

**The Undergraduate and Graduate Courses Taught in English
and Opened to the International Visiting/Exchange Students
at Tsinghua University
(Spring Semester, 2019)**

Note:

- (1) *The course information provided herein may be subject to change before course registration.*
- (2) *The courses of a department/school are preferentially open to the exchange students of the department/school.*
- (3) *The Elementary Chinese courses in ICLCC are preferentially open to the university-level exchange students.*

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1. School of Architecture

(1) **【Course Title】** Academic Frontier of Urban and Rural Planning
城乡规划学术前沿

【Course Code】 Y0000111

【Credits】 1

【Credit Hours】 16

【Semester】 Spring

【Capacity】 30 Students

【Instructor】 Hok-Lin Leung 梁鹤年

【Course Description】

The lecture will examine how Western cultural concepts explain urban phenomena and planning theories of the West, draw parallels and contrasts from contemporary Chinese contexts, and derive lessons for theory and practice development in China. (5 sessions)

Introduce meta-methods in public policy analysis, comparative study, and paradigmatic analysis, and illustrate their application with international examples. (3 sessions)

Session 1: Plato's "changelessness" and the concept of "justice" in ordering and balancing urban functions and forms.

Session 2: Aristotle's "change" and the concept of causality, especially "causational synonym" in the formation of urban spaces.

Session 3: Augustine's "human depravity" and land-use zoning.

Session 4: Aquinas' "universal values" and planning conflict resolution.

Session 5: Athenian "democracy" and civil societies (NGO's).

Session 6: "Subjectivity-Consistency-Adequacy-Dependency" (SCAD) as a meta-method in public policy analysis.

Session 7: "Shift-of-Context Analysis" as a meta-method in comparative study.

Session 8: "Geometry of Economic Analysis" as a meta-method in comparing and contrasting the economist's and planner's approach to urban analysis.

(2) **【Course Title】** Introduction on Contemporary Urban Planning and Design
当代城市规划与设计

【Course Code】 80000841

【Credits】 1

【Credit Hours】 16

【Semester】 Spring

【Capacity】 25 Graduate Students

【Instructor】 LIU JIAN 刘健

【Course Description】

An introduction to the contemporary urbanization process, the theory and practice of urban development in China and abroad. Analysis some urban and regional development planning cases, including Beijing and Shanghai metropolitan areas, Yangtze River and Purl River Delta urbanizing regions and urban agglomeration development, as well as the new town development in the Shenzhen special economic zones.

(3) **【Course Title】** Practice and Theory in Green Building Design
绿色建筑理论与实践

【Course Code】 80000861

【Credits】 1

【Credit Hours】 16

【Semester】 Spring

【Capacity】 25 Graduate Students

【Instructor】 SONG Yehao 宋晔皓

【Course Description】

The course lasts eight weeks and consists of eight lectures. The first three lectures will be given by Prof. Thomas Herzog, former dean of Department of Architecture in TUM. He will concentrate on the using of solar energy in architecture and urban planning. Besides, he will introduce briefly the new trends of green building design and research. The forth lecture will be given by Prof. Qin Youguo, former dean of School of Architecture, Tsinghua University, he will show the students the overall view of the development of green building design in China. The fifth one will be given by Prof. Zhu Yingxin, which is about the recognition of the built environment. The sixth one will be given by Associate Prof. Song Yehao, which concentrates on green building design for farmers in the rural area in China. The seventh one will be given by Associate Prof. Zhou Zhengnan, which concentrates on the green building design in the urban area. The last one will be given by Associate Prof. Lin Borong, which concentrates on computer simulation in green building design. There are several seminars in the course and one paper is asked to each student at the end of course.

(4) **【Course Title】** Design Studio III
设计专题三

【Course Code】 80001063

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 25 Graduate Students

【Instructor】 ZHANG Yue 张悦; HUANG He 黄鹤; LONG Ying 龙瀛

【Course Description】

The design studio will investigate the potentials of the YongDing River, Beijing's most important native waterway. We will research, map, and analyze historic, current, and future scenarios of the river in order to propose a new urban relationship between Beijing and its waters in general, and the relationship between the various neighborhoods and districts of western Beijing with the YongDing River specifically.

(5) **【Course Title】** Design Studio IV
设计专题四

【Course Code】 80001073

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 25 Graduate Students

【Instructor】 LI Xiaodong 李晓东

【Course Description】

From 1949 to 2000, a large amount of public housing was developed in Beijing under the planned socialistic welfare housing distribution system. Those former public housing areas have started to face the challenge of deterioration in terms of ageing, lack of maintenance/management, increasing mobility of residents, etc. But those areas still keep their values to a certain extent due to their central locations, easy access, convenient public spaces/facilities, or existing conditions of mixed-use, and in the collective memory of a special historical era. Within this context, urban sustainable renewal would be a potential solution for the urban problems of the former public housing area. Therefore, we chose Block 1 of Sanlihe Neighborhood 1 in Beijing Xicheng District, which was designed and constructed in 1950s, constituting a typical representative of the former public housing areas in Beijing, as the study case.

2. Department of Automation

- (1) **【Course Title】** How to Report Research Results in English and the Related Issues
英文科技论文写作与学术报告

【Course Code】 60250101

【Credits】 1

【Credit Hours】 16

【Semester】 Spring

【Capacity】 150 Graduate Students

【Instructor】 GUAN Xiaohong 管晓宏

【Course Description】

Chinese scholars and students become more and more active in international academia and publications and professional participations have become a key measure of scholarly accomplishment. With this new trend, it becomes increasingly important that Chinese scholars and students get familiar with, and abide by the international standard when writing papers, submitting them for publication, dealing with editors, and applying for funding. This course intends to give some advice to the new scholars on the etiquette of writing a paper, proper citing of reference, and giving attribution. The "conventions and protocols" of international academia are discussed together with the cultural differences between the East and the West. The norms of serving academic communities as reviewer, associate editor and programming committee member are also introduced. The advice is given for engaging in the most important activities in academic career development such as choosing research topics and writing proposals for applying for research funding.

- (2) **【Course Title】** Enterprise and Information System Modeling and Analysis
企业与信息系统建模分析

【Course Code】 40250942

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 30 Undergraduate Students

【Instructor】 LI Qing 李清

【Course Description】

Enterprise engineering and information system modeling and analysis techniques are introduced in this course. These techniques are basic methods of system design/realization, industrial engineering, management and IT consulting for graduated students from industrial engineering, management engineering, and information engineering department.

- (3) **【Course Title】** Network Security Essentials
网络安全基础

【Course Code】 40251052

【Credits】 1

【Credit Hours】 16

【Semester】 Spring

【Capacity】 16 Undergraduate Students

【Instructor】 LI Jun 李军

【Course Description】

This is a research oriented seminar course on special network security topics. Featured with small class and take-home experiments, it provides insights on industrial background and technical trends to inspire students' interest and innovation. The lectures are all in English. Homework review and discussions are sometimes mixed in English and Chinese for the convenience of TA and students.

3. Department of Automotive Engineering

- (1) **【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

- (2) **【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.

- (3) **【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.

(4) 【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

(5) 【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.

4. Department of Chemical Engineering

(1) **【Course Title】** Chemical Engineering Ethics 化学工程伦理

【Course Code】 60340011

【Credits】 1

【Credit Hours】 16

【Semester】 Spring

【Capacity】 110 Graduate Students

【Instructor】 Zhao Jinsong 赵劲松

【Course Description】

The safety and environmental technologies, regulations and the current status of the chemical industry are introduced in this class. The basic engineering ethics concepts are systematically discussed based on typical domestic and international chemical industry case studies. Invited presentations on practical chemical engineering ethics issues will be made by industrial and government authority experts. The students will gain thorough understanding of various ethics issues caused the development of the chemical industry as well the professional ethical codes and social responsibility. The students will also learn the methodologies for addressing chemical engineering ethics issues.

(2) **【Course Title】** Advanced Biological Science and Engineering

现代生命科学与生物工程进展

【Course Code】 80340502

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 30 Graduate Students

【Instructor】 ZHANG Chong、XING Xinhui、WANG Zhao、LU ZHI 张翀、邢新会、王钊、鲁志

【Course Description】

This course will introduce current development in the field of modern life science and biological engineering, which could give students advanced knowledge and thinking mode in biological science and engineering. The content includes four parts: 1, Basic knowledge: overview of modern biological science and engineering, review of classical molecular biology and basic biological engineering; 2, Current topics: bioinformatics, synthetic biology and metabolic engineering, modern biological pharmaceutical; 3, Case study: case study for previous current topics, most cutting-edge research cases from Tokyo Institute of Technology offers; 4, course summary: final reports by the students. Evaluation: homework and final report. This course will specially emphasis on case study, which could allow students to understand not only current development in the field of biological science and engineering, but also the logic behind it, and finally cultivate critical thinking in scientific research.

