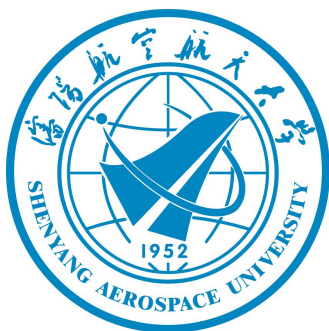# 课程计划/课程描述
Curriculum /Course Description

机械电子工程专业
Mechanical Engineering

沈阳航空航天大学

Shenyang Aerospace University

2022

Foreword

Mission

The mission of the Mechatronics Engineering Program is to cultivate senior engineering and technical personnel who possesses comprehensive professional abilities after mastering the skills of utilizing machinery industrial automation technology, power electronic technology and computer application technology. The cultivated personnel will mainly engaged in equipment operation management, mechanical and electrical products design and development, computer-aided design of mechanical and electronic products and computer aided management.

Programs Educational Objectives

1. Educate students to have a certain natural science and humanistic science basic theory knowledge, the good humanistic quality.

2. Cultivate students to master the basic theory and knowledge of science and technology systematically, have the solid and broad basic theory, basic knowledge and basic skills, which are in the core of engineering mechanics, mechanical, electrical and electronic technology, computer application technology and mechanical electrical control.

3. Prepare students to have the capabilities of preliminary scientific research, technology development and organizational management, utilize complementary non-technical skills such as communication skills, teamwork, leadership, ethical and societal responsibility considerations.

4. Provide students with applied engineering experiences through hands-on laboratory courses, internships, and cooperative education experience.

5. Maintain an ongoing consultation with students, faculty, industry, and mechatronic professionals for the continuous process of academic improvement.

Mechatronics Engineering

1st Semester First Year

Code	Course Name	Hours	Credits
L17001	Comprehensive Chinese I	64	4
L17006	Introduction to China	32	2
L17007	Introduction to Chinese Law	32	2
L14013	Advanced Mathematics I	80	5
L14031	General Chemistry	24	1.5
L26007	C Programming	56	3.5
L26023	C Programming Design Lab	1W	1
L06018	Engineering Drawing I	40	2.5
		328	21.5

2nd Semester First Year

Code	Course Name	Hours	Credits
L17002	Comprehensive Chinese II	64	4
L14014	Advanced Mathematics II	80	5
L06019	Engineering Drawing II	48	3
L14004	Physics I	56	3.5
L14051	Physics Lab I	24	1.5
L03117x	Introduction to Aerospace Engineering	32	2
L26042	Engineering Training I	3W	3
		304	22

1st Semester Second Year

Code	Course Name	Hours	Credits
L17003	Comprehensive Chinese III	64	4
L14005	Physics II	56	3.5
L14052	Physics Lab II	24	1.5
L14010	Probability and Statistics	48	3
L14053	Linear Algebra	40	2.5
L07011	Circuits and Electronics I	40	2.5
L07013	Circuit and Electronics Lab I	14	1
L03061	Theoretical Mechanics	80	5
L26043	CNC Machining Lab II	2W	2
		366	25

2nd Semester Second Year

Code	Course Name	Hours	Credits
L17004	Comprehensive Chinese IV	64	4
L02123	Circuits and Electronics II	40	2.5
L02124	Circuits and Electronics Lab II	18	1

L11031	Engineering Materials	40	2.5
L02120	Analog Electronic Circuits	64	4.0
L03006	Material Mechanics	72	4.5
L06033	Computer Aided Drafting(Auto-CAD)	2w	2
		298	20.5

1st Semester Third Year

Code	Course Name	Hours	Credits
L17005	Comprehensive Chinese V	64	4
L06016	Interchangeability and Technique Measurement	32	2
L06050	Mechanisms and Machine Theory	56	3.5
L06051	Course Design of Mechanisms and Machine Theory	2W	2
L02141	Introduction to Controls	48	3
L06134	Hydraulic and Pneumatic Transmission	48	3
L06114	Hydraulic and Pneumatic Transmission Lab	8	0.5
L26010	Digital Electronics Lab	2W	2
		256	20

2nd Semester Third Year

Code	Course Name	Hours	Credits
L17009	Chinese for Science and Technology	32	2
L07007	Sensors and Instrumentation	32	2
L01124B	Micro-controller's principle and applications	64	4
L06233	Lathe Power and PLC Control	48	3
L06043	Machinery Design	56	3.5
L06037	Course Design of Machinery Design	3W	3
L03028	Introduction to Mechanical Manufacturing	48	3
L06236	Lathe Power and PLC Control Lab	8	0.5
		288	21

1st Semester Final Year

Code	Course Name	Hours	Credits
L06023	CNC Technology	48	3
L06025	Electromechanical Transmission and Controls	48	3
L06029	Mechatronics System Design	32	2
L03054	Machine tools structure and design	48	3
L03141	CAD/CAM System	32	2
L06141	CNC Technology Lab	8	0.5
L06138	Electromechanical Transmission and	8	0.5

	Controls Lab		
L06026	Course Design of Electromechanical Transmission and Controls	3w	3
L06237	Integrated Design Projects	3w	3
		224	20

2nd Semester Final Year

Code	Course Name	Hours	Credits
L06100	Production Practice/Internship	3w	3
L06065	Graduation Project & Thesis	16w	16.0
			19.0
		Total	**169.0**

Medium of Education: English

Comprehensive Chinese Ⅰ/Ⅱ/Ⅲ/Ⅳ/Ⅴ/Chinese for Science and Technology

This course is aimed at developing students' skills in listening, speaking, reading, and writing. It also focuses on improving basic communication competence in Chinese language.

