Introduction to 《Mechanisms and Machine Theory》

【**Course name**】 Mechanisms and Machine Theory

【**Period and Credits**】 56； 3.5

【**Curriculum type**】 Technical basic course 　　　【**Curriculum pattern**】 Core

【**Prerequisite(s)**】 Advanced mathematics, theoretical mechanics, mechanical drawing

【**Teaching unit**】 School of Mechanical and Electrical Engineering

【**Semester**】 Fifth semester

【**Students type**】 Undergraduate students of aerospace,vehicle and manufacturing engineering

【**Exam method**】 Examination

The objects of this course are mechanisms and machines. The course studies the common problems of mechanisms and machines, the analysis and design of kinematics and dynamics of commonly used mechanisms.

1. Characteristic, aim and task of this course

This course is a special fundamental Course for specialties as Flight Vehicle Manufacture Engineering, Machinery Manufacturing and Automation and Engineering Mechanics, it is the foundation of all mechanics curriculums, and has a wide application in many areas of engineering and technology. The task of this course is

(1) Enable students to master the basic theory, knowledge and methods of mechanisms and machines.

(2) Enable students to determine the scheme of mechanical motion, to analyze and create the mechanisms.

(3) Provide the foundation for the professional courses.

2. The contents, basic requirements and credit hours

(1) Introduction（2 credit hours）

(2) Kinematic Fundamentals(6 credit hours, 5 for class introduction, 1 for exercise)

　▲The concepts of link, kinematic pairs and mechanisms, types of pairs.（1 credit hour）

　●The kinematic diagram of mechanism. （1 credit hour）

　●The conditions f or a mechanism to have determined motion. Degree of f reedom

of a mechanism and points for attention during the calculation of DOF. （3 credit hours）

Exercises. （1 credit hour）

△ Experiment: Drawing of the kinematic diagram of a mechanism. Through the observation and analysis of typical mechanism models, students should learn how to draw the kinematic diagram of mechanisms and calculate the degree of freedom.

(3) Velocity Analysis and Acceleration Analysis （6 credit hours, 5 for class introduction, 1 for exercise）

●Velocity analysis by the method of instant centers （1 credit hour）

▲Acceleration analysis by Vector equation method （2 credit hours）

▲Analytical solutions f or velocity analysis and acceleration analysis （2 credit hour）

Exercises. （1credit hour）

△ Experiment: The measurement and analysis of mechanical motion parameters. Through the experiment, learn the measuring method of displacement, velocity and acceleration.

(4) Graphical linkage synthesis （8 credit hours, 7 for class introduction, 1 for exercise）

▲ Characteristics of planar linkage mechanisms （1 credit hour）

▲ The types of f our-bar linkage mechanisms　（1 credit hour）

● Characteristics analysis of f our-bar linkage mechanisms (Grashof criterion, Pressure angle and transmission angle, Dead points characteristics, Quick return) （3 credit hours）

●Design of f our-bar linkage mechanisms （2 credit hour）

Exercises （1 credit hour）

△ Experiment: The combination of mechanisms and the design of combined mechanisms. Through the experiment, train the abilities of design of mechanisms and innovative thoughts.

(5) Cam Design （6 credit hours for class introduction）

▲Characteristics and classif ication of cam mechanisms（1 credit hour）

▲Follower motion curves（1 credit hour）

●Design of plate Cam with translating roller (or knif e-edge) f ollower（2 credit hours）

●Analytical synthesis of pitch curve（1 credit hour）

●Pressure angle （1 credit hour）

(6)　Gear mechanisms（9 credit hours, 8 for class introduction, 1 for video）

▲Types of gear mechanisms（0.5 credit hour）

▲Fundamentals of engagement of tooth prof iles（0.5 credit hour）

●The involute and its properties（1 credit hour）

●Standard involute spur gears（2 credit hours）

●Gearing of involute spur gears（1 credit hour）

●Contact ratio of an involute spur gear set（1 credit hour）

▲Manuf acturing methods of involute prof iles（1credit hour for video）

●Helical gears f or parallel shaf ts（2 credit hours）

(7)　Gear Trains（5 credit hours, 4 for class introduction, 1 for exercise）

▲The types of gear trains（1 credit hour）

●The transmission ratios of f ixed axes.　（1 credit hour）

●The transmission ratios of elementary epicyclic　（1 credit hour）

●The transmission ratios of combined gear trains（1 credit hour）

Exercises（1credit hour）

(8)　Other mechanisms in common use（2 credit hours, 1 for class introduction, 1 for video）

(9)　Balancing（1 credit hour for class introduction）

(10)　Motion and Regulation of Mechanical Systems（1 credit hour for class introduction）

(11)　Scheme Design of Mechanism System（2 credit hours for class introduction）

Quizs（2 credit hours）

Remarks: ● is the emphatic contents, ▲ is the general conternts, △ is the experiments, and no marking is the unimportant.