(3) **【Course Title】** Recent Advances in Separation Processes

分离技术最新进展

【Course Code】 80340512

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 20 Graduate Students

【Instructor】 骆广生、刘铮、陈健、王运东、王保国 LUO Guangsheng、LIU Zheng、CHEN Jian、WANG Yundong、WANG Baoguo

【Course Description】

The course of Recent Advances in Separation Processes will mainly introduce the development of solvent extraction, adsorption, absorption, membrane separation, bio-separation, and microscale separation.

(4) **【Course Title】** Principles of Transport Processes of Chemical Engineering 化工传递过程原理

【Course Code】 70340073

【Credits】 3

【Semester】 Spring

【Capacity】 30 Graduate Students

【Instructor】 王运东 WANG Yundong

【Course Description】

A review of the mechanisms of momentum, energy and mass transport. Momentum transport: Derivation of equations of continuity and motion (Navier-Stokes). Application to laminar flow problems. Energy transport: Derivation of energy equation. Application to heat transfer problems involving conduction, forced and free convection. Mass transport: Derivation of species conservation equations for binary and multi-component mixtures. Application to mass transfer problems with and without chemical reaction. Transport in turbulent flow: Fluctuations and time-averaged quantities. Time averaged form of the governing equations of momentum, energy and mass transport. Expressions for the Reynolds stresses, turbulent energy and mass flux. Temperature and concentration distribution in turbulent pipe flows.

5. Department of Civil Engineering

(1) **【Course Title】** Structural Mechanics (1)

结构力学 (1)

【Course Code】 20030134

【Credits】 4

【Credit Hours】 64

【Semester】 Spring

【Capacity】 60 Undergraduate Students

【Instructor】 LI Quanwang 李全旺

【Course Description】

This course is intended to provide the student majoring in civil engineering skills of structural analysis at an elementary level. It mainly consists of structural geometric construction rules, computational methods for internal forces and deformation. The three major relations: equilibrium, deformation compatibility and stress-deformation conditions are used to study the behavior of structural components under various external loads. Emphasis is placed on the two major methods: the consistent displacement (force) method and the displacement method. The course serves as the basis for further exposure of structural theories to the student majoring in civil engineering.

(2) **【Course Title】** Construction Contracts

工程合同管理

【Course Code】 30030482

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 40 Undergraduate Students

【Instructor】 LI AO Binchao 廖彬超

【Course Description】

Legal aspects of construction contracts and specifications; contract formation, interpretation, rights and duties, and changes; legal liabilities and professional ethics of architects, engineers, and contractors.

(3) **【Course Title】** Programming Analysis of Structures

结构矩阵分析

【Course Code】 40030702

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 40 Undergraduate Students

【Instructor】 YUAN Si 袁驷

【Course Description】

(4) **【Course Title】** Advanced Experimental Soil Mechanics
高等实验土力学

【Course Code】 80030332

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 30 Graduate Students

【Instructor】 XU Ming 徐明

【Course Description】

Students will learn principles and methods of typical advanced geotechnical laboratory and field experiments in the course, as well as the latest development in soil mechanics achieved through these experiments. At the mean time, training will be given for data interpretation and analysis. Furthermore, some of the leading research projects in soil mechanics will be introduced as case studies, in which experiments are playing key roles.

6. Department of Computer Science and Technology

(1) **【Course Title】** Human Computer Interaction Technology

人机交互技术

【Course Code】 80240533

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 30 Graduate Students

【Instructor】 SHI Yuanchun 史元春

【Course Description】

This course covers the basic understanding of human perception and cognition, interaction styles development, design and evaluation of GUI, and natural human computer interface technologies. Computer output mediums will include graphics, music, and 3-D sound. Input technologies are emphasized. Multimodality about visual, acoustic and touch sense channels are introduced with new input interfaces. Signal processing, feature extraction, and mapping schemes will also be covered. Measure methods are for the efficiency of interaction. Hands-on laboratories and independent projects, which can potentially continue as further researches.

(2) **【Course Title】** Web Information Retrieval

网络与信息检索

【Course Code】 80240573

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 30 Graduate Students

【Instructor】 ZHANG Min 张敏

【Course Description】

This course gives a survey to the new research branches, introduces the state-of-the-art technologies, and discusses on open problems and challenges on Web information retrieval (Web IR). At the same time, the course focuses on the real applications in the Internet environment, making case study and detail analysis on commercial search engines (SE). The main topics of the course includes (but not limited to): IR in Web environment, such as link analysis, anti-spam, etc; question answering; opinion / sentimental analysis; social media and IR; personalized IR and recommendation; user behavior analysis; online advertisement; mobile search; and IR and SE evaluations. The course is composed of lectures and student-conducted discussions.

(3) **【Course Title】** Fundamentals of Computer Graphics

计算机图形学基础

【Course Code】 80240593

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 30 Graduate Students

【Instructor】 LIU Yongjin 刘永进

【Course Description】

This course gives an introduction to computer graphics, by intergrating various skills in computer science such as programming, data structure and algorithm design. With the aid of new human-computer interface, students will learn these fundamental knowledges in computer science in terms of fancy graphics effects that reduce the learning load through abstract data visualizationn. The content of this course includes raster graphics, interative graphics, matrix representation of 3D transformation, curve and surface design, ray tracing and visual realism, all with OpenGL source code.

(4) **【Course Title】** Introduction to Big Data System

大数据系统导论

【Course Code】 80240693

The course starts with an overview of the big data analytics, clustering and distributed programming. We will also cover methods for processing big data as well as optimization techniques. Graph processing and visualization of big data will be covered. There will be labs and projects which allow students to experiment with real data and apply the knowledge of what they learnt in class.

(5) **【Course Title】** Distribute System

分布式系统

【Course Code】 80240613

This is an introductory course on distributed systems. This course introduces the principles of distributed systems as well as some of the current influential large-scale distributed systems such as Google file system, MapReduce, Amazon Dynamo etc. To make the course more concrete, this course uses a series of labs requiring the students to build real distributed systems. This course emphasizes on the general principles of building distributed systems in addition to introducing important practical distributed systems. For example, the various kinds of distributed consistency protocols will be discussed and such principles can be adopted in many kinds of real distributed applications. The current systems used by Googe, Amazon, Microsoft will be introduced.

(6) **【Course Title】** Deep Learning

【Course Code】 80240743

(7) **【Course Title】** Natural Language Processing

【Course Code】 80240763

7. School of Economics and Management

(1) **【Course Title】** Econometrics (1)

计量经济学 (1)

【Course Code】 30510973

【Credits】 3

【Credit Hours】 32

【Semester】 Spring

【Capacity】 20 Undergraduate Students

【Instructor】 Yuan XU

【Course Description】

The purpose of this course is to help students understand how to interpret economic data. It will focus on the issues that arise in using this type of data, and the methodology for solving these problems. The focus of the course is on regression analysis. Specific topics and extensions will include multivariate regression, dummy variables, heteroskedasticity, serial correlation, and instrumental variables. Problem sets will provide practical experience in addressing some of these issues using actual economic data. Chapter 1-8 and selected material in Chapter 10-15 will be covered. In addition, basics of hypothesis testing will be covered.

(2) **【Course Title】** Management Information Systems

管理信息系统

【Course Code】 30510202

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 30 Undergraduate Students

【Instructor】 CHEN Guoqing 陈国青

【Course Description】

The objectives of the Management Information Systems (MIS) course are to provide the students with (1) a understanding of MIS essentials and prospects from a combined perspective of technology and management, in the context of big data; (2) a mastery of some classical MIS theories and methods; (3) a mastery of some new MIS concepts and techniques; and (4) a understanding of certain key issues of and thoughts on information technology (IT) management.

In light of rapid advances in information technology (IT) and Internet applications, the course covers a series of related materials as follows: (1) Gaining competitive advantages with IT (e.g., supply chain management and ERP, customer relationship management, business intelligence); (2) Business analytics for decision support (e.g., knowledge types, knowledge discovery techniques, associative patterns); (3) Modeling and decisions in having information systems (e.g., in-sourcing cycle, data modeling, business descriptions,

outsourcing); (5) Emerging trends (e.g., big data/cloud computing and data-centric businesses).

The content of the course also includes case discussions (e.g., Digital China, CSC and General Dynamics), lab studies (e.g., SAP ERP, Weka, Node XL) etc

(3) **【Course Title】** Intermediate Macroeconomics

中级宏观经济学

【Course Code】 30510763

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 40 Undergraduate Students

【Instructor】 Tuo CHEN

【Course Description】

The primary purpose of this course is to introduce students the modern approach to macroeconomics and how to apply it to analyze macroeconomic issues such as: the determination of national income and price levels in the closed and open economy, the cause of economic growth, the source of unemployment, and the origin of business cycles. A substantial amount of time will be devoted to studying the impact of fiscal and monetary policies.

