgjg_">https://www.icourse163.org/course/CUMT-1466066208?from=searchPage&amp;outVendor=zw_mooc_pcsgjg_</a></p>
Data of last amendment	August 2024

## Employment Guidance

Module designation	Employment Guidance
Semester(s) in which the module is taught	6 <sup>th</sup> semester
Person responsible for the module	Lecturer Su Daxun, Lecturer Zheng Yao
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	This course adopts a mixed teaching method combining classroom teaching, students' independent learning, and participation in employment practice.
Workload (incl. contact hours, self-study hours)	Total workload = 30 hours Contact hours = 16 hours Self-study hours = 14 hours
Credit points	1.0
Required and recommended prerequisites for joining the module	Career Development
Module objectives/intended learning outcomes	The course aims to help students analyze and accurately grasp the current employment situation, and guide them to establish correct outlooks on life, values, employment, and career choice. They will be prepared for job-hunting, reasonably determine target positioning, improve job-searching skills, methods, and techniques, effectively enhance employment competitiveness, and ultimately achieve successful employment.
Content	<p><b>Chapter 1: Employment Situation and Environment for College Students</b></p> <p><b>1.Teaching Contents</b></p> <p>(1) Analysis of employment situation for college students</p> <p>(2) Analysis of employment environment for college students: Outlook of the career</p> <p><b>Chapter 2 Employment Policies and Procedures for College Students</b></p> <p><b>1.Teaching Contents</b></p>

	<p>(1) Employment policies for college students</p> <p>(2) Types of college students' employment</p> <p>(3) Employment procedures for college students</p> <p><b>Chapter 3 Psychological Preparation for College Students' Employment</b></p> <p><b>1. Teaching Contents</b></p> <p>(1) Common Psychological Problems of College Students in the Employment Process.</p> <p>(2) Psychological Adjustment of College Students in the Employment Process.</p> <p><b>Chapter 4 Employment Abilities that College Students Should Possess</b></p> <p><b>1. Teaching Contents</b></p> <p>(1) Knowledge Literacy that College Students Should Possess</p> <p>(2) Ability Literacy that College Students Should Possess</p> <p>(3) Cultivation Paths for Improving Employment Abilities</p> <p><b>Chapter 5 Employment Information and Employment Channels</b></p> <p><b>1. Teaching Contents</b></p> <p>(1) Collection of Employment Information</p> <p>(2) Screening of Employment Information</p> <p>(3) Application of Employment Information</p> <p><b>Chapter 6 Preparation of Job Search Materials for College Students</b></p> <p><b>1. Teaching Contents</b></p> <p>(1) Basic Composition of Job Search Materials;</p> <p>(2) Make a Beautiful Resume;</p> <p>(3) Prepare Other Job Search Materials.</p> <p><b>Chapter 7 Written Tests and Interviews for College Students' Job Search</b></p> <p><b>1. Teaching Contents</b></p> <p>(1) Preparation and Precautions for Written Tests;</p> <p>(2) Assessment for Interviews;</p> <p>(3) Common Forms of Interviews;</p>
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	<p>(4) Coping Skills for Interviews.</p> <p><b>Chapter 8 Etiquette for College Students in Job Hunting</b></p> <p><b>1. Teaching Contents</b></p> <p>(1) Grooming and Dressing Etiquette;</p> <p>(2) Manners and Social Etiquette.</p> <p><b>Chapter 9 Ways of Job Contract Signing for College Students and Precautions</b></p> <p><b>1. Teaching Contents</b></p> <p>(1) Grooming and Dressing Etiquette;</p> <p>(2) Manners in Social Intercourse and Social Etiquette.</p>
Examination forms	Assessment
Study and examination requirements	The Employment Guidance course is a required course for all majors. The course assessment methods include: Mid-term Assignment and Daily Performance (30%) + Final Assignment (70%).
Reading list	<p>1. Zero Distance to the Workplace - College Student Employment Guidance, compiled by the Beijing Association for Human Resources of Chinese and Foreign Enterprises (HRA), Higher Education Press, December 2014 Edition.</p> <p>2. College Student Employment Guidance Tutorial, Editor-in-Chief: Wang Haitang, Peking University Press, February 2009 Edition.</p> <p>3. College Student Employment Guidance (21st Century Higher Education Series Planning Textbook), Editor-in-Chief: Yao Shuzhi, Northwest University Press, January 2010 Edition.</p>
Data of last amendment	December 2024

## Physical Education

Module designation	Physical Education
Semester(s) in which the module is taught	1 <sup>st</sup> , 2 <sup>nd</sup> , 3 <sup>rd</sup> , and 4 <sup>th</sup> semester
Person responsible for the module	Lecturer Ding He
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, game practice method, competition practice method
Workload (incl. contact hours, self-study hours)	Total workload = 240 hours Contact hours = 144 hours Self-study hours = 96 hours
Credit points	8.0
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	<ol style="list-style-type: none"> <li>1. To learn the basic theoretical knowledge of sports and practice methods, master the disposal methods of common sports trauma.</li> <li>2. Master the 1-2 sports basic technology, improve sports skills, enhance sports ability, develop lifelong exercise habits.</li> <li>3. Develop physical flexibility and coordination and endurance, strength, speed and other physical quality.</li> <li>4. Master and use appropriate methods to regulate self-emotion, and show brave and tenacious will in a challenging sports environment.</li> <li>5. Cultivate a good spirit of collectivism and patriotism, and establish a correct outlook on life and values.</li> </ol>
Content	In order to achieve the goal of physical education curriculum and organically combine classroom teaching with extracurricular and extracurricular sports activities, various types of physical

education courses are set up for all students. Students can choose projects according to their own conditions and interests to meet the needs of students of different levels, levels and interests. At present, it mainly offers optional sports courses, sports health care courses, sports classes, special improvement classes and sports clubs. Basically meet the needs of students to choose their own projects, choose teachers and choose time.

Course Content:

1. Sports elective courses: In order to benefit the needs of college students' personality development and multiple interests, a variety of sports elective courses are offered to all students, including: basketball, volleyball, air volleyball, football, table tennis, badminton, tennis, peek ball, Baseball and softball, cheerleading, aerobic dance, rhythmic gymnastics, yoga, taekwondo, karate, martial arts, roller skating, track and field, fat reduction and body shaping courses.

2. Physical education and health care courses: For some college students with physical abnormalities, diseases, disabilities, and frailness, physical education and health care courses focusing on rehabilitation, health care, and suitable activities are offered.

3. Special improvement class: set up improvement class by item, complete the training content and undertake the popularization and promotion of the special in the school, and be responsible for the organization, management and referee of the special competition in the school under the guidance of teachers. The teaching plan and assessment criteria for such courses shall be formulated separately.

4. Sports clubs: for some students whose physical fitness level has reached a higher standard, diversified autonomous sports courses are offered. The teaching plan and assessment criteria of the club courses shall be formulated separately.

5. Sports class: adopt the form of multi-person sports to realize the linkage between different special projects, and select the hot sports activities to equip special teachers for professional guidance 2-3 times a week.