Introduction to China

This course introduces students to the characteristics of China's social development, Chinese history, and culture, Chinese traditional thinking inheritance and innovation of Chinese life changes, China's contribution to human civilization, and various manifestations of China's modernization. It also introduces the students to China's ideology of past, present, and future.

Introduction to Chinese Law

This course introduces students to Chinese legal tradition and law, such as constitutionalism and rule of law, administrative law, civil law, marriage law, succession law, criminal law, and the procedural law. The course also focuses on fundamental and practical aspects of the Chinese law to familiarize international students about legal issues in China.

Advanced Mathematics Ⅰ/Ⅱ

This course is designed to introduce the student to the main ideas of calculus. It is divided into two semesters.

General Chemistry

This course is an introduction to basic areas of chemistry including energy relationships in chemical reactions, entropy and free energy, chemical equilibrium, rates of chemical reactions, acids and bases, and electrochemistry.

C Programming

This course provides students with a comprehensive study of the C programming language. Classroom lectures stress the strengths of C, which provide programmers with means of writing efficient, maintainable, and portable code. The lectures are supplemented with non-trivial lab exercises. The course aims to introduce programmers to C language. The course aims to introduce C in a structured manner beginning with simple aspects of the language and working up to more complex issues.

Engineering Drawing I

Descriptive geometry and mechanical drawing is an application oriented subject that

introduces the preparation, representation and reading of mechanical drawings, similar to characters and numbers, mechanical drawing is one of the tools used by human for the expression. The course is divided into two parts, I and II. The first it mainly covers basic theories and methods for the preparation and reading of mechanical drawings.

Engineering Drawing II

The course involves examination of drafting as a tool of technical communication and for solving graphical problems. Emphases are on development of basic drafting skills, visualization, and solution of spatial problems. It is an exploratory first course in drafting.

College Physics Ⅰ

This course is the introduction to classical mechanics, electromagnetism and special relativity. In classical mechanics, it includes motion in one and two dimensions, Newton's laws of motion and their applications, work and energy, linear momentum and collisions, rotational motion, and principles of conservation. In electromagnetism, it covers a study of electric charges, forces, and field, Coulomb's law, electric potential and electric potential energy, electric current, electric circuits, and an introduction to magnetism. In special relativity, it includes frame of reference, Galilean transformation, Michelson, Morley experiment, postulates of special theory of relativity, Lorentz transformation, length contraction, time dilation, relativity of simultaneity in addition to velocities, variation of mass with velocity, Mass energy equation.

Introduction to Aerospace

The course provides the basic theory of flight. Students are introduced to aircraft primary structure, flight controls, aerofoil, and aerodynamic forces. The course discusses the four forces acting on an airplane during flight, aircraft performance basics, and weight and balance.

College Physics II

This course introduces students to the laws of thermodynamics, wave motion, optics, and quantum physics. The student will learn about heat behaviors critical to understanding of engines and furnaces, metallurgy, geothermal system, etc.   A mathematical description of wave motion will be introduced. The student will also learn about that light can be viewed as either a particle or a wave. The three primary topics examined are interference, diffraction, and polarization. These phenomena can't be adequately explained with ray optics, but can be

understood if light is viewed as a wave. For quantum physics, it introduces underlying ideas of quantum theory and the wave-particle nature of matter, and discusses applications of quantum theory including the photoelectric effect, the Compton Effect, and x-rays.

Probability and Statistics

This course provides an elementary introduction to probability and statistics with applications.

Linear Algebra

This course encompasses the study of linear equations, matrices, determinants, vectors in the plane and space, vector spaces, linear transformations, inner products, eigenvalues values and eigenvectors. Students will learn to recognize and express the mathematical ideas graphically, numerically, and symbolically.

Circuits and Electronics I

This course introduces a range of topics on electrical technology. Topics cover circuit analysis and theory application, including basic components and basic laws of the circuit and circuit analysis methods. It also includes measuring the parameters of DC and AC circuits, verifying circuit analysis methods, applications of Multisim on studying electric circuits, applications of oscilloscope and function generator.

Theoretical Mechanics

This fundamental course is designed for engineering disciplines, such as aerospace vehicle manufacturing engineering, mechanical machines manufacturing, and automation engineering. it is the foundation of all mechanics curriculums, and has a wide application in many areas of engineering and technology. The course introduces students to basic laws and research methods of mechanical motion (including balance) of particle, particle systems and rigid-body. It also provides the ability to analyze and solve practical problems in engineering using knowledge of theoretical mechanics.