We will study the economic issues within a unified framework as possible as we can. At the same time, we will also try to introduce alternative theories and models. The main purpose is to introduce the method to study macroeconomics, not the facts and the theories. We will start with the basic facts and issues in macroeconomics. Then we will introduce the modern approach to address these issues. We will study how different markets work together in general equilibrium. Markets for labor, saving and investment, and financial assets interact to determine the economy's long-run growth and its fluctuations.

(4) **【Course Title】** Marketing Management

营销管理

【Course Code】 30510812

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 50 Undergraduate Students

【Instructor】 LIU Xia 刘霞

【Course Description】

The objective of this course is to introduce students to the concepts, analyses, and activities that comprise marketing management, and to provide practice in assessing and solving marketing problems. The course is also a foundation for advanced electives in marketing as well as other business/social science disciplines. We will explore the theory and applications of marketing concepts through a mix of cases, discussions, lectures, guest speakers, individual

assignments, and group projects. We will draw materials from a variety of sources and settings including services, consumer and business-to-business products.

(5) **【Course Title】** Developmental Economics

发展经济学

【Course Code】 30510863

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 20 Undergraduate Students

【Instructor】 SHI Xinzheng 施新政

【Course Description】

Development economics is a course involving economic problems and policies of those countries that have not yet reached the level of economic well being observed in the western world. At the completion of this course, students will be familiar with theories of development and their applications in the real world. Students will have a better understanding of a number of topics that shed light on the development process, including poverty, inequality, education, international trade, the role of the government, and population issues. Students will also be trained to conduct their own research by using theories learned in class and analyzing real world data. They will also present their research results in class, which can improve their ability of public speaking and intellectual interactions.

(6) **【Course Title】** International Economics

国际经济学

【Course Code】 40510763

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 40 Undergraduate Students

【Instructor】 MA Hong 马弘

【Course Description】

This course aims to provide students with a survey of fundamentals in international economics, in both theory and empirics. The course consists of two parts: international trade and international finance, with an emphasis on the former. The first part includes topics on why countries trade, what they trade, the benefits and costs of trade, and the motivations for and the effects of government trade policies. The second part contains topics on how exchange rates are determined and the effects of global imbalance.

(7) **【Course Title】** Theory of Industrial Organization

产业组织理论

【Course Code】 40510943

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 40 Undergraduate Students

【Instructor】 Alexander Cowles White

【Course Description】

Under what circumstances should telecommunication firms be allowed to merge? When are hotel room prices "too high", such that public authorities should intervene to make them lower? Is it ok for nightclubs to charge an entry fee for men but to let women in for free? Industrial Organization Theory is a set of tools that seek to provide economic answers to these and many other questions. Ranging from one extreme of monopoly to the other of perfect competition, this course will provide an introductory exploration of the rich set of models of imperfect competition, with a focus on business strategy and policymaking applications.

Or, if you prefer, this a description of the subject from Prof. GAO Ming, who another section of this course at Tsinghua SEM: Industrial Organization (IO) is the sub-field of microeconomics that studies firm behaviour and strategy in market competition, as well as the induced industry characteristics. Not only useful for economists, the theory of IO also provides the basic theoretical framework for researchers and practitioners in many other business subjects, including corporate finance (e.g. merger and acquisition), marketing (e.g. pricing) and strategic management (e.g. competitiveness analysis).

(8) **【Course Title】** Econometrics (2)

计量经济学 (2)

【Course Code】 40511133

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 20 Undergraduate Students

【Instructor】 ZHU Lin 祝林

【Course Description】

This course aims to equip students with modern econometric tools and modeling methods for them to set up suitable econometric models to do data analysis. Hence the approach of this course will be model-driven and data-driven, which focuses on econometric applications without pursuing technical details. This course will cover some modern topics in both macro-econometrics and micro-econometrics. For macro side, we will introduce the concept of non-stationarity and study the problem of unit-root tests and co-integration test, as well as the famous ECM model. We will also study the vector autoregression models which play an important role in macro applications. For microeconometrics, we will cover several important models in application, namely, binary choice model, discrete choice model, models for count data,

sample selection model, and the panel data model. For each model introduced, we will discuss its applicability, limitation, and estimation methods together with inference tools. Since this course focuses on applied side, we will also provide training in econometrics softwares, e.g. STATA/Eviews/R.

(9) **【Course Title】** Investment

投资学

【Course Code】 40511423-1

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 20 Undergraduate Students

【Instructor】 Yintian WANG

【Course Description】

This course will introduce and delineate basic concepts and techniques in investments by examining such topics as risk-return tradeoff, optimal portfolio construction, Capital Asset Pricing model, APT, Market efficiency, bonds and futures. On the theoretical side, this course introduces fundamental knowledge for investment strategies and portfolio management. On the practical side, this course covers recent topics that are related to the investment strategies and portfolio management. Some projects of portfolio management are specially designed to let you apply the theoretical knowledge to practice.

This course introduces the theory and practice of investment management. It provides you with fundamental knowledge of financial markets and asset pricing, and recent development of investment tools and strategies. This course is highly recommended for students who intend to pursue a finance career or further studies in derivatives, fixed income securities, or portfolio management.

By the end of the class, you will have a basic grasp of the following topics:

1. The risk-return tradeoff in financial markets; computing security risk and return and equity indices.
2. Basics of investing mechanism, including buying securities on margin, selling short securities, asset allocation strategies, and active versus passive investment management.
3. Overview of different asset classes such as equity, fixed-income securities and derivatives; introduction to the concepts of fixed-income securities and derivatives.
4. Measuring portfolio risk and return, forming optimal portfolio using mean-variance analysis, portfolio diversification, deriving efficient frontier.
5. The security market line and capital asset pricing model (CAPM)
6. Understanding the concepts of financial market efficiency and anomalies; examining evidence on profitable trading strategies in US and around the world.
7. Investigating different types of mutual funds; developing performance measures of mutual funds; using these measures to evaluate mutual fund performance in the U.S..

(10) **【Course Title】** Management Accounting(1)

管理会计（1）

【Course Code】 40510343

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 25 Undergraduate Students

【Instructor】 ZHANG Haiyan 张海燕

【Course Description】

This is the first course of the management accounting sequence. It introduces concepts, methods, and analytical techniques related to managerial accounting. Topics include fundamental cost concepts, Cost Volume Profit (CVP) analysis, activity-based costing (ABC), job-costing and process-costing systems, marketing and production decisions, budgets, management control system, and related decision-makings. The objective of this course is to enable you to solve real world managerial problems by applying managerial accounting concepts and techniques.

(11) **【Course Title】** Strategic Management

战略管理

【Course Code】 30510992

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 50 Undergraduate Students

【Instructor】 GUO Yidi 郭依迪

【Course Description】

This course introduces the concepts and tools of strategy formulation. You will learn about why some firms survive and prosper while others do not, and develop critical analysis and communication skills to create and implement firm strategy. The course focuses on the analyses, organizational processes, skills and business judgment managers must use to craft strategies, position their businesses so as to maximize long-term profits upon uncertainty and competition.

Strategic Management is an integrative and interdisciplinary course, which takes a general management perspective. It views the firm as a whole, and examines how policies in each functional area (such as accounting, economics, finance, marketing, and organizational behavior) are integrated into an overall competitive strategy. It is intended that you develop a “general management point of view” in this course. This point of view is the best vantage point for making decisions that lead to sustainable business performance. The key strategic business decisions of concern involve determining organizational purpose to evolving opportunities, creating competitive advantages, choosing competitive strategies, securing and defending

sustainable market positions, and allocating critical resources over long periods. Decisions such as these can only be made effectively by viewing a firm holistically, and over the long term.

This course is intended to help you develop skills for formulating strategy. The strategy formulation process demands the mastery of a body of analytical tools and the ability to take an integrative point of view.

(12) **【Course Title】** Elementary Chinese

初级汉语

【Course Code】 60610162-7

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】

【Instructor】 YUE Yao 岳瑶

【Course Description】

(13) **【Course Title】** Econometrics

计量经济学

【Course Code】 30510053

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 20 Undergraduate Students

【Instructor】 Yuan XU

【Course Description】

This course is an introduction to econometrics. It introduces students to multiple regression methods for analyzing the relationship between two or more economic variables. It starts from the simple linear regression to multivariate regression, regression with discrete random variables, instrumental variables, and to regression with panel data, time series data. The objective is to help students understand, evaluate and conduct empirical studies in economics and related disciplines.

(14) **【Course Title】** Mathematics of Risk 1

精算学（1）

【Course Code】 40511373

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 20 Undergraduate Students

【Instructor】 Michael R. Powers

【Course Description】

The course provides a rigorous introduction to the basic probability theory and

models used in the study of insurance and risk finance. Students are expected to be proficient in differential, integral, and multivariate calculus, and some previous exposure to probability and/or statistics is desirable.