6. The basic theory of physical education arranges different contents in each semester, uses the online platform for mixed teaching, and requires students to browse and learn within the

	<p>specified time limit.</p> <p>7. Each physical education class should ensure proper exercise intensity and arrange at least one physical fitness exercise for 15-30 minutes.</p> <p>8. Establish good communication channels between teachers and students to guide students' extracurricular physical exercise.</p> <p>9. Actively adopt various teaching methods such as network, multimedia and audio-video teaching.</p>
Examination forms	Physical measurements
Study and examination requirements	The assessment of physical education curriculum includes the establishment of sports knowledge, the enhancement of sports ability, the improvement of physical quality, the usual performance and the process evaluation of extracurricular physical exercise, etc. Sports results are based on a percentile system.
Reading list	<p>1, 'University Sports Health Theory and Practice' Shanghai Jiaotong University Press, September 2022, the first edition of the first printing.</p> <p>2. Interpretation of National Student Physical Health Standard, People's Education Press, June 2007, Editorial Board of Interpretation of National Student Physical Health Standard</p>
Data of last amendment	August 2024

### Cognitive Practice

Module designation	Cognitive Practice
Semester(s) in which the module is taught	1 <sup>st</sup> semester
Person responsible for the module	Associate Professor Li Tai
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Using lecturing as a primary teaching method, in combination with classroom exercises and discussion

Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 30 hours Self-study hours = 30 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	Professional Introduction
Requirements according to the examination regulations	Only students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> Students can understand the safety operating procedures in fitter work, master the use of personal protective equipment, prevent accidents, and ensure work safety; Familiar with fitter tools and equipment: students are able to identify and proficient in using various fitter tools and equipment, such as manual pliers, static pliers, power pliers, files, hammers, etc., to improve work efficiency; Mastering basic fitter skills: Students can proficiently master the basic operational skills required for fitters, such as filing, sawing, marking, drilling, etc., laying a solid foundation for future work</li> <li>● <b>Skills:</b> Students will deepen their understanding of the design, analysis, and control of automation systems through this course, and master the working principles and integration methods of key components such as sensors, actuators, and controllers in automation systems. In addition, the course aims to cultivate students' ability to analyze and solve practical automation problems, including practical skills such as system optimization, fault diagnosis and repair.</li> <li>● <b>Competence:</b> Cultivate students' scientific research attitude of integrating theory with practice, seeking truth from facts, and being rigorous and pragmatic degree and work style; Participate in the solution of practical problems, cultivate the ability to apply professional knowledge to solve practical problems, and cultivate innovative consciousness.</li> </ul>
Content	<p><b>Experiment /practice teaching:</b> 60 hours (30 contact hours; 30 self-study hours)</p> <p><b>Stage 1 Internship research and data retrieval</b> (15 contact hours, 15 self-study hours)</p> <ul style="list-style-type: none"> <li>● Internship research</li> </ul>

	<ul style="list-style-type: none"> <li>● Study literature</li> </ul> <p><b>Stage 2 Participate in internship and record</b> (15 contact hours, 15 self-study hours)</p> <ul style="list-style-type: none"> <li>● Participate in internships</li> <li>● record daily internship situations, and write internship reports.</li> </ul>
Study and examination requirements and forms examination	The cognitive internship course is a compulsory course in this major, and the course assessment methods include: course hours discussion (30%)+outcome assessment (70%)
Reading list	<p><b>1. Required books</b></p> <p>Liu Sheng, Zhang Lanyong. Introduction to Automation [M]. Harbin: Harbin Engineering University Press, 2021.</p> <p><b>2. Reference books</b></p> <p>[1] Zhang Yufeng Introduction to Automation [M]. Jiangsu: China University of Mining and Technology Press, 2022.</p> <p>[2] Zhou Xianzhong, Chen Chunlin. Introduction to Automation [M]. Beijing: Science Press, 2022</p>
Data of last amendment	April 2025

## Metalworking Practice

Module designation	Metalworking Practice
Semester(s) in which the module is taught	2 <sup>th</sup> semester
Person responsible for the module	Lecturer Huang Jun
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Lab works
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 30 hours Self-study hours = 30 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	Engineering Drawing
Requirements according to the examination regulations	Only students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <p><b>Knowledge:</b></p> <ol style="list-style-type: none"> <li>1. Familiarize with the operation and measurement methods of various tools and measuring instruments.</li> <li>2. Understand the role of benchwork in mechanical manufacturing and maintenance.</li> <li>3. Understand the basic knowledge of metal cutting processes.</li> <li>4. Understand the process characteristics, machining range, accuracy, and surface roughness of milling operations.</li> <li>5. Understand the characteristics and machining range of planing operations.</li> </ol> <p><b>Skills:</b></p> <ol style="list-style-type: none"> <li>1. Strengthen the cultivation of students' hands-on professional skills.</li> <li>2. Encourage students to develop the ability and habit of identifying, analyzing, and solving problems independently using acquired knowledge and skills.</li> <li>3. Foster and emphasize students' innovative thinking and creativity.</li> <li>4. Integrate teaching content to cultivate students'</li> </ol>

	<p>engineering awareness, product awareness, and quality consciousness, thereby enhancing their engineering competence.</p> <p><b>Competence:</b></p> <ol style="list-style-type: none"> <li>1. Possess proper academic aspirations and integrity, and embody scientific spirits such as seeking truth, being pragmatic, and reflecting critically.</li> <li>2. Understand the social responsibilities of engineers regarding public safety, health, welfare, and environmental protection, and consciously fulfill these responsibilities in engineering practice.</li> <li>3. Be able to communicate effectively and collaborate with members of other disciplines.</li> </ol>
Content	<p><b>Stage 1 Lathe Work</b></p> <ol style="list-style-type: none"> <li>1. Safety operation regulations for lathe work.</li> <li>2. Basic knowledge of metal cutting processes.</li> <li>3. Types of lathes, the composition, movements, transmission systems, and uses of horizontal lathes.</li> <li>4. Composition and structure of common lathe tools, as well as the main angles of lathe tools and their functions.</li> <li>5. Characteristics of clamping methods for shaft and disc parts, and the structure and uses of common accessories.</li> <li>6. Methods for turning external cylindrical surfaces, facing, drilling, and boring.</li> <li>7. Methods for grooving, cutting, turning tapered surfaces, forming surfaces, and threading.</li> </ol> <p><b>Stage 2 Bench Work</b></p> <ol style="list-style-type: none"> <li>1. Safety operation regulations for bench work.</li> <li>2. The role of bench work in mechanical manufacturing and maintenance.</li> <li>3. Methods and applications of marking, sawing, filing, drilling, tapping, and threading.</li> <li>4. Composition, movements, and uses of drilling machines, as well as methods for reaming and countersinking.</li> <li>5. Basic knowledge of mechanical component assembly.</li> </ol>
Study and examination requirements and forms examination	<p>The assessment of the Metalworking Lab course is primarily designed to evaluate students' achievement of the course objectives and their proficiency in various skills.</p> <p>The course grade is composed of three parts: attendance and safe operation (20%), assessment of practical workpieces (50%), and the Metalworking Lab report (30%).</p>
Reading list	<p><b>1. Required books</b></p> <p>Huang Liming. Metalworking Lab, National Defense Industry Press, 2013.</p> <p><b>2. Reference books</b></p>

	<p>[1] Li Zhangdong, Metalworking Lab, China Electric Power Press, 2011.</p> <p>[2] Li Li, Liu Shanchun, Metalworking Lab, China Water &amp; Power Press, 2013.</p> <p>[3] Wang Junbo, Metalworking Lab Tutorial, Science Press, 2011.</p>
Data of last amendment	April 2025

