School of Vehicle and Mobility

Graduate Courses taught in English in the academic year of 2021-2022

(1)【Course Title】Fundamentals of Lightweight Design
轻量化设计基础
【Course Code】70150133
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】30 Graduate Students
【Instructor】HOU Zhichao 侯之超
【Course Description】

Chapter 1 Introduction (3 class hours)
- motivation of structural lightweight design
- concepts and approaches of lightweight design
- main methods for vehicle lightweight design
- contents and schedule of the classes

Chapter 2 Fundamentals (4.5)
- Typical structures and their models
- Structural elements and their failure modes

Chapter 3 Material Selection for Lightweight Design (7.5)
- Materials for lightweight design
- Indices for material lightweight design
- Structural elements and typical material indices
- Tutorial: Application of a special software for material selection

Chapter 4 Truss and Solid Beams (14)
- Truss
- Engineering beam theory
- Basics of plastic beam
- Tutorial

Chapter 5 Thin-walled Beam and Stiffened Shear Web (16)
- Bending of thin-walled beams
- Torsion of thin-walled beams
- Stiffened shear web
- Tutorial

Chapter 6 Typical Applications of Lightweight Design (3)
- USA and EU: ULSAB program
- Vehicle lightweight design in Japan and South Korea
- Other examples

(2)【Course Title】Automotive Engineering I
汽车工程 I
【Course Code】70150153
【Credits】3
【Credit Hours】48

【Semester】Fall
【Capacity】30 Graduate Students
【Instructor】WANG Xiaofeng 王霄锋
【Course Description】Automotive engineering I focuses on dealing with vehicle performances in their longitudinal direction, i.e., driving and braking performances. The main contents of the course are as follows:

1. The resistance forces to the motion of vehicle, including rolling resistance, aerodynamic drag, upgrade resistance force, and acceleration resistance.
2. The designs and structures of the engines, clutches, hydrodynamic couplings, hydrodynamic torque converters, transmissions, transfercases, driveshafts, differentials, brakes and brake circuits
3. Determination of the vehicle performances, including maximum velocity, maximum slope angle which can be overcome, maximum acceleration.
4. Determination of the fuel consumption of the vehicle.
5. determination of the brake performances of the vehicle.

The students are required to do exercises.

(3)【Course Title】Internal Combustion Engines I
内燃机 I
【Course Code】70150203
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】30 Graduate Students
【Instructor】MA Xiao 马骁
【Course Description】
This course will focus on introducing the working process and the design of the internal combustion engines. This course includes the introduction and the properties of the fuels for internal combustion engines, and the energy efficiency（thermodynamic fundamentals）of internal combustion engines, together with heat transfer in combustion engines which are three of the key chapters. Design of combustion engines, valve train and design elements of combustion engines are the important contents of the combustion engines' design.

(4)【Course Title】Electrochemical Methods: Measurement and Simulation
电化学方法：测量与模拟
【Course Code】70150362
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】30 Graduate Students
【Instructor】Zhang Jianbo 张剑波
【Course Description】
课程大纲：Syllabus of Electrochemical Methods: Measurement and Simulation

Chapter 1 Introduction
Chapter 2 Fundamentals of electrochemistry
Chapter 3 Electrochemical measurement
Chapter 4 Electrochemical simulation
Chapter 5 Application of electrochemical methods in FC
Chapter 6 Application of electrochemical methods in LIB

(5)【Course Title】Alternative Vehicle Propulsion System
车辆新型驱动系统
【Course Code】80150162
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】30 Graduate Students
【Instructor】ZHANG Junzhi 张俊智
【Course Description】
The subject of this lecture series is alternative concepts for vehicle drive-trains. These lectures deal with the different alternative drive systems, such as unconventional types of combustion engines with the consideration of alternative fuels (alcohol, natural gas, and hydrogen), gas turbines, Stirling engines and fuel cells. Furthermore, these lectures discuss the different types of variable transmissions and power split drive trains. Regenerative drives e.g. electric, flywheel and hybrid drives are a main topic of these lectures. Beside the discussion of the different components (hydraulic machines, electric motors, hydraulic pressure accumulators, batteries, flywheels), possible control strategies (integrated engine-transmission management) are deducted, according to the various drive concepts.

(6)【Course Title】Vehicle NVH
汽车 NVH
【Course Code】80150173
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】30 Graduate Students
【Instructor】ZHENG Sifa 郑四发
【Course Description】
Vehicle NVH mainly concerns the fundamentals of acoustic, and principal, analysis and control method of vehicle NVH. Six parts are included in this course: 1) fundamentals of acoustics and audiology, 2) measuring equipment and signal analysis, 3) legistation, measuring regulations and limiting values, 4) drive chain and chassis NVH, 5) body NVH, 6) Psychoacoustics and sound quality.

(7)【Course Title】Fundamentals of Automotive Crash Safety

汽车碰撞安全基础

【Course Code】80150193

【Credits】3

【Credit Hours】48

【Semester】Fall

【Capacity】30 Graduate Students

【Instructor】ZHOU Qing 周青

【Course Description】

This course will systematically introduce the fundamental knowledge, current technologies and research methods in the area of vehicle crashworthiness and occupant and pedestrian protection. The main contents include safety features of automotive body structure, design and analysis of major energy absorbing components, occupant injuries in motor vehicle accidents, occupant restraint systems, pedestrian impact protection, analysis of vehicle structure failure under impact loading, vehicle safety assessment method, etc.