The following specific topics will be covered:

- Foundations of probability theory
- Random variables in insurance
- Parametric distributions (univariate and multivariate)
- Common probability distributions for loss frequencies
- Common probability distributions for loss severities
- Convolutions of distribution functions; total-loss models
- Alternative characterizations of random variables (survival functions, MGFs, etc.)
- Risk measures (value at risk, expected shortfall, ruin probability, etc.)
- Transformations of random variables
- Effects of insurance-policy restrictions (deductibles, limits, copayments)
- Heavy-tailed random variables

(15) **【Course Title】** General Management
管理学原理

【Course Code】 30510732

【Credits】 2

【Credit Hours】 48

【Semester】 Spring

【Capacity】 20 Undergraduate Students

【Instructor】 Ling YANG

【Course Description】

Organizations are all around us in society: we study in them, work for them, rely on them for goods and services, and we are often regulated and highly influenced by them. Understanding the management of organizations, therefore, is the key to becoming more effective actors of the organizations we are or will be part of. We will cover three traditional functions of management: planning, organizing, and leading. Overall, this course offers a comprehensive perspective for those interested in management and organizations.

By the end of the course, you will achieve the following:

Be familiar with key principles of management and organizations

Develop analytical skills in the diagnosis of organizational & managerial (in)effectiveness

Be able to apply basic principles of management to real-world practices.

(16) **【Course Title】** Human-Computer Interaction
人机接口设计

【Course Code】 40511323

【Credits】 3

【Credit Hours】 48

【Semester】 Spring
【Capacity】 20 Undergraduate Students
【Instructor】 Cheng YI
【Course Description】

This course is intended for students whose work interacts with user interface issues in the design of social and software systems. The course stresses the importance of user-centered design and usability in the development of software applications and systems. Students will receive theoretical training on the analysis, design, and evaluation of user interfaces. They will also acquire hands-on design skills through a graphical user interface design project. The module takes into account contextual, organizational, and social factors in system design.

(17) **【Course Title】** Information Resource Management (IRM)
信息资源管理

【Course Code】 40511273
【Credits】 3
【Credit Hours】 32
【Semester】 Spring
【Capacity】 30 Undergraduate Students
【Instructor】 Cheng YI
【Course Description】

With the explosive growth in the variety of information resources nowadays, effective management and use of information resource becomes a key issue. Effective information resource management depends upon a comprehensive awareness of the information architecture and a deep understanding of the social, technological and cognitive environments. This course will introduce the concepts and methods related to information organization, retrieval, and dissemination (especially in online environment), as well as the economics of information in various contexts. It illustrates how effective information resource management can benefit individuals, organizations, and the public in general. Issues and policies related to information resource use will also be discussed. The content of the course also includes case discussions (e.g., Digital China, CSC and General Dynamics), lab studies (e.g., SAP ERP, Weka, Node XL) etc

(18) **【Course Title】** Economic Growth
经济增长

【Course Code】 30510883
【Credits】 3
【Credit Hours】 32
【Semester】 Spring
【Capacity】 30 Undergraduate Students
【Instructor】 Wenlan LUO
【Course Description】

“Once you start thinking about growth, it’s hard to think about anything else.”

—Robert E.

Lucas In this course, we start thinking about growth. We answer questions such as: what is the source of economic growth? What initiates industrial revolutions and drives the great divergence between the western and the eastern since the 1800s? What explains China's growth miracles in the past four decades? What structural reform has China experienced during the high growth episode? How to relate growth and economic fluctuations? The course is designed for advanced undergraduate students and mostly theory-orientated. We will go over classical growth models such as Solow, Ramsey and Endogenous Growth models, and touch the research frontier such as structural change, directed technology change and growth with financial frictions. The only prerequisites are intermediate micro/macro and basic calculus and a new set of (exciting) mathematical/economic tools such as dynamic programming and computational methods will be gradually developed throughout the course. The course will also survey the most-up-to-date pro-growth policy practice and empirical analyses about China and the world economy. After the course, a successful student will have a deep understanding of various sources of growth and be able to fit each historical growth episode into different growth theories. The student will also be able to generate growth-related policy proposals supported with rich empirical evidence.

(19) **【Course Title】** Case analysis for Corporate Finance

公司金融案例分析

【Course Code】 40511242

【Credits】 2

【Credit Hours】 48

【Semester】 Spring

【Capacity】 20 Undergraduate Students

【Instructor】 LEE HOAN SOO

【Course Description】

Corporate finance describes the corporation and its operating environment, the manner in which corporate boards and management evaluate investment opportunities, arrange for financing, create value for shareholders, and develop strategies for meeting the claims of financial market participants. Case analysis for Corporate Finance course covers the content of both basic theory of corporate finance and the knowledge and skills of financial decision making analysis. It mainly includes the financial statement analysis, risk and return and cost of capital, valuation, capital budgeting, financing alternative approaches, dividend policy, and mergers & acquisitions. The teaching methodology of the course is mainly case study combined with practical project and mini lecturing. After taking this course, the students should: 1) learn the basic principle of Corporate Finance, 2) build the basic skill of financial analysis and decision-making.

(20) **【Course Title】** Chinese Civilization

中国文明

【Course Code】 10510123

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 20 Undergraduate Students

【Instructor】 Gang CHENG

【Course Description】

This is a course of Chinese Civilization which the basic requirements include both teaching within lesson and watching museums without lesson. In this course some dynasties or topics (Confucianism, Buddhism, Taoism and Sino-west Cultural Exchanges) are selected as the teaching subjects, and these dynasties and topics are represents of Chinese civilization. With the help of Teaching and reading, and watching exhibits in museums, students are encouraged to get the interrelated understanding and sensitive perception of Chinese civilization. The contents of this course are as follows: (1) Zhou Dynasty; (2) Intellectual Development of Chun Qiu and Warring Periods; (3) Qin Dynasty; (4) Han Dynasty; (4) Tang Dynasty; (5) Lixue in Song and Ming Dynasties; (6) Buddhism; (7) Taoism; (8) Sino-western Cultural Exchanges in Ming and Qing dynasties; (9) Academic Learning in Qing Dynasty; (10) Modern Chinese Civilization.

(21) **【Course Title】** Game Theory

博弈论

【Course Code】 40511103

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 20 Undergraduate Students

【Instructor】 Xiao LIU

【Course Description】

Game theory is the foundation of almost all modern economic theory. It is one of the most interesting courses in undergraduate economics. Emerged originally as a field of mathematics, it has been successfully applied to all fields of economics. Furthermore, game theory also plays an increasing role in other social sciences such as philosophy, law and politics, and in natural science such as evolutionary biology and computer science, etc. This course is an introduction to game theory, which puts emphasis in introducing basic game-theoretic analysis, including the conception, analytic techniques and applications for each type of games. We will discuss static games with perfect information, static games with imperfect information, and dynamic games with or without perfect information. Most class sessions will be delivered in English and will consist of both “hands-on” experiences in structured strategic situations as well as lectures about the theory underlying these situations. Student participation is strongly encouraged.

(22) **【Course Title】** Intermediate Accounting (II)
中级财务会计 (2)

【Course Code】 40510333

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Instructor】 Kun WANG

【Course Description】

1. To understand the conceptual framework of accounting, the accounting principles and standards based on Generally Accepted Accounting Principles (GAAP) relating to valuation and reporting of liability and equity items.
2. To train you to apply these accounting principles and standards in data accumulation, summarization and reporting techniques.
3. To develop creative and deeper thinking and to develop the analytical skills required to use and interpret the accounting information and principles.

(23) **【Course Title】** Monetary and Banking Economics
货币银行学

【Course Code】 30510523

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 20 Undergraduate Students

【Instructor】 Qing LIU and Wenlan LUO

【Course Description】

Why do people hold money? What determines the amount of money people hold relatively to other assets? What role do banks and other financial institutions play in the economy? Why isn't there just one world currency? How does the monetary policy work in an economy? These are the fundamental questions in monetary economics, and the purpose of the course is to provide students with the comprehensive analysis of the money markets and modern monetary policy. Throughout the course, a special emphasis will be put on using simple mathematical models to answer the questions we are interested in, rather than focusing on institutional details, which traditionally are the focus of money and banking courses. This course is designed as a survey of the basic theories in monetary economics for advanced undergraduate students. A good skill in mathematics will be helpful for the understanding of the lectures. Among the topics to be covered include: money demand and money supply, inflation and optimal quantity of money, international monetary system, Banking, monetary policy transmission mechanism, strategy of monetary policy and optimal monetary policy, time inconsistency problem in monetary policy. For each topic covered, a core body of theories, issues, and evidence will be presented and discussed.