## Course Exercise of Embedded Systems

Module designation	Course Exercise of Embedded Systems
Semester(s) in which the module is taught	3 <sup>th</sup> semester
Person responsible for the module	Lecturer Huang Jun
Language	Chinese
Relation to curriculum	Specialisation
Teaching methods	Lab works
Workload (incl. contact hours, self-study hours)	Total workload = 120 hours Contact hours = 60 hours Self-study hours = 60 hours
Credit points	4.0
Required and recommended prerequisites for joining the module	Microcomputer Principle and Interface Technology, C Language Programming
Requirements according to the examination regulations	Only students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Module objectives/intended learning outcomes	<p>Learning Outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Understand GPIO port initialization, input, and output operations.</li> <li>2. Understand the memory structure of STM32.</li> <li>3. Understand the working principle of the SysTick timer.</li> <li>4. Understand the STM32 interrupt system, interrupt management, and external interrupts.</li> <li>5. Understand the structure of STM32 timers, timer interrupts, and PWM modulation.</li> <li>6. Understand the structure of STM32 serial ports, register configuration, communication with a PC, and initialization procedures.</li> </ol> </li> <li>● <b>Skills:</b> <ol style="list-style-type: none"> <li>1. Possess the ability to program and access the main resources of STM32.</li> <li>2. Possess the ability to develop and apply embedded system hardware.</li> <li>3. Possess the ability to solve practical problems through collaborative development of embedded system software and hardware.</li> </ol> </li> </ul>

	<p>● <b>Competence:</b></p> <ol style="list-style-type: none"> <li>1. Demonstrate proper academic aspirations and academic integrity.</li> <li>2. Exhibit a spirit of exploration, collaboration, and scientific inquiry.</li> </ol>
Content	<ol style="list-style-type: none"> <li>1. Running Light Design Learn the basic operations of Keil software and familiarize yourself with the steps of writing STM32 programs in C language; learn GPIO initialization and delay program writing. Write a program to implement a running light using STM32 pins.</li> <li>2. Quiz Buzzer Design Learn key recognition.</li> <li>3. External Interrupt Experiment Use button interrupts to control the state of an LED.</li> <li>4. Serial Communication Experiment Learn the use of STM32 serial ports (receiving and sending).</li> <li>5. Electronic Clock Design Design an electronic clock using the STM32 timer.</li> <li>6. OLED Display Experiment (Optional) Display your student ID and other specified information on an OLED display.</li> <li>7. AD Conversion Experiment (Optional) Learn the use of the STM32 built-in ADC controller.</li> <li>8. Temperature Measurement Experiment (Optional) Learn the use of the DS18B20 temperature sensor.</li> <li>9. Motor Control (Optional) Learn the use of STM32 microcontroller GPIO ports and timers.</li> <li>10. Electronic Perpetual Calendar Design (Optional) Comprehensive application.</li> <li>11. Smart Agriculture (Optional) Comprehensive application.</li> </ol>
Study and examination requirements and forms examination	The phased achievements of curriculum design accounted for 40%, and the curriculum design report accounted for 60%.
Reading list	<p><b>1. Required books</b></p> <p>Zhang Shuqing, Hu Yongtao, Zhang Ligu. Principles and Applications of Embedded Microcontroller STM32 [M]. Beijing: Mechanical Industry Press, March 2020.</p> <p><b>2. Reference books</b></p> <p>[1] Guo Zhiyong. Embedded Technology and Application Development Project Tutorial (STM32 Edition) [M]. Beijing: People's Posts and Telecommunications Press, May 2019.</p>

	<p>[2] Ou Qibiao. STM32 Programming Case Tutorial [M]. Beijing: Publishing House of Electronics Industry, June 2019.</p> <p>[3] Shen Hongwei. STM32 Microcontroller Application and Full Case Practice [M]. Beijing: Publishing House of Electronics Industry, June 2017.</p>
Data of last amendment	April 2025

## Comprehensive Experiments of Single-Chip Microcomputers Principles and Applications

Module designation	Comprehensive Experiments of Single-Chip Microcomputers Principles and Applications
Semester(s) in which the module is taught	3 <sup>rd</sup> semester
Person responsible for the module	Professor Song Zhiqiang
Language	Chinese
Relation to curriculum	Specialisation
Teaching methods	Lab works
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 30 hours Self-study hours = 30 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	C Language Programming
Requirements according to the examination regulations	Only students with class attendance rate over 2/3 and practical tasks over 2/3 are allowed to take the exam.
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Basic knowledge of computer, hardware structure of 8051 microcontroller.</li> <li>2. Addressing mode, 111 instructions of 8051 microcontroller, the assembly language programming.</li> <li>3. The interrupts of 8051 microcontroller, the timer system and the serial communication system of 8051 microcontroller.</li> </ol> </li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>1. Be able to understand the computer composition, memory, input and output interfaces, common number system and coding of microprocessor.</li> <li>2. Be able to understand 8051 chip internal structure, 8051 memory configuration, and the clock circuit and 8051 CPU timing, reset circuit.</li> <li>3. Be able to master 8051 instruction system, and assembly language programming.</li> <li>4. Be able to master 8051 Interrupt and timer systems, and 8051 Serial port and serial communication technology.</li> </ol> </li> </ul>

	<ul style="list-style-type: none"> <li>● <b>Competence:</b></li> </ul> <ol style="list-style-type: none"> <li>1. The hardware design of the control system makes full use of the 8051 resource structure.</li> <li>2. 8051 interrupt, timer system and 8051 serial communication system are used in related design.</li> <li>3. Improve the ability to solve engineering problems by using single-chip microcomputer, enhance students' understanding of single-chip microcomputer, and help students improve the design ability of single-chip microcomputer control system.</li> </ol>
Content	<p><b>Experiment /practice teaching:</b> 60 hours (30 contact hours; 30 self-study hours)</p> <p><b>Stage 1 Clarify Design-tasks</b> (5 contact hours; 5 self-study hours)</p> <ul style="list-style-type: none"> <li>● Clarify design tasks.</li> <li>● Analyze design characteristics.</li> <li>● Study literature.</li> <li>● Select structure scheme and formulate overall scheme.</li> </ul> <p><b>Stage 2 Determine Scheme and Key Parameters</b> (10 contact hours; 10 self-study hours)</p> <ul style="list-style-type: none"> <li>● Develop the overall scheme and process scheme.</li> <li>● Select components, design the hardware schematic diagram, and check the schematic diagram.</li> </ul> <p><b>Stage 3 Software Design</b> (10 contact hours; 10 self-study hours)</p> <ul style="list-style-type: none"> <li>● Manually draw program flowcharts.</li> <li>● Program design and code implementation.</li> <li>● Program testing.</li> </ul> <p><b>Stage 4 Improve the Results Report</b> (3 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Improve the hardware schematic diagram, program flowcharts, program design, and code implementation.</li> <li>● Improve specification of the course design.</li> </ul> <p><b>Stage 5 Evaluate and Accept</b> (2 contact hours; 2 self-study hours)</p> <ul style="list-style-type: none"> <li>● Evaluating achievement.</li> <li>● Accepting data.</li> </ul>
Study and examination requirements and forms examination	<p>After-class assignment shall be done independently by students after each class.</p> <p>Attendance accounts for 10%, after-class assignment accounts for 30%, the quality of experiments accounts for 30%, and report quality of reports for 30%.</p>
Reading list	<p><b>1.Required books</b></p> <p>[1] Song Zhiqiang, Chen Yifei. Principles and Applications of Single-Chip Microcomputers -- Task-Driven Tutorial Based on</p>

	<p>C51 + Proteus [M]. Beijing: Machinery Industry Press, 2022.</p> <p>[2] Peng Min, Zou Jing, Wang Ruiying. Guidance for the Course Design of Single-Chip Microcomputer (2nd Edition) [M]. Wuhan: Huazhong University of Science and Technology Press, 2023.</p> <p><b>2.Reference books</b></p> <p>[1] Li Chaoqing. Principle and Interface Technology of Single Chip Microcomputer [M]. Beijing University of Aeronautics and Astronautics Press, 2018.</p> <p>[2] Zhang Zhenrong. MCS-51 MCU Principle and Practical Technology [M]. Beijing: Posts and Telecommunications Press, 2019.</p>
Data of last amendment	April 2025