Circuits and Electronics II

This course describes principle of digital and analogy electronic circuits and it emphasizes the applications of integrated circuits, diodes and its application circuits, model of amplifiers, electronic device- BJT (Bipolar Junction Transistor), and amplifiers circuits composed of BJT. DC regulated power supply, concepts and application circuits of digital logic circuits and

basic functions of triggers, simulation experiments with EDA (Electronic Automatic Design) software of Multisim include two-stage amplifier circuit, odd/even examining circuit and logic circuit design of intelligence competition responder are also covered.

Engineering Materials

This course covers common engineering materials and it provides an introduction to crystalline structures and properties of engineering materials, Students will be introduced to factors affecting the selection of materials, structure and properties of materials, and the types of possible defects. The course develops the knowledge of students in analysing the failure of engineering products and systems related to mechanical behavior of materials.

Analog Electronic Circuits

This course covers a range of topics on electrical and electronic engineering, such as circuit analysis, digital and analog systems, and device modelling. Students will also be introduced to capacitance, inductance, impedance, first order systems, AC circuits, power systems, and transistor devices.

Material Mechanics

This course introduces students to fundamental concepts of mechanics of deformable solids. Essentially, the course covers theory and methods of determining normal and shear stresses. Students will also learn about physical performance of solid structural members associated with mechanical, civil, and aerospace engineering.

Interchangeability and Technique Measurement

This course involves how to design and express geometric precision requirements include sizes and shapes of a workpiece when design a machinery or instrument, how to measure a size or a shape deviation from ideal conditions, and it is as a tool of technical communication. Emphases are on how to express geometric precision requirements on engineering drawings

Mechanisms and Machine Theory

This course explores design and analysis of mechanisms used in complex machineries. It also includes designing of primary mechanisms. Common problems of mechanisms, such as motion, force, and balancing are also examined in this course.

Introduction to Controls

This is a comprehensive course on basic knowledge of automatic control system. The course deals with introduction to design of feedback control systems, properties and advantages of feedback systems, time-domain and frequency-domain performance measures, stability and degree of stability. It also covers root locus method, nyquist stability criterion and frequency-domain design. Examples are drawn from electrical, mechanical, and other applications.

Hydraulic and Pneumatic Transmission

This course covers principles of hydraulic and pneumatic transmission, material application of the fluid three equations, the operating principle and types of hydraulic pumps and choose of pumps, the structure features kinds of hydraulic motors and cylinders, operating principle, structure features and types of hydraulic valves such as pressure valves, flow valves and Electro-hydraulic proportional valves, the basic characters for hydraulic and pneumatic circuits and types.

Sensor and Detection Technology

This course covers the general characteristics of the sensor and analysis methods, sensor principles, properties and applications, the basic concepts of the detection system and its applications. Explanation of engineering application cases, skills and ability of using various types of sensors, engineering measurement methods and experimental design methods of common sensors and detection systems, development trend of sensor and detection technology is also included.

Micro-controller's Principle and Applications

This course introduces students to microprocessor and micro-controller technologies covering the theory of micro-controller architecture, instruction set, assembly language programming, analogy and digital peripherals, interrupts, parallel and serial interfacing. The 8-bit Intel 8051 micro-controller is selected for laboratory training sessions.

Lathe Power and PLC Control

This course covers machine electrical control system (relay control and Programmable Logic Controller) structure, working principle and application of the basic theory.

Machinery Design

Primarily, this course focuses on basic theory and methods of designing machines and

universal components. Students will be introduced to design concept, handling technical data, various standards, criterion, technical manuals, and development processes. Additionally, the new developments in the field of machinery design will also be discussed in this course.

Introduction to Mechanical Manufacturing

his course emphases on structural manufacturability of the castings forgings and machining parts. Process planning of mechanical manufacturing are also covered in this course.

CNC Technology

This course introduces students to machine numerical control technique, principle of machine tool numerical control technology, hardware and software of control system, and CNC machining programming. It also covers application of the simple NC system and CNC programming.

Electromechanical Transmission and Control

This course provides a basic introduction to the operating principle, characteristics and application of motors and electrical control components, mechanical and electrical transmission control system.

Mechatronics System Design

This course covers mechanical technology, micro-electronics technology, information processing technology, automatic control technology, measure technology, power electronics, interface technology, and system integration technical groups technology. It deals with system functional objectives and optimizing organization structure target, movement and the perception of elements as the foundation, elements and mutual information processing, interface coupling, motion transmission, material movement, and energy conversion.

Machine Tool Structure and Design

This course introduces students to the necessary knowledge about structural analysis and design of machine tool with an ability of reasonable choice adjusting and correcting uses of metal-cutting machine tools. It also covers foundation knowledge on machine tool design, mechanical processes, fixture design, metal cutting and tools design.

CAD/CAM Systems

aircraft manufacturing domain. Students will learn computer-aided design tools for

engineering drawings, mathematical expression method of geometry shape of mechanical products, computer graphic transformation, coordination routine in aircraft manufacture, and related advance techniques.. Methods of computer aided design and its platform software CATIA are also covered in the course.