8. Department of Electronic Engineering

(1) **【Course Title】** Signals and Systems

信号与系统

【Course Code】 30230654

【Credits】 4

【Credit Hours】 64

【Semester】 Spring

【Capacity】 60 Undergraduate Students

【Instructor】 SONG Jian 宋健

【Course Description】

This course covers the signal representation/analysis, especially how to represent the complex signals in simple format either in time or frequency domain. Based on that, it also covers how signals behave after passing through various linear, time-invariant systems. This course consists of following individual yet highly related sessions such as Introduction, time-domain analysis on the linear, time-invariant systems, signal representation in frequency domain (Fourier analysis/Fourier transform), Laplace Transform, Discrete time-domain signals, Z-Transform, Discrete/Fast Fourier transform, the state space analysis of the linear systems, and etc.

(2) **【Course Title】** Case Study on the Design of the Communication Networks

通信网络设计实例研究

【Course Code】 40230952

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 20 Undergraduate Students

【Instructor】 SONG Jian 宋健

【Course Description】

PLC networks and PLC-specific network layers are then defined before modulation schemes and various possibilities for realization of error handling in PLC systems are discussed. The different solutions of multiple-access schemes and various MAC protocols for PLC applications are introduced together with several solutions for traffic control in PLC networks. In the end, comprehensive performance evaluation of reservation MAC protocols, suitable for broadband PLC applications are evaluated by comparing various signaling MAC protocols under different traffic and disturbance conditions. Fundamental concepts are the major focus of this course, and the students are required to do the literature investigation with a group and present their results by the end of the course.

(3) **【Course Title】** Probability Theory and Random Processes

概率论与随机过程 (1)

【Course Code】 30230742-3

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 30 Undergraduate Students

【Instructor】 SHEN yuan 沈渊

【Course Description】

This course will introduce undergraduate students to the modeling, quantification, and analysis of uncertainty. Topics covered include: formulation and solution in sample space, random variables, transform techniques, simple random processes and their probability distributions, limit theorems, and Markov chains. The tools of probability theory are the keys for being able to analyze and make sense of data. These tools underlie important advances in many fields, from the basic sciences to engineering and management. Although this is not a mathematics course, it does rely on the language and some tools from mathematics. It requires a level of comfort with mathematical reasoning, familiarity with sequences, limits, infinite series, and the chain rule, as well as the ability to work with ordinary or multiple integrals.

9. Department of Engineering Physics

- (1) **【Course Title】** Introduction to High Energy Physics
高能物理导论

【Course Code】

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 30 Undergraduate Students

【Instructor】 CHEN Shaomin 陈少敏

【Course Description】

This course provides an up-to-date and comprehensive introduction to modern particle physics, including all the recent developments in elementary particle physics, as well as its connections with cosmology and astrophysics. The balance between experiment and theory is emphasised. The stress is on the phenomenological approach and basic theoretical concepts rather than rigorous mathematical detail. Short descriptions are given of some of the key experiments in the field, and how they have influenced our thinking. Although most of the material is presented in the context of the Standard Model of quarks and leptons, the shortcomings of this model and new physics beyond its compass (such as supersymmetry, neutron mass and oscillations, GUTs and superstrings) are also discussed. This course is suitable for the 3rd and 4th-year undergraduate students.

10. School of Environment

- (1) **【Course Title】** Treatment Technologies for Safe Drinking Water
饮用水水质安全保障工艺

【Course Code】 40050622

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 30 Undergraduate Students (Junior and Senior Students Preferred)

【Instructor】 WANG Xiaomao 王小佺 XIE Yuefeng 解跃峰

【Course Description】

The course is structured with a main line pertaining to drinking water qualities, and is mainly composed of the removal of individual impurities and contaminants in the conventional treatment process and the advanced treatment process, focusing on the principle and applicability of each unit operation. Case studies and invited speech by renowned professors will also be included in the course. By taking this course, students should have the “multiple barrier” concept and would be able to select appropriate treatment processes for particular cases.

- (2) **【Course Title】** Low-carbon Technology and Management
低碳技术与管理

【Course Code】 40050752

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 30 Undergraduate Students

【Instructor】 ZHAO Ming 赵明

【Course Description】

The whole world is currently committed to adaptation against climate change, extreme disasters, environmental pollutions and exhausting fossil energy by means of establishment of a low-carbon society. Such transmission is certainly necessitated in China, the largest carbon emitter and 2nd biggest economy of the world. Development of low-carbon technologies and management system will be the key approach.

This course is aimed to train the undergraduate students of SOE in terms of both technological and management knowledge. It is thus a cross-disciplinary course that encourages students to learn independently and collaboratively with the purpose to address complicated issues in energy, resource, environmental, economy and policy areas under the globalization circumstance.

This course is not merely lecture and also includes quite a number of curriculum projects that require students to learn more after class and collaborate with team members. In course of the project design, students will be enhanced of abilities including but not limited to scientific writing, public speaking, literature hunting and communication skills.

This course will be delivered in pure English environment. Furthermore, the students will be fortunate to stay with world famous experts in low-carbon fields and experience the cutting-edge research. The guest professors may come from Imperial College London, Cambridge, Columbia Uni, Stanford, Ohio State, etc.

Students will also enjoy the impressive industrial field trips. They will experience how low-carbon technologies are implemented in various companies. This will be a perfect compensation to the coursework learning, providing information and ideas for the curriculum project. If lucky, students may also find exciting opportunities for internship in industries.

Low-carbon technology and management is a fast developing field with frequently updated knowledge and information. This course extremely encourages students to challenge the conventional viewpoints and existing database of knowledge. The lecturer has the responsibility to lead students to think and behave in such creative and originative ways.

(3) **【Course Title】** Advanced Environmental Chemistry

高等环境化学

【Course Code】 70050323

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 25 Graduate Students

【Instructor】 HUANG Jun 黄俊 YU Gang 余刚

【Course Description】

By learning Advanced Environmental Chemistry, the students will grasp the methodology of studying the transport, transformation and fate of pollutants using chemical principle and approaches, with the concept of multimedia in their mind. Also they will get good understandings about the environmental problems especially for those current hot issues - case studies will illustrate their chemical mechanism as well as the latest progress. The course mainly contains four parts: (1) Environmental pollution chemistry, which mainly talks about the main environmental problems and their chemical mechanism, and the transport, transformation and fate of pollutants. (2) Environmental analytical chemistry, which mainly talks about the monitoring and analysis methods for priority pollutants with important environmental significance. (3) Environmental toxicological chemistry, which mainly talks about the dose-response relationship, kinetics, and the mechanism for teratogenesis, mutagenesis and carcinogenesis. (4) Environmental Engineering Chemistry, which mainly talks about the technical principles of chemical approaches of pollution control.

(4) **【Course Title】** Advanced Wastewater Treatment

高级废水处理工程

【Course Code】 80050233

【Credits】 3

【Credit Hours】 48
【Semester】 Spring
【Capacity】 25 Graduate Students
【Instructor】 WEN Xianghua 文湘华
【Course Description】

This course provides various kinds of engineering issues related to water environment in English, which cover fundamental knowledge, the latest technologies, including wastewater reuse & disinfection, anaerobic biological treatment technologies, membrane technology, biological nutrient removal technology, and etc., and regional application examples. These lectures, will also arrange English presentations by students, and discussions to enhance English capability and internationality of students.

(5) **【Course Title】** Restoration Ecology and Applications
恢复生态学及其应用

【Course Code】 80050243
【Credits】 3
【Credit Hours】 48
【Semester】 Spring
【Capacity】 25 Graduate Students
【Instructor】 LIU Xuehua 刘雪华
【Course Description】

Theoretic and practical research of restoring the degraded ecosystems is the hot topic in the modern ecological development. This course mainly contains the following contents: the degraded ecosystems under human disturbance, contents and development of restoration ecology, general introduction of global ecological restoration, restoration of degraded forest ecosystem, restoration of wetland ecosystem, restoration of grassland ecosystem, restoration of ocean and coast zone ecosystems, restoration of abandoned-land ecosystems, restoration of urban ecosystem. Restoration ecology is one of the key courses in Ecology. The students in Ecology, Ecological conservation and Environmental protection are requested to select it for credit.

(6) **【Course Title】** Global Environmental Issues
全球环境问题

【Course Code】 80050253
【Credits】 3
【Credit Hours】 48
【Semester】 Spring
【Capacity】 25 Graduate Students
【Instructor】 WANG Can 王灿
【Course Description】

The course will target to five important global environmental issues, including 1) global climate change, 2) Persistent Organic Pollutants, 3)

curriculum-transboundary movement of hazardous waste and international chemicals management, 4) biodiversity and conservation, and 5) global and regional air pollution. On the global climate change, the following aspects will be introduced: the scientific evidence and courses of global climate change, the impacts of and adaption to climate change, the social economic impacts of mitigation, the UNFCCC and its negotiation progress, the global carbon market, the global energy issues, and so on. Several discussion topics will be identified among the aforementioned issues. Regarding the issue of Persistent Organic Pollutants (POPs), the course will firstly introduce the Origin of POPs as an environmental concern, followed by Properties and global transport of POPs, Process of developing the international treaty, Main POPs included in the Stockholm Convention, Obligations required by the Stockholm Convention, Existing barriers for developing countries to implement the Convention, Obligation of developed countries in financial and technology transfer, Trend and main problems of the Stockholm Convention. The discussion topics will focus on listing new POPs into the Stockholm Convention. The part on curriculum-transboundary movement of hazardous waste and international chemicals management will cover the following issues: International Conventions related to transboundary movement of hazardous waste and international chemicals management will be introduced and discussed in this course. Based on the introduction of hazardous waste, origin, main content and development trend of Basel Convention will be instructed, with an emphasis on hot topics.