## Subject Experiments of Movement Control

Module designation	Subject Experiments of Movement Control
Semester(s) in which the module is taught	4 <sup>th</sup> semester
Person responsible for the module	Lecturer Yuan Jie
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Experiment teaching
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 30 hours Self-study hours = 30 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	Motor Drive and Movement Control System
Requirements according to the examination regulations	Only students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Understand the concept of digital twins and their current application areas. Grasp the concept of engineering solutions and the general process and methods for designing and implementing model-based system engineering solutions.</li> <li>2. Comprehend the concept of simulation solutions and the general process and methods for designing and implementing model-based 3D design and simulation solutions. Understand the concept of intelligent manufacturing engineering solutions and the general process and methods for designing and implementing model-based intelligent manufacturing system engineering solutions.</li> </ol> </li> <li>● <b>Skills:</b> <ol style="list-style-type: none"> <li>1. Be able to design and implement model-based system engineering solutions, 3D design and simulation solutions, and intelligent manufacturing system engineering solutions.</li> <li>2. Analyze the fault phenomena of digital twin application cases, propose solutions, and troubleshoot. Based on the system's operation, put forward reasonable modification plans, organize technical modifications, draw system</li> </ol> </li> </ul>

	<p>flowcharts, propose process requirements, and compile technical documents.</p> <ul style="list-style-type: none"> <li>● <b>Competence:</b></li> </ul> <ol style="list-style-type: none"> <li>1. Develop good communication skills and team spirit. Enhance the ability to analyze and solve problems.</li> <li>2. Cultivate the spirit of innovation and dedication, as well as the ability of self-management and self-discipline. Strengthen the awareness of environmental protection, quality, and safety.</li> </ol>
Content	<p><b>Experiment /practice teaching:</b> (30 contact hours; 30 self-study hours)</p> <p><b>Stage 1 Understand the Concept and Application of Digital Twins</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understand the concept of digital twins, including physical twins and digital twins.</li> <li>● Learn the characteristics and life cycle of digital twins.</li> <li>● Explore the application areas of digital twins and their development.</li> </ul> <p><b>Stage 2 Study the Related Technologies and Architecture of Digital Twins</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Study the technical basis of digital twins and the emerging information technologies that drive digital twins.</li> <li>● Learn the general architecture of digital twin systems.</li> <li>● Conduct experiments to gain a deeper understanding of the related technologies and architecture.</li> </ul> <p><b>Stage 3 Explore the Digital Twin Ecosystem for Intelligent Manufacturing</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Learn about intelligent manufacturing and smart factories.</li> <li>● Understand the digital twin-based intelligent manufacturing and the manufacturing digital twin ecosystem.</li> <li>● Conduct experiments to master the general process and methods for designing and implementing model-based 3D design and simulation solutions.</li> </ul> <p><b>Stage 4 Investigate the Digital Twin Factory</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Study the planning and control of digital factories.</li> <li>● Learn about the models and data in factory digital twin systems, as well as their characteristics and structure.</li> <li>● Conduct experiments to master the general process and</li> </ul>

	<p>methods for designing and implementing model-based intelligent manufacturing solutions.</p> <p><b>Stage 5 Study the Intelligent Applications of Digital Twins</b> (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Learn about the knowledge and expression, model and data-driven optimization, machine learning based on digital twins, assembly optimization based on digital twins, and equipment maintenance based on digital twins.</li> <li>● Conduct experiments to master the general process and methods for designing and implementing model-based intelligent application solutions.</li> </ul>
Study and examination requirements and forms examination	<p>After-class assignment shall be done independently by students after each class.</p> <p>In-class performance and attendance accounts for 20%. Specification quality accounts for 30%. Drawing quality accounts for 40%. Report quality accounts for 10%.</p>
Reading list	<p><b>1. Required books</b></p> <p>[1] Lu Jianfeng. Digital Twin Technology and Engineering Practice--Model+Data-driven Intelligent Systems [M]. Beijing: Mechanical Industry Press, 2022.</p> <p><b>2. Reference books</b></p> <p>[1] Liang Naiming. Digital Twin Practice: Model-based Digital Enterprise [M]. Beijing: Mechanical Industry Press, 2019.</p> <p>[2] Chen Gen. Digital Twin [M]. Beijing: Electronic Industry Press, 2020.</p>
Data of last amendment	April 2025

## Experiments of Automatic Control Theory

Module designation	Experiments of Automatic Control Theory
Semester(s) in which the module is taught	4 <sup>th</sup> semester
Person responsible for the module	Lecturer Ji Nan
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Lab works
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 30 hours Self-study hours = 30 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	Advanced Mathematics, Complex Functions and Integral Trans-formations, Fundamentals of Circuit Analysis, Fundamentals of Analog Electronics, Fundamentals of Digital Electronics
Requirements according to the examination regulations	Only students with a class attendance rate over $2/3$ and assignment completion rate over $2/3$ are allowed to take the exam.
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Master the mathematical modeling methods for automatic control systems, including time-domain and frequency-domain methods, and understand the applicable scenarios and advantages and disadvantages of different modeling methods.</li> <li>2. Understand the performance indicators of control systems, such as stability, speed, accuracy, etc., and be able to analyze and verify these indicators through experimental data.</li> </ol> </li> <li>● <b>Skills:</b> <ol style="list-style-type: none"> <li>1. Proficient in using simulation tools such as Matlab/Simulink to model, simulate, and analyze control systems, and able to design and debug control systems according to experimental requirements.</li> <li>2. Master the operation skills of experimental equipment, be able to correctly build experimental platforms, collect, process and analyze data, and ensure the accuracy and repeatability of experimental results.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Develop the ability to solve practical control problems, be</li> </ol> </li> </ul>

	<p>able to design reasonable control schemes based on specific application scenarios and verify their effectiveness through experiments.</p> <p>2. Improve teamwork and communication skills, be able to effectively collaborate with team members during the experimental process, have clear division of labour, jointly complete experimental tasks, and clearly express the experimental process and results.</p>
Content	<p><b>Experiment /practice teaching:</b> 60 hours (30 contact hours; 30 self-study hours)</p> <p><b>Stage 1 Open-loop Control System Mathematical Model Research Experiment</b> (3 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Use time-domain testing to test the mathematical model of an open-loop system.</li> </ul> <p><b>Stage 2 Control System Time-domain Characteristics Research Experiment</b> (3 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Time-domain performance analysis of a first-order control system.</li> <li>● Time-domain performance analysis of a second-order control system.</li> </ul> <p><b>Stage 3 Control System Root Locus Analysis</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Given the transfer function of an open-loop speed control system, determine the system's mathematical model parameters by testing its frequency characteristics.</li> <li>● Compare experimental test values with experimental verification values, analyze the reasons for differences, and the advantages and disadvantages of the two methods.</li> </ul> <p><b>Stage 4 Disk Drive Read System Simulation (I)</b> (3 contact hours; 3 self-study hours)</p> <ul style="list-style-type: none"> <li>● Disk drive read system modeling and control system MATLAB programming simulation and Simulink design and simulation.</li> </ul> <p><b>Stage 5 Open-loop Control System Frequency Characteristic Testing Experiment</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Given the transfer function of an open-loop speed control system, determine the system's mathematical model parameters by testing its frequency characteristics.</li> <li>● Compare experimental test values with experimental</li> </ul>