(8)【Course Title】Vehicle Control Engineering

车辆控制工程

【Course Code】70150113

【Credits】3

【Credit Hours】48

【Semester】Fall

【Capacity】30 Graduate Students

【Instructor】LI Keqiang, Li Shengbo 李克强、李升波

【Course Description】

Based on Control Theory and Vehicle Dynamics, this course will present the control strategies, system design and evaluation method to develop vehicle electronic control devices, and introduce the state of the art and perspectives of vehicle control technology. To introduce the concepts and terminology, the state-of-the-art development, and basic principles of various vehicle control systems. Principles，Rather Than Specifics Will be Emphasized Upon completion of this course, students should be able to follow the literature on these subjects and perform independent design, research and development work in this field.

(9)【Course Title】Mechatronic Systems in Automotive Engineering

汽车机电系统

【Course Code】70150163

【Credits】3

【Credit Hours】48

【Semester】Spring

【Capacity】30 Graduate Students

【Instructor】LI Jianqiu 李建秋

【Course Description】

The contents in this course includes: Chapter 1 Introduction (Development of the terminology, Demand on a Mechatronic Engineer, Education of a Mechatronics Engineer, Examples of a Mechatronic System in Vehicle Construction, Design Process of Mechatronic Systems); Chapter 2 Sensors; Chapter 3 Signal Processing; Chapter 4 Signals Output; Chapter 5 Conduction-bound Disturbance & Irradiated Disturbance; Chapter 6 Bus System; Chapter 7 Actuators and Chapter 8 Power System

(10)【Course Title】Automotive Engineering II
汽车工程 II
【Course Code】70150333
【Credits】3
【Credit Hours】48
【Semester】Spring
【Capacity】30 Graduate Students
【Instructor】ZHENG Sifa 郑四发　Wang Wenjun 王文军
【Course Description】
The contents in Automotive Engineering II include:1) fundamentals requirements and analysis of vehicle vertical and lateral dynamics, excitation characteristic of the road, 2) structure and character of tires, components of suspension system and steering system, 3)single wheel model, single-track model , two-Track model for vertical dynamics, 4) Single Track Vehicle Model, Four-Wheel Vehicle Model for lateral dynamics, 5)the influence of the parameters of tires, suspension system and steering system to the vehicle vertical and lateral dynamics.

(11)【Course Title】Internal Combustion Engine II
内燃机 II
【Course Code】80150183
【Credits】3
【Credit Hours】48
【Semester】Spring
【Capacity】30 Graduate Students
【Instructor】WANG Zhi 王志
【Course Description】
This course is suitable for the postgraduate students majored in Vehicle Engineering and Power Machinery Engineering. The course mainly focuses on the working process of internal combustion engines, including gas exchange in internal combustion engine, gasoline engine and diesel engine combustion process, special combustion processes (such as HCCI, etc), supercharging for internal combustion engine, as well as the generation of pollutants formation and emission control.

(12)【Course Title】Materials Selection in Mechanical Design
机械设计中的材料选择
【Course Code】80150122
【Credits】2

【Credit Hours】32
【Semester】Spring
【Capacity】30 Graduate Students
【Instructor】WEI Yintao 危银涛
【Course Description】

The primary goal of this course will be for students to learn to identify, based on previously-defined design requirements, the basic function of an engineering object, the parameters to be optimized and the best material(s) to meet the design requirements. Students should also become aware of the breadth and range of material properties associated with different material classes, the basic processes available for processing materials and how to relate the shape of a component to its mechanical response. As the application of the materials selection theory the materials for automobile bodies will be introduced in the second part of the lectures. The practical objects includes

- Developing students' ability to select and optimize materials for a given engineering application, especially for vehicle structures, with due consideration to functional requirements, cost, availability, manufacturability, etc.
- Learn basic criteria for materials selection.
- Derive the performance indices for materials.
- Select materials with lightweight design and energy-safety.
- Select materials with good toughness and impact properties.
- Familiar with materials of automotive bodies

After this course, the students should have

- Talent of systematic selection of materials for a variety of structural designs, especially for vehicle/component
- Capability of identifying the basic function of an engineering object, the parameters to be optimized and the best material(s) to meet the design requirements

Application of the material selection theory to the automobile bodies

(13)【Course Title】Detonation and Supersonic Combustion
激波和超声燃烧
【Course Code】80150532
【Credits】2
【Credit Hours】32
【Semester】Spring
【Capacity】30 Graduate Students
【Instructor】MEVEL Remy Lucien Henri
【Course Description】

The class is divided into 9 main chapters. Each chapters will be the subject of a 2 to 3 lectures (45 minutes each) and a 2 to 3 exercise session (45 minutes each). Some sessions will be devoted to the use of some numerical software. The chapter list is given below: Chapter 1: Reaction stoichiometry (basic recalls); Chapter 2: Mode of

propagation of flames; Chapter 3: Theories of detonation; Chapter 4: Structure of detonation; Chapter 5: Near-limit detonation; Chapter 6: Critical energy for direct initiation; Chapter 7: Detonation diffraction; Chapter 8: Experimental techniques for detonation study; Chapter 9: Application of detonation; Chapter 10: Effect of non-equilibrium temperature on detonation structure.