(7) **【Course Title】** Hazardous Waste Disposal

危险废物处置技术

【Course Code】 80050263

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 25 Graduate Students

【Instructor】 LI Jinhui 李金惠

【Course Description】

Solid waste pollution control and reclamation is one of the most popular topics in the field of environmental protection. Concerning solid waste, emphasis is laid on the sound environmental management of hazardous wastes and municipal wastes. Many universities abroad have set up courses of hazardous waste management, including management policy, methodology, technology, engineering and practices. Although a different course name is used here, the overall outlook is the same, including contents as follows. 1. Introduction on hazardous waste, including the history, important incidences and future endeavors of the hazardous waste management, and the definition, typology and sources of the hazardous waste. 2. The legal framework of hazardous waste management, including Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Stockholm Convention on Persistent Organic Pollutants, introduction on

laws and regulations of hazardous waste management in EU, USA and China, and cutting-edge information about hazardous waste management. 3. Hazardous waste minimization and management plan, including hazardous waste minimization, waste exchange, project planning and audits. 4. Hazardous waste treatment methods, including physical chemical processes, biological methods, stabilization and solidification. 5. Hazardous waste facility development and operation, including facility types, facility operations, needs assessment, site selection, public participation, permitting. 6. Hazardous waste thermal treatment methods, including regulations, combustion, liquid injection incinerators, solid waste incineration, storage and feed systems, air pollution control, continuous emission monitors, trial burns, mobile systems. 7. Hazardous waste land disposal methods, including landfill operations, site selection, liner and leachate collection systems, cover systems, contaminant transport through landfill barriers, landfill stability, etc.

(8) **【Course Title】** Social Practice

社会实践

【Course Code】 69990041

【Credits】 1

【Credit Hours】 16

【Semester】 Spring

【Capacity】 30 graduate Students

【Instructor】 DENG Shuo 邓述波

【Course Description】

In this course, the oversea students visit Chinese History Museum, Memorial Museum of Chinese People's Anti-Japanese War, Military Museum, Yuanmingyuan Park to know the Chinese history; visit exhibition such as China grow up to know Chinese culture and achievements in past 30 years; participate in community service to foster service consciousness; participate one of the in-situ social practices such as cycling economy, nationality culture, water environmental problems, teaching in west china to further know China change as well as the related environmental problems. Finally, the results of social practice are submitted in hard copy and orally presented.

(9) **【Course Title】** Environmental Transport Processes

环境传质学

【Course Code】 70050332

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 30 graduate Students

【Instructor】 ZHANG Fang 张芳, Bruce E.LOGAN

【Course Description】

This course covers the fundamentals of mass transport of chemicals between air, water, soil, and biota. Material is divided into three subject areas: mass transfer

theory, transport processes related to engineered reactors, and transport in the natural environment. The focus of the course is on chemical calculations particular to dilute systems, with emphasis on quantifying chemical transport rates and distributions in natural and engineered environments. Special topics of interest to Environmental Engineers include biofilm models, bioreactors, chemical partitioning in thin fluid films, and fate of anthropogenic chemicals from spills and discharges into the environment (rivers, lakes, and groundwater).

11. Department of Hydraulic Engineering

(1) **【Course Title】** Integrated River Management

河流综合管理

【Course Code】 80040103

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 30 Graduate Students

【Instructor】 WANG Zhaoyin 王兆印

【Course Description】

12. Department of Industrial Engineering

(1) **【Course Title】** Engineering and Technology Management

工程与技术管理

【Course Code】 80160363

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 55 Graduate Students

【Instructor】 HE Fang 何方 WANG Chen 王琛

【Course Description】

- Engineering and Management
- Functions of Technology Management
- Human Aspects of Organizing
- Leading Technical People
- Engineers in Marketing
- Globalization
- Engineering Economy

(2) **【Course Title】** Enterprise Information Management

企业信息资源管理

【Course Code】 80160033

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 40 Graduate Students

【Instructor】 CAO Hui 曹晖

【Course Description】

This graduate course leads students to systematically explore the fast expanding field of information systems and their applications in enterprises. Students will investigate the organizational and technical impact between enterprise management strategies and information system/technologies.

The course aims at getting students to think about the overall picture of enterprise information systems, match up the relationship between the production problems and corresponding IT solution, and at the same time, understand the methodologies of system analysis and design for enterprise information systems.

The course will help students choose from various information systems and development/integration strategies in an enterprise context. Strategies include Enterprise Resource Planning, Supply Chain Management, Customer Relationship Management and Product Lifecycle Management will be investigated, and the methods of system analysis, enterprise modeling and enterprise integration will be discussed.

(3) **【Course Title】** Logistics & Supply Chain Management

物流与供应链管理

【Course Code】 80160223

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 55 Graduate Students

【Instructor】 HUANG Simin 黄四民 ZHANG Chi 张弛

【Course Description】

Develop a knowledge and understanding of the issues and technologies underlying supply chain management with a focus on analysis and design skills for Logistics systems, including demand management, inventory management, logistics network design, supply chain risk, etc.

(4) **【Course Title】** Manufacturing in China

中国制造

【Course Code】 80160423

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 30 Graduate Students

【Instructor】 ZHANG Chi 张弛 ZHENG Li 郑力 XIE Xiaolei 谢小磊

【Course Description】

Competence after taking this course: capable of analyzing and diagnosing complex production systems Knowledges to deliver: 1. Fundamental knowledge on production system modeling and analysis; 2. Production automation and its developing trends 3. A whole picture of Manufacturing in China integrated with logistics and supply chains 4. relationship between Manufacturing in China and Global manufacturing.

Methods: 1. Lectures on production systems; 2. Tours and on-site lectures in different production lines.

(5) **【Course Title】** China Studies: Industry, Society and Culture

中国研究：产业、社会与文化

【Course Code】 80160433

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 50 Graduate Students

【Instructor】 ZHU Wanshan 朱万山 MA Liang 马靓

【Course Description】

China is in the process of transforming from a society dominated by agriculture to one by modern industries. However, this transformation process is not a simple replication of the industrialization process that revolutionized the western world in

the first half of the twentieth century because the Chinese culture and the new technologies make this process distinct and bring many new challenges. This course teaches students the new trends and challenges in various industries that the industrial engineering may make the highest impact, and discuss the reach problems in these industries. The students will also learn the tools that have been used to solve these research problems. The focus industries include supply chain and logistic, transportation, energy, retail, medical service, and e-commerce. Emphasis is on the impact of the Chinese culture on the trends and challenges of these industries and on the difference between the Chinese and western industries. The course consists of learning the industry background in class room and on-site visiting & investigation, equally splitting in total learning hours.

13. Institute of Interdisciplinary Information Sciences

(1) **【Course Title】** General Physics (1)

普通物理 (1)

【Course Code】 20470024

【Credits】 4

【Credit Hours】 64

【Semester】 Spring

【Capacity】 60 Undergraduate Students

【Instructor】 Xiongfeng Ma 马雄峰

【Course Description】

Calculus-based first physics course for physics majors and students with a serious interest in physics. Students are required to actively participate during the lectures, asking questions, and having questions asked. This class will provide you with an enhanced opportunity to acquire a good understanding of fundamental mechanics and thermodynamics and to learn how to apply this understanding to physics and beyond.

(2) **【Course Title】** Computational Biology

计算生物学

【Course Code】 30470093

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 40 Undergraduate Students

【Instructor】 ZENG Jianyang 曾坚阳

【Course Description】

To introduce various computational problems for analyzing biological data (e.g. DNA, RNA, protein sequences, and biological networks) and the algorithms for solving these problems. Topics covered include: biological sequence analysis, gene identification, regulatory motif discovery, genome assembly, genome duplication and rearrangements, evolutionary theory, clustering algorithms, and scale-free networks.

(3) **【Course Title】** Autonomous Driving

自动驾驶

【Course Code】 40470262

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 40 Undergraduate Students

【Instructor】 Longbo Huang, Tiancheng Lou

【Course Description】

This course covers the design principles and implementation essentials of the

various functional modules of an autonomous driving system: 1. Overview: architecture of autonomous driving system, and overview of the autonomous driving industry; 2. Hardware: sensors (sensor fusion), computational hardware and gps ; 3. Perception: computer vision and deep learning; 4. Map: roadgraph and 3D model of the static elements of the driving environment; 5. Localization: localization based on differential GNSS systems and computer vision; 6. Planning: global route planning and local trajectory planning; 7. Control: accurately execute the planned maneuvers through feedback control mechanisms 8. System and simulation: reliable, scalable and real-time system, including testing in both physical world and simulation.