	<p>verification values, analyze the reasons for differences, and the advantages and disadvantages of the two methods.</p> <p><b>Stage 6 Disk Drive Read System Simulation (II)</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Disk drive read system modeling and control system MATLAB programming simulation and Simulink design and simulation.</li> </ul> <p><b>Stage 7 Dual-tank Liquid Level System Modeling and Control System Design and Simulation</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Disk drive read system modeling and control system MATLAB programming simulation and Simulink design and simulation.</li> </ul> <p><b>Stage 8 Control System Correction Design Experiment</b> (5 contact hours; 5 self-study hours)</p> <ul style="list-style-type: none"> <li>● Speed control system correction design.</li> <li>● Position control system correction design.</li> <li>● After parameter setting, obtain the system's closed-loop Bode plot and Nyquist plot.</li> </ul>
Study and examination requirements and forms examination	<p>After-class assignment shall be done independently by students after each class.</p> <p>In-class performance and attendance account for 40%. The quality of experimental reports, including experimental principles, experimental results, and result analysis accounts for 60%.</p>
Reading list	<p><b>1. Required books</b> [1] Hu Shousong. Principles of Automatic Control (8th Edition) [M]. Beijing: Science Press, 2023.</p> <p><b>2. Reference books</b> [1] Pan Feng, Xu Yingqin. Principles of Automatic Control (2nd Edition) [M]. Beijing: Mechanical Industry Press, 2019. [2] Sun Bingda. Automatic Control Theory (5th Edition) [M]. Bei-jing: Mechanical Industry Press, 2022.</p>
Data of last amendment	April 2025

## Comprehensive Practice of Innovation and Entrepreneurship

Module designation	Comprehensive Practice of Innovation and Entrepreneurship
Semester(s) in which the module is taught	4 <sup>th</sup> semester
Person responsible for the module	Lecturer Li Jiayi
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Lab works
Workload (incl. contact hours, self-study hours)	Total workload = 120 hours Contact hours = 60 hours Self-study hours = 60 hours
Credit points	4.0
Required and recommended prerequisites for joining the module	Complete all courses for Semester 1-3
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> Understand the working condition of the machine, select the materials of the parts reasonably, correctly calculate the working capacity of the parts, and determine the size of the parts.</li> <li>● <b>Skill:</b> Starting from the functional requirements of the machine, it is possible to develop a design plan and select transmission components and mechanisms reasonably.</li> <li>● <b>Competence:</b> Capable of solve complex engineering problems, apply course knowledge, communicate and express themselves, as well as have the awareness of self-directed learning and lifelong learning.</li> </ul>
Content	<p>Students participating in practical training should conscientiously complete practical training tasks in accordance with the internship outline and schedule under the guidance of their supervising teachers. The main content and schedule of the course are as follows:</p> <p><b>View Manuals and Materials to Clarify the Sequence of Institutional Actions.</b></p> <p>(12 contact hours; 12 self-study hours)</p>

	<p><b>Hand Drawn Part Sketches.</b> (12 contact hours; 12 self-study hours)</p> <p><b>Create assembly and exploded views.</b> (12 contact hours; 12 self-study hours)</p> <p><b>Convert Formal Part Drawings.</b> (12 contact hours; 12 self-study hours)</p> <p><b>Institutional and Structural Analysis.</b> (12 contact hours; 12 self-study hours)</p>
Examination forms	/
Study and examination requirements	Internship reports and drawings must be completed on time. The qualities of drawings accounts for 40%, and internship reports accounts for 60%.
Reading list	<p>1. Required books</p> <p>[1] Bao Zhongfu. SolidWorks Digital Simulation Project Tutorial [M]. Beijing: Mechanical Industry Press, 2020.</p> <p>2. Reference books</p> <p>[1] Zhang Zhongjiang. SolidWorks 2017 Mechanical Design Complete Example Tutorial [M]. Beijing: Mechanical Industry Press, 2020.</p>
Data of last amendment	April 2025

## Electronic and Electrical Practice

Module designation	Electronic and Electrical Practice
Semester(s) in which the module is taught	4 <sup>th</sup> semester
Person responsible for the module	Associate Professor Chen Yifei
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Project
Workload (incl. contact hours, self-study hours)	Total workload = 120 hours Contact hours = 60 hours Self-study hours = 60 hours
Credit points	4.0
Required and recommended prerequisites for joining the module	Foundational of Digital Electronics, Foundational of Analog Electronics, Project Lab: Single-Chip Microcomputers Principles and Applications
Requirements according to the examination regulations	Only students with a class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. The construction of intelligent vehicles</li> <li>2. The methods of electronic circuit design</li> <li>3. The hardware structure and functions of micro-controllers</li> <li>4. The register operations for basic functions as well as the methods for programming and debugging micro-controllers.</li> </ol> </li> <li>● <b>Skills:</b> <ol style="list-style-type: none"> <li>1. Be able to design signal acquisition and processing circuits, as well as line-following detection and control circuits for intelligent vehicle control systems</li> <li>2. Be able to debug the hardware and software of intelligent vehicle steering and speed control systems, collect data, and analyze results</li> <li>3. Be able to communicate and collaborate with team members</li> <li>4. Be able to independently or collaboratively undertake the design, fabrication, and debugging of intelligent vehicles within a project team, and complete course reports.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. The professional design capabilities and teamwork skills</li> </ol> </li> </ul>

	<p>required to solve complex engineering problems such as intelligent vehicle control using micro-controllers and their peripheral circuits</p> <p>2. A correct professional orientation, a pragmatic professional ethos, and a scientific spirit of inquisitiveness and reflection.</p>
Content	<p><b>Experiment /practice teaching:</b> 120 hours (60 contact hours; 60 self-study hours)</p> <p><b>Stage 1 Chassis Installation and Circuit Soldering of the Vehicle</b> (8 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Introduce the basic principles of intelligent vehicle design and distribution of materials</li> <li>● Assembly of the vehicle (chassis, motor, motor module, main-board, battery case, power module): assembly of various modules and circuit soldering.</li> </ul> <p><b>Stage 2 L298N Driver DC Motor PWM Speed Control Program Design and Testing</b> (16 contact hours; 16 self-study hours)</p> <ul style="list-style-type: none"> <li>● Connect motor driver circuits on both sides</li> <li>● Understand the logical relationship between motor rotation direction and vehicle movement direction</li> <li>● Program design for vehicle movement direction control</li> <li>● Understand the working principle of PWM and design of PWM speed control program</li> <li>● Implementation of forward, left turn, right turn, and reverse movements under vehicle speed regulation</li> </ul> <p><b>Stage 3 Obstacle Avoidance Control for Intelligent Vehicles</b> (8 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understand the working principle of the obstacle avoidance module</li> <li>● Design the program of the obstacle avoidance</li> <li>● Adjust the sensitivity of the obstacle avoidance module</li> <li>● Test the vehicle's obstacle avoidance function</li> </ul> <p><b>Stage 4 Design and Test the Infrared Line-Following Detection Circuit</b> (8 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understand the working principle of the line-following module</li> <li>● Design the line-following program</li> <li>● Adjust the sensitivity of the line-following module</li> <li>● Debug the vehicle to complete travel on track 1</li> </ul> <p><b>Stage 5 Schematic Circuits and PCB Design for Intelligent Vehicle</b> (8 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Draw the schematic diagrams for the main circuits of the</li> </ul>

	<p>vehicle</p> <ul style="list-style-type: none"> <li>● Design the PCB for the main circuits of the vehicle</li> </ul> <p><b>Stage 6 Assembly and Testing of the Intelligent Vehicle</b> (8 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Integrate the entire vehicle program and debug the functional</li> <li>● Finish the speed competition on track 1</li> <li>● Test the vehicle to complete line-following on track 2 while avoiding two obstacles</li> </ul> <p><b>Stage 6 Evaluate and Accept</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Evaluating achievement.</li> <li>● Course defense.</li> </ul>
Study and examination requirements and forms examination	<p>Laboratory reports (3 times) account for 30%. Project test scores account for 21%. Course defense scores account for 21%. Design report accounts for 28%.</p> <p>Laboratory reports shall be done independently by students after stage 2~stage4. The course project and design report are to be completed by groups, with each group typically consisting of two members. The course defense is conducted and graded on an individual basis.</p>
Reading list	<p><b>1. Required books</b></p> <p>Song Zhiqiang, Chen Yifei, et al. Microcontroller Principles and Applications: A Task-Driven Tutorial Based on C51 + Proteus [M]. Beijing: China Machine Press, 2022.</p> <p><b>2. Reference books</b></p> <p>[1] Cheng Yuhua. Series of Guidance Books for the National Undergraduate Intelligent Vehicle Competition — System Design [M]. Beijing: Higher Education Press, 2019.</p> <p>[2] Wang Panbao, Fan Yuxiao, et al. Making Intelligent Vehicles. Beijing [M]: Tsinghua University Press, 2018.</p>
Data of last amendment	April 2025

## The Training of Engineering Software

Module designation	The Training of Engineering Software
Semester(s) in which the module is taught	4 <sup>th</sup> semester
Person responsible for the module	Lecturer Xue Sun, Hongyu Ma
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Using experimental operation as a primary teaching method, in combination with classroom teaching and discussion
Workload (incl. contact hours, self-study hours)	Total workload =120 hours Contact hours = 60 hours Self-study hours = 60 hours
Credit points	4.0
Required and recommended prerequisites for joining the module	Circuit Theory, Linear Algebra, C Language Programming
Requirements according to the examination regulations	Only students with class attendance rate over 2/3 and assignment completion rate over 2/3 are allowed to take the exam.
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1.Understand the basic concepts and programming methods of MATLAB, including numerical computing, symbolic computation, and graphical processing.</li> <li>2.Master the use of Altium Designer for circuit schematic design, PCB layout, and component selection.</li> </ol> </li> <li>● <b>Skills:</b> <ol style="list-style-type: none"> <li>1.Ability to use MATLAB for data analysis, numerical simulation, and system modeling.</li> <li>2.Proficient in using Altium Designer to design and simulate electronic circuits.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1.Be able to apply MATLAB and Altium Designer to solve practical engineering problems.</li> <li>2.Develop the ability to design and implement complex electronic circuits using EDA tools.</li> </ol> </li> </ul>
Content	<p><b>Experiment /practice teaching:</b> 120 hours (60 contact hours; 60 self-study hours)</p> <p><b>Chapter 1: MATLAB Introduction</b></p>

	<p>- Topics include: (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of MATLAB, installation guide, directory structure, and essential commands.</li> <li>● Introduction to MATLAB's integrated development environment (IDE).</li> </ul> <p><b>Chapter 2: MATLAB Basics</b></p> <p>- Topics include: (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Understanding data types, variables, and memory management.</li> <li>● Basic matrix operations and string processing functions.</li> </ul> <p><b>Chapter 3: MATLAB Mathematical Operations</b></p> <p>- Topics include: (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Matrix algebra, solving linear equations, and performing eigenvalue computations.</li> <li>● Trigonometric, exponential, and logarithmic functions.</li> </ul> <p><b>Chapter 4: MATLAB Programming</b></p> <p>- Topics include: (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Writing M-files, defining functions, implementing loops and conditional statements.</li> <li>● Debugging and optimizing MATLAB scripts.</li> </ul> <p><b>Chapter 5: MATLAB Plotting</b></p> <p>- Topics include: (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Creating 2D and 3D plots for data visualization.</li> <li>● Graph customization, annotation, and coordinate system adjustments.</li> </ul> <p><b>Chapter 6: Numerical Computing in MATLAB</b></p> <p>- Topics include: (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Polynomial fitting, interpolation, regression analysis, and numerical differentiation.</li> <li>● Data analysis and visualization techniques.</li> </ul> <p><b>Chapter 7: Altium Designer Introduction</b></p> <p>- Topics include: (6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of Altium Designer, installation, and software interface navigation.</li> </ul>
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	<p><b>Chapter 8: Schematic Design in Altium Designer</b></p> <p>- Topics include:</p> <p>(6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Creating schematic files, using component libraries, and electrical wiring techniques.</li> <li>● Best practices for circuit design and schematic verification.</li> </ul> <p><b>Chapter 9: Component Design in Altium Designer</b></p> <p>- Topics include:</p> <p>(6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● Designing schematic symbols, footprints, and custom components.</li> <li>● Understanding component parameters and simulation models.</li> </ul> <p><b>Chapter 10: PCB Design in Altium Designer</b></p> <p>- Topics include:</p> <p>(6 contact hours; 6 self-study hours)</p> <ul style="list-style-type: none"> <li>● PCB layout techniques, signal integrity considerations, and design rule verification.</li> <li>● Manual and auto-routing methods for circuit board design.</li> </ul>
Study and examination requirements and forms examination	<p>After-class assignment shall be done independently by students after each class.</p> <p>In-class performance and attendance accounts for 10%. Assignments for 30%. Report quality and final project accounts for 60%.</p>
Reading list	<p><b>1. Reference books</b></p> <p>[1] Li Xiaodong. MATLAB: From Introduction to Practice, Tsinghua University Press, 2019.</p> <p>[2] Zhang Ping. Fundamentals and Applications of MATLAB (3rd Edition), Beihang University Press, 2018.</p> <p>[3] Wen Zheng. Scientific Computing with MATLAB, Tsinghua University Press, 2017.</p> <p>[4] Yan Congcong, Yang Yulong. Altium Designer 16: Basic Tutorial, People's Posts &amp; Telecommunications Press, 2016.</p> <p>[5] CAD/CAM/CAE Technology Alliance. Altium Designer 18: Circuit Design and Simulation from Beginner to Expert, Tsinghua University Press, 2018.</p>
Data of last amendment	April 2025

## Course Exercise of PLC Application

Module designation	Course Exercise of PLC Application
Semester(s) in which the module is taught	4 <sup>th</sup> semester
Person responsible for the module	Lecturer Sun Fengyong
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Lab works
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 30 hours Self-study hours = 30 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	Principle and application of PLC
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> Master the driving method and basic driving principle of the controlled object, and have the ability to complete basic program design with corresponding development software.</li> <li>● <b>Skills:</b> <ol style="list-style-type: none"> <li>1. Master the driving method and basic driving principle of the controlled object, and have the ability to complete basic program design with corresponding development software.</li> <li>2. Master the driving method and basic driving principle of the controlled object, and have the ability to complete basic program design with corresponding development software.</li> </ol> </li> <li>● <b>Competence:</b> Understand and master the joint operation principle of the upper and lower machines; Master the operation and parameter setting methods of the control system, and understand the configuration and comprehensive design process of a certain control system; Will write the design report correctly.</li> </ul>
Content	<p><b>Experiment /practice teaching:</b> 60 hours (30 contact hours; 30 self-study hours)</p> <p><b>Stage 1 Topic Selection and Preliminary Design</b> (6 contact hours; 6 self-study hours)</p> <p>Students majoring in automation should choose a reasonable</p>