(4) **【Course Title】** Introduction to Computer Networks

计算机网络基础

【Course Code】 30470223

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 40 Undergraduate Students

【Instructor】 HUANG Longbo 黄隆波

【Course Description】

This course aims at giving a comprehensive introduction to the fundamentals of computer networks and network performance analysis. The course contains two parts. The first part covers various networking topics including network principles, Ethernet, WiFi, routing, inter-networking, transport, WiMax and LTE, QoS, and physical layer knowledge. The second part presents mathematical techniques for modeling, analyzing and designing computer systems, including convex optimization, queueing theory, game theory and stochastic analysis. This course is intended for junior or senior undergraduate students in computer science or electrical engineering.

(5) **【Course Title】** Advanced Theoretical Computer Science

高等理论计算机科学

【Course Code】 80470214

【Credits】 4

【Credit Hours】 64

【Semester】 Spring

【Capacity】 10 Undergraduate Students, 10 Graduate Students

【Instructor】 LI Jian 李建

【Course Description】

The course will cover the following topics: NP completeness, PSPACE, L Space, IP system, BPP, derandomization, PCP, classical communication complexity, circuit complexity, Decision tree complexity.

quickly recall basics about convex optimization and machine learning: linear/logistic regression, regularization, newton method, stochastic gradient

descent (asynchronous, variance reduction method), generative vs discriminative, variance vs bias.

Off-the-shelf machine learning and prediction algorithms: k-nn, SVM, kernel trick, clustering, Adaboost, gradient boosting, random forest.

Online learning and sequential prediction. Multi-armed bandit, Universal portfolio, Multiplicative weighting method, online convex optimization, basic time series

linear algebra-based learning algorithms: SVD, principle component analysis (PCA), independent component analysis (ICA), Nonnegative matrix factorization (NMF), topic modeling, matrix completion, dictionary learning, tensor method, spectral clustering.

(6) **【Course Title】** Advanced Quantum Information Theory

高等量子信息学

【Course Code】 80470163

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 10 Undergraduate Students, 30 Graduate Students

【Instructor】 Kihwan Kim

【Course Description】

This course provides an overview of the latest advancements in quantum information theory and quantum computation. Starting from the foundation of the framework of density matrices and open system dynamics, the course gradually transitions into two main chapters, the first about the quantum theory of information compression and transmission and the second on the topological models of quantum computation. The first chapter will deal with quantum entropies and quantum typicality, providing useful tools also for students interested in quantum thermodynamics. The second chapter will deal with anyons and geometric phases, showing the features of anyonic statistics can be used to perform stable and efficient quantum computations. Students who take this course will develop the mental discipline needed to identify and discuss critically these questions and will be provided with the sharpest theoretical tools to address these questions.

(7) **【Course Title】** Topics in Large-Scale Data Analysis

大规模数据分析专题

【Course Code】 80470113

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 10 Undergraduate Students, 20 Graduate Students

【Instructor】 Changle Lin 林常乐

(8) **【Course Title】** Security Technologies in Cyberspace
网络空间中的安全技术

【Course Code】 80470233

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 10 Undergraduate Students, 30 Graduate Students

【Instructor】 Wenfei Wu 吴文斐

【Course Description】

Cyberspace security consists of three parts – information security, system security, and application security. Information security leverages cryptographical mechanisms to guarantee data privacy; system security leverages sandboxing, program analysis etc. to guarantee the authentication and privacy of system usage; application security leverage anomaly behavior detection to recognize malicious user and software. In this course, we would discuss typical security issues and solutions in each section, and require students to practice them in course projects. We would also research into new security issues in latest scenarios and new technologies (e.g., machine learning, trusted execution environment) that can be used to solve security problems.

14. International Chinese Language and Culture Center (ICLCC)

(1) **【Course Title】** Elementary Chinese

初级汉语

【Course Code】 60610162 (6)

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 30

【Instructor】 ZHANG Yi 张怡

【Course Description】

For Exchange Students (Beginner).

15. School of Journalism and Communication

- (1) **【Course Title】** Feature Writing in English
英语特稿写作

【Course Code】 80670612

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 45 Graduate Students

【Instructor】 ZHOU Qingan 周庆安

【Course Description】

This course aims to integrate reading and writing of feature journalism. By reading the canonic texts of feature writing from British and US newspapers and magazines, the instructor will help students know its notion, genre, and format. The students will practice the different styles of feature writing (political, economic, social and cultural) with the instructor's guidance.

- (2) **【Course Title】** Intercultural Communication
跨文化传播

【Course Code】 80670632

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 18 Graduate Students

【Instructor】 SHI Anbin 史安斌

【Course Description】

*to learn the concept and theoretical framework, paradigms and research methodology of intercultural communication at interpersonal/organizational/mass media levels; *to acquire the "backgrounder" of the main patterns of global media/culture and basic skills in intercultural communication; *to apply the coursework to intercultural praxis in journalism, broadcasting, advertising and public relation.

- (3) **【Course Title】** Business News Data Mining and Analysis
财经新闻数据挖掘与分析

【Course Code】 80670833

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 45 Graduate Students

【Instructor】 Lee J. Miller

【Course Description】

A key asset of the class will be students' use of the Bloomberg Professional Terminal. TSJC has more terminals of any university in the world. Students will

have the opportunity to learn data mining on the platform that is used by the world's leading business journalists, financial analysts, economists and consultants will provide a competitive advantage upon graduation and during their careers.

(4) **【Course Title】** Business News Data Mining and Analysis

财经新闻数据挖掘与分析

【Course Code】 80670833

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 45 Graduate Students

【Instructor】 Lee J. Miller

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16. School of Law

- (1) **【Course Title】** Hot Issues of the Contemporary International Legal System
当代国际法热点问题

【Course Code】 30660192

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 50 Undergraduate Students

【Instructor】 LI Zhaojie 李兆杰

【Course Description】

By identifying and analyzing the hot issues of the contemporary international legal system, this seminar course is designed to broaden students' professional horizon and to promote their English proficiency for reading and communicating, in the field of international law. Ultimately, through their studies in this course, students are expected to familiarize themselves with the dynamic characteristics of the contemporary system of international law and make progress in building up their professional capacity of dealing with international legal transactions.

- (2) **【Course Title】** Legal English
法律英语

【Course Code】 40660072

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 30 Undergraduate Students

【Instructor】

【Course Description】

1. THE U.S. GOVERNMENT SYSTEM This chapter will introduce students to the terminology used to describe the U.S. system of government. Particular attention will be paid to the various tools available to the legislative, executive, and judicial branches to carry out their responsibilities, as well as to the ways the three branches interact with one another. After completing the chapter, students should be able to describe the way the U.S. government functions. 2. FEDERALISM This chapter will introduce students to some of the key legal concepts related to the U.S. federal system. Particular attention will be paid to the Constitutional basis for this system and to how the federal and the state governments limit each other's authority. After completing the chapter, students should have a better understanding of the way these two legal systems in the United States interact and overlap. 3. THE JUDICIAL SYSTEM This chapter will introduce students to the U.S. judicial system. Particular attention will be paid to the federal court system laid out in Article III of the U.S. Constitution. After completing this chapter, students should be able to discuss the basic structure of the U.S. judicial system, as well as be able to reference and describe key mechanisms that allow the judicial

system to function. 4. LEGAL METHODOLOGY This chapter will introduce students to important methodological concepts that underlie legal thought in the United State. Particular attention will be paid to the types of reasoning methods used in legal education and practice. After completing this chapter, students should be able to discuss the various schools of thought regarding how best to deal with legal problems, and which of those schools of thought are the most popular in the U.S. legal community.

(3) **【Course Title】** the System and International Arbitration in China

中国仲裁制度与中国国际仲裁

【Course Code】 80661822

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 50 Graduate Students

【Instructor】 LV Xiaojie 吕晓杰

【Course Description】

This course will discuss the trend and problems of developing international commercial arbitration in China mainland, as well as domestic arbitration legislation and related cases. Lectures will be given by practitioners in international commercial arbitration in the region who will share with the students the issues arising in their field of practice. Arbitration rules in various arbitration institutions will be covered.

(4) **【Course Title】** Research of Case in International Arbitration

国际仲裁案例研修

【Course Code】 80661803

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 50 Graduate Students

【Instructor】 LV Xiaojie 吕晓杰

【Course Description】

This course will highlight the importance of evidence and focus on the different ways and approaches in preparing and presenting a case in international arbitrations in various jurisdictions. The module would provide students with the opportunity to prepare and learn how to present its case both in writing and orally through mock scenarios. Documentary evidence, oral evidence of fact witnesses and expert evidence will be covered.