	<p>topic according to the existing experimental equipment. According to the requirements of the training program, they should focus on the topic of the motor drive direction, such as the driver design of the controlled objects such as DC motor, servo motor or AC motor.</p> <p><b>Stage 2 Lower Machine Design</b> (8 contact hours; 8 self-study hours)</p> <p>According to the selected controlled object and the preliminary design program, the PLC driver is designed in detail, including the driving form of the controlled object, control law and control strategy design, program design and debugging operation.</p> <p><b>Stage 3 Upper Computer Design</b> (8 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Manually draw process figure.</li> <li>● Manually draw processing schematic figure.</li> <li>● Manually draw machine tool contact size figure.</li> <li>● Draw productivity calculation card.</li> </ul> <p><b>Stage 4 Comprehensive Debugging of Upper and Lower Computer, Writing Design</b> (8 contact hours; 8 self-study hours)</p> <p>The lower computer designed for the controlled object is improved and updated to realize communication with the upper computer, and comprehensive debugging is carried out to optimize the design scheme and control parameters of the control system.</p>
Study and examination requirements and forms examination	<p>After-class assignment shall be done independently by students after each class.</p> <p>Design stage results (20%) + results assessment (80%, including: work test (30%) + defense (20%) + course report (30%)).</p>
Reading list	<p><b>Reference books</b></p> <p>[1] Zhou Wenjun. Siemens S7-1200/1500 PLC project-based tutorial - Programming based on SCL and LAD [M], Beijing: Publishing House of Electronics Industry, 2023.</p> <p>[2] Liao Changchu. S7-1200 PLC Programming and Application (4th edition)[M], Beijing: China Machine Press, 2021.</p> <p>[3] Wu Fanhong. Siemens S7-1200 PLC Application Technology Project Course (2nd edition)[M], Beijing: Publishing House of Electronics Industry, 2021.</p> <p>[4] Li Fangyuan. S7-1200PLC Application Technology [M], Beijing: Publishing House of Electronics Industry, 2023.</p>
Data of last amendment	April 2025

## Monographic Experiments of Industrial Robot

Module designation	Monographic Experiments of Industrial Robot
Semester(s) in which the module is taught	6 <sup>th</sup> semester
Person responsible for the module	Lecture Xi Wanqiang
Language	Chinese
Relation to curriculum	Specialisation
Teaching methods	On-site teaching centered around physical equipment, supplemented by software simulation, with student activities as the main focus.
Workload (incl. contact hours, self-study hours)	Total workload = 60 hours Contact hours = 30 hours Self-study hours = 30 hours
Credit points	2.0
Required and recommended prerequisites for joining the module	Robotics Technology Fundamentals
Requirements according to the examination regulations	Only students with a class attendance rate over 80% and assignment completion rate over 80% are allowed to take the exam.
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Understand the structure, working principles, and functional characteristics of FANUC robots.</li> <li>2. Master offline programming methods and simulation techniques using Roboguide software.</li> </ol> </li> <li>● <b>Skills:</b> <ol style="list-style-type: none"> <li>1. Independently design teach pendant programming and manual operations for robots based on task requirements.</li> <li>2. Configure and simulate robot workstations using Roboguide.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Demonstrate problem-solving abilities in designing automated production lines.</li> <li>2. Produce clear technical reports and documentation.</li> </ol> </li> </ul>
Content	<p><b>Experiment /practice teaching: 60 hours (30 contact hours; 30 self-study hours)</b></p> <p><b>Stage 1 Industrial Robot Platform Familiarization</b> (4 contact hours; 4 self-study hours)</p>

	<ul style="list-style-type: none"> <li>● Study the modules and safety protocols of the industrial robot platform.</li> </ul> <p><b>Stage 2 Teach Pendant Operation</b> (8 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Practice robot jogging in different coordinate systems.</li> </ul> <p><b>Stage 3 Robot Programming Design</b> (10 contact hours; 10 self-study hours)</p> <ul style="list-style-type: none"> <li>● Program linear and circular trajectories via the teach pendant.</li> </ul> <p><b>Stage 4 Robot Application Training</b> (8 contact hours; 8 self-study hours)</p> <ul style="list-style-type: none"> <li>● Design and execute material handling tasks using robots.</li> </ul>
Study and examination requirements and forms examination	<p>Regular Grades (30%): Robot jogging (10%), Trajectory simulation (10%), Handling task design (10%).</p> <p>Summative Assessment (70%):</p> <p>Operational Exam (35%): Demonstrate error-free robot programming for trajectories or handling tasks.</p> <p>Design Report (35%): Submit a detailed report with schematics, simulations, and analysis of an automated production line.</p>
Reading list	<p><b>1. Required books</b></p> <p>Chen Jiangnan. Industrial Robot Offline Programming and Simulation (ROBOGUIDE) [M]. Beijing: People's Posts and Telecommunications Press, 2018.</p> <p><b>2. Reference books</b></p> <p>Han Yajun. Industrial Robot System Programming [M]. Beijing: People's Posts and Telecommunications Press, 2021.</p>
Data of last amendment	April 2024

## Comprehensive Exercise of Control Systems

Module designation	Comprehensive Exercise of Control Systems
Semester(s) in which the module is taught	7 <sup>th</sup> semester
Person responsible for the module	Lecturer Lu Zhuheng
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Lab works
Workload (incl. contact hours, self-study hours)	Total workload = 120 hours Contact hours = 60 hours Self-study hours = 60 hours
Credit points	4.0
Required and recommended prerequisites for joining the module	Automatic Control Theory, Modern Control Theory, Motor Drive and Movement Control System
Requirements according to the examination regulations	Only students with a class attendance rate of over 2/3 are allowed to participate in the defense.
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> <ol style="list-style-type: none"> <li>1. Master the theory and methods of automatic control system calibration.</li> <li>2. Master the analysis and design of control systems, the program aims to master the application of established methods, improve existing approaches, and explore new methodologies.</li> </ol> </li> <li>● <b>Skills:</b> <ol style="list-style-type: none"> <li>1. Master the professional knowledge and skills in integrated control system design.</li> <li>2. Master the self-learning ability, collect relevant literature on the basis of teaching content.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>1. Master scientific engineering thinking methods and possess a practical and innovative mindset, engineering</li> </ol> </li> </ul>

	<p>awareness, and cost-effectiveness consciousness.</p> <p>2. Master problem-solving abilities and critical thinking in the context of control engineering.</p>
Content	<p><b>Experiment /practice teaching:</b> 120 hours (60 contact hours; 60 self-study hours)</p> <p><b>Stage 1 Introduction to Control Systems Laboratory</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Overview of control systems and laboratory objectives.</li> <li>● Safety guidelines and lab equipment introduction.</li> <li>● Basic laboratory procedures and documentation.</li> </ul> <p><b>Stage 2 Internal Technical Requirements</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Task and indicator analysis.</li> <li>● Data retrieval and learning, project design and argumentation.</li> </ul> <p><b>Stage 3 External Non-technical Requirements</b> (4 contact hours; 4 self-study hours)</p> <ul style="list-style-type: none"> <li>● Professional norms and social competency requirements</li> <li>● Design discipline and assessment requirements</li> </ul> <p><b>Stage 4 Simulation Tools</b> (16 contact hours; 16 self-study hours)</p> <ul style="list-style-type: none"> <li>● Analysis and application of Simulink tools and calibration functions.</li> </ul> <p><b>Stage 5 Course Design</b> (32 contact hours; 32 self-study hours)</p> <ul style="list-style-type: none"> <li>● Develop project implementation.</li> <li>● Complete the prescribed tasks and requirements.</li> </ul>
Study and examination requirements and forms examination	<p>In-class performance and attendance accounts for 20%. Course report accounts for 30%. Experimental quality accounts for 30%. Defense accounts for 20%.</p>
Reading list	<p><b>1. Reference books</b></p> <p>[1] Yan Maode. Modern control theory [M]. Beijing: China Machine Press, 2016.</p> <p>[2] Mu Yanhua. Process Control System [M]. Beijing: Tsinghua University Press, 2018.</p>
Data of last amendment	<p>April 2025</p>

## Graduation Practice

Module designation	Graduation Practice
Semester(s) in which the module is taught	7 <sup>th</sup> semester
Person responsible for the module	Associate Professor Fan Shibo
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Project
Workload (incl. contact hours, self-study hours)	Total workload = 240 hours Contact hours =120 hours Self-study hours = 120 hours
Credit points	4.0
Required and recommended prerequisites for joining the module	Basic engineering courses, basic specialized courses, specialized courses
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> Through the internship, we can understand the operation and management mechanism of the internship organization, and understand the technical standard system, intellectual property rights, industrial policies and laws and regulations in the field of the enterprise.</li> <li>● <b>Skill:</b> 1. Familiarize yourself with the practical engineering activities carried out by the internship unit through hands-on practice, understand the relevant background knowledge, and be able to recognize that different societies and cultures can have an impact on engineering activities. 2. Ability to present ideas in a variety of formats and express themselves with basic accuracy on specialized engineering issues in robotics during an internship.</li> <li>● <b>Competence:</b> Understand that communication is differentiated through preparation for internship defense as well as defense and be able to respond correctly in an appropriate manner.</li> </ul>
Content	The assessment of this course adopts graduation internship summary, graduation internship guidance appraisal, graduation internship unit appraisal, graduation internship defense, etc., and the resulting assessment data is the

	<p>evaluation basis.</p> <ol style="list-style-type: none"> <li>1. Through the internship, understand the operation and management mechanism of the internship unit, and understand the technical standard system, intellectual property rights, industrial policies and laws and regulations involved in the enterprise's field. (18 contact hours; 18 self-study hours)</li> <li>2. Familiarize yourself with the practical engineering activities implemented in the internship unit through hands-on practice, understand the relevant background knowledge, and be able to recognize that different societies and cultures can have an impact on engineering activities. (64 contact hours; 64 self-study hours)</li> <li>3. To be able to present ideas in a variety of forms and express oneself with basic accuracy on specialized engineering problems in automation during the course of an internship. (24contact hours; 24 self-study hours)</li> <li>4. Understand that communication is differentiated and be able to respond appropriately in the right way by preparing for the internship defense as well as the defense. (14 contact hours; 14 self-study hours)</li> </ol>
Examination forms	/
Study and examination requirements	<p>After-class assignment shall be done independently by students after each class.</p> <p>No late arrivals, no early departures, and no unauthorized absences.</p> <p>Internship summary, graduation internship supervision appraisal booklet, internship defense grade record for 24%, Summary of internship, appraisal of internship organization, record of internship defense results for 28%, Internship unit appraisal, internship defense grade record for 27%, Graduation internship supervision appraisal, internship defense grade record for 21%.</p>
Reading list	<p>[1] Li Jiang, Yang Qiuping. Industrial automation comprehensive application practical training (basic) [M]. Xi'an: Xi'an University of Electronic Science Press,2015.</p> <p>[2] Liu J, Zhu H, Chang JR. Comprehensive practice of mechanical design [M]. Chongqing: Chongqing University Press, 2020.</p> <p>[3] Xiao Mingyao, Cheng Li. Practical training of industrial robot program control skills [M]. Beijing: China Electric Power Press, 2010.</p> <p>[4] Ye Hui. Industrial Robot Typical Application Cases [M]. Beijing: Machinery Industry Press, 2013.</p>

	<p>[5] Zhao DF. Automated manufacturing system [M]. Beijing: Machinery Industry Press, 2004.</p> <p>[6] Wang Panbao, Fan Yuechu et al. Intelligent Vehicle Fabrication - From Components, Electromechanical Systems, Control Algorithms to Complete Intelligent Vehicle Design [M]. Beijing: Tsinghua University Press, 2017.</p>
Data of last amendment	April 2025

## Graduation Design(Dissertation)

Module designation	Graduation Design(Dissertation)
Semester(s) in which the module is taught	8 <sup>th</sup> semester
Person responsible for the module	Professor Song Zhiqiang
Language	Chinese
Relation to curriculum	Compulsory
Teaching methods	Project, seminar etc
Workload (incl. contact hours, self-study hours)	Total workload = 840 hours Contact hours = 240 hours Self-study hours = 600 hours
Credit points	28.0
Required and recommended prerequisites for joining the module	Complete all theoretical courses and practical courses
Module objectives/intended learning outcomes	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>● <b>Knowledge:</b> Demonstrate understanding of knowledge learned from the programme as well as methods of literature review and research.</li> <li>● <b>Skill:</b> <ol style="list-style-type: none"> <li>4. Master the application methods and basic principles of literature retrieval, information query, modern engineering tools and information technology tools.</li> <li>5. Demonstrate the ability to process and analyse data.</li> <li>6. Demonstrate the ability to write thesis, design specifications and abstracts.</li> </ol> </li> <li>● <b>Competence:</b> <ol style="list-style-type: none"> <li>4. Capable of literature retrieval and comprehensive analysis, through the collection of information, literature review, to obtain the latest technical progress in the professional field, to solve the practical problems in the field of automatic control.</li> </ol> </li> </ul> <p>Be able to consider safety, health, legal, cultural and environmental constraints in the design of structures and processes in the field of automatic control.</p>
Content	<p><b>Stage 1 Topic choose</b> (40 contact hours; 60 self-study hours)</p> <ul style="list-style-type: none"> <li>● Relying on the online selection system, teachers set up a prescribed number of questions, and after the subject</li> </ul>

management review, the topic of the bachelor's degree thesis is open to students.

### **Stage 2 Research, literature search and program design**

(40 contact hours; 90 self-study hours)

- Through research and literature review (more than 10 articles are required), be familiar with the major literature journals and magazines of the major and their review methods, or complete the literature review designated by the teacher.
- On the basis of consulting the relevant literature, write the proposal report, including the purpose and significance of the project, the research status and existing problems, the overall design of the program and the analysis of the principle characteristics.

### **Stage 3 Theoretical analysis and calculation, software and hardware design**

(50 contact hours; 110 self-study hours)

- Use the basic theory and professional knowledge to carry out the correct calculation analysis and design, including the necessary test analysis, computer calculation or simulation debugging analysis, as well as the necessary control circuit, mechanical structure, experimental device structure drawings.

### **Stage 4 Thesis writing**

(50 contact hours; 130 self-study hours)

- The writing of the bachelor's degree thesis requires clear content, rigorous argument, clear hierarchy, smooth sentences, correct font, exact expression, and all print in accordance with the prescribed format.

### **Stage 5 Examination of defence qualification**

(10 contact hours; 50 self-study hours)

- According to the requirements of Wuxi University Undergraduate Thesis (Design) Work Management Measures (Trial), the quality of students' graduation thesis is strictly required, and the defence qualification examination is conducted through the inspection of instructors and the Internet.

### **Stage 6 Archiving of materials**

(30 contact hours; 90 self-study hours)

- Sorting and filing relevant materials, such as topic selection approval form, task book, proposal report, mid-term examination form (student self-examination and teacher examination, mid-term examination), defence application form, instructor evaluation form, evaluation teacher evaluation form, defence committee evaluation form, etc.

### **Stage 7 Graduation defence**

(20 contact hours; 70 self-study hours)

Before the defence, students should prepare the speech outline, the necessary structure diagram or device diagram, diagram; When

	introducing the content of the dissertation, it should be systematic, focus on the key points, concise and to the point, and the speaking time is generally 10 minutes; The time for each student to defend is limited to 15 minutes. If the student fails to pass the graduation defence, a second defence will be arranged. After graduation defence, students will self-evaluate their personal design results, and revise the design results and the problems existing in the defence process.
Examination forms	/
Study and examination requirements	Final score include: Advisor Evaluation (30%), review teacher evaluation (30%), defence group evaluation (40%).
Reading list	Papers and other materials related to the subject of the bachelor's degree.
Data of last amendment	April 2025