(5) **【Course Title】** Enforcement of Arbitral Awards

国际仲裁裁决的执行

【Course Code】 80661812

【Credits】 2

【Credit Hours】 32
【Semester】 Spring
【Capacity】 50 Graduate Students
【Instructor】 LV Xiaojie 吕晓杰
【Course Description】

The New York Convention is the most important treaty in the context of international commercial arbitration. The module will examine the cases on recognition and enforcement of arbitration agreements and arbitral awards under the New York Convention in various jurisdictions. The jurisprudence emanating from the court decisions on the way as to how various jurisdictions interpret this Convention will be studied and discussed.

(6) **【Course Title】** WTO Dispute Settlement Mechanism
WTO 争端解决机制

【Course Code】 80661933
【Credits】 3
【Credit Hours】 48
【Semester】 Fall
【Capacity】 50 Graduate Students
【Instructor】 LV Xiaojie 吕晓杰 ZHANG Yuejiao 张月姣
【Course Description】

The seminar will explore these issues and some proposals for reform in the context of the structure of the World Trade Organization established by the Uruguay Round negotiations completed in 1994. There will be some emphasis on how these dispute settlement procedures interact with diplomacy and policy-making concerning international economic relations. These subjects will be explored in the context of problems of regulation of cross-border economic activity, as well as broader problems of “globalization” of economic affairs. Various constitutional problems will be discussed including questions of sovereignty, allocation of power among international and national governmental institutions, and threats to national “sovereignty.” Some specific cases will be taken up, possibly the Bananas case, the Beef Hormones case, the Shrimp–Turtle case, and recent cases such as Asbestos, Safeguards, GSP, Gambling, and others.

17. School of Life Sciences

- (1) **【Course Title】** Topics in Tumor Biology
肿瘤生物学专题讨论课

【Course Code】 90450041

【Credits】 1

【Credit Hours】 16

【Semester】 Spring

【Capacity】 15 Graduate Students

【Instructor】 CHEN Yeguang 陈晔光

【Course Description】

- (2) **【Course Title】** Biochemistry (1)
生物化学（1）

【Course Code】 30450203

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 185 Undergraduate Students

【Instructor】 LIU Dong 刘栋

【Course Description】

The main purpose of this course is to teach the students the basic concepts in biochemistry, which includes the structures and functions of proteins, nucleic acids, carbohydrates, lipids and biomembranes. We will also put the emphasis on enzyme kinetics and molecular mechanisms of signal transduction of the cells. Besides lectures, we will also discuss the problems and answer the questions to the students through the websites or one-to-one meeting. There are will be some homework assignments to students after each lecture. We will also recommend some original research articles for students to read to further raise their interests in biochemistry.

- (3) **【Course Title】** Genetics
遗传学

【Course Code】 30450303

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 250 Undergraduate Students

【Instructor】 ZHOU Bing 周兵

【Course Description】

This course is designed to introduce genetic principles to students of biology major. It aims to cover comprehensively all fields of classical and modern genetics, but skips most topics that have been taught in biochemistry and microbiology.

(4) **【Course Title】** Molecular Biology

分子生物学

【Course Code】 30450453

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 150 Undergraduate Students

【Instructor】 XI Qiaoran 郗乔然

【Course Description】

Molecular Biology is to study the activity and function of genes at molecular level. In this class, I will introduce the key points in molecular biology, focusing on the basic theories and major techniques with current development and emerging discoveries of molecular biology. The main topic in this class includes: 1) the major tools to study genes and their activities, 2) Transcription and transcriptional regulation in prokaryotes, 3) Transcription and transcriptional regulation in eukaryotes, 4) DNA and protein interaction during transcription, 5) Post-transcriptional modification of RNA, 6) DNA recombination and transposition, 7) DNA damage repair, 8) Small RNAs, 9) Omics (genomics, transcriptomics and proteomics).

18. School of Materials Science and Engineering

(1) **【Course Title】** Introduction to Metallic Functional Materials

金属功能材料导论

【Course Code】 20350102

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 20 Undergraduate Students

【Instructor】 GODFREY ANDREW WILLIAM

【Course Description】

This is an introductory level course aimed at giving a basic introduction to the key relationship between structure and properties in material science, and on a wider level to encourage students to think about the role of materials in modern society. The course content will focus predominantly on metallic materials, but for completeness will also cover other classes of material (including ceramics, composites and semi-conductors). The first half of the course will cover the atomic structure of materials and then review different meanings of the mechanical “strength” of a material. Following this some key functional properties will be covered, including electrical conduction, semi- and super-conduction, and magnetism. The final lecture will give students an insight into the materials science of carbon-based materials. This is a Freshman Seminar course – where all students will be expected to participate in class discussions on topics raised during the lecture periods, and where the emphasis is not on learning technical details, but on developing an awareness of key concepts. The course is open to students from all backgrounds – in the past students with study majors as diverse as economics and medicine have taken part, and actively contributed to the course. Course assessment will be based on a combination of a group presentation (groups of 3-4 students depending on class size), a final written paper (4 pages typically), and class participation. Note that the class will be conducted entirely in English, so students should be comfortable with this. The final written paper will however not be graded based on the quality of the written language (as long as the key points presented are clear). There is no textbook for the course – lecture handouts in PDF format and additional reading materials will be provided as required.

19. Department of Mechanical Engineering

- (1) **【Course Title】** Welding Technology I: Welding and Cutting Technologies
焊接技术 I: 焊接与切割方法

【Course Code】 80120253

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 30 Graduate Students

【Instructor】 ZHAO Haiyan 赵海燕

【Course Description】

This course looks at the principles and applications of welding and cutting technology, as well as the latest developments and application status of the technology at home and abroad. It aims to enable students to master not only the basic knowledge of modern welding and cutting and related technologies, but also to understand the forefront of the development of the discipline and the direction of the discipline, broaden student's horizons, and activate academic thinking to improve the ability of carrying out innovative research. The main contents include: introduction of different welding methods such as gas welding, electric arc welding, electric resistance welding, pressure welding, high energy beam welding, as well as cutting methods, welding automation, welding sensors, welding forming methods, etc. The lecture also focuses on its latest development and application.

- (2) **【Course Title】** Numerical Simulation of Manufacturing Processes
制造过程数值模拟技术

【Course Code】 80120692

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 20 Graduate Students

【Instructor】 RONG Yiming 融亦鸣

【Course Description】

The course is designed by Professor Yiming Rong. The course has been designed to focus on fundamentals and numerical modelling technology for manufacturing processes. The newest commercial CAE software packages have been provided for projects and exercises. The content of this course includes the fundamentals, complete procedure and state-of-art on applications of numerical simulation technology in modern manufacturing engineering. The goal of this course is to help students to grasp basic concepts and main steps in numerical simulation for manufacturing processes systematically, to connect the manufacturing theory with modelling technology, to understand the state of art and tendency of the technology, to

extend the capability of analyzing and solving problems. It will be foundation of digitalization of manufacturing processes that has been developing rapidly.

(3) **【Course Title】** Manufacturing Technology II 制造技术 (2)

【Course Code】 80120723

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 15 Graduate Students

【Instructor】 SHI Wei 石伟

【Course Description】

Manufacturing Technology II is one of courses belonging to the joint master degree program of RWTH Aachen in Germany and Tsinghua University, and open of international students. The main purpose of this course is to teach postgraduate students materials forming mechanism, and production procedure, productivity and cost about material forming techniques which consist of casting, sintering, and metal forming technology. Besides metallurgy and the processing method knowledge, the course also teaches students how to analyze and compare different manufacturing methods by considering dimension accuracy, production efficiency and costing of these methods, and using methods of technology planning. Forming technology is the main part of this course, which includes metallurgical basics in plastic deformation, bulk forming, blanking, and forming tools and tribology. The course is given in English and offered to international students whose majority is Production Engineering, Industrial Engineering, or Mechanical Engineering. The course is given in every week, 3 units per week.

(4) **【Course Title】** Tribology 摩擦学

【Course Code】 70120253

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 20 Graduate Students

【Instructor】 WANG JiaDao 汪家道 TIAN Yu 田煜 SHAO TianMin 邵天敏

【Course Description】

The course is a systematic presentation of tribology fundamentals, and the current state and development trend in tribology research. It mainly consists of three parts including lubrication, friction and wear. Besides the classical tribology contents, it also covers scopes of surface forces, contact mechanics and other current attractive topics in tribology. Additionally, typical tribological instruments and experiments will be introduced to enhance the concepts of the tribology.

20. School of Medicine

(1) **【Course Title】** Management on Public Health Services

卫生事业管理

【Course Code】 74000283

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 10 Undergraduate Students, 50 Graduate Students

【Instructor】 LIU Tingfang 刘庭芳

【Course Description】

Management on Public Health Services is a subject that explores the development rule of health service, the allocating mechanism of health resource, health policy in step with the situation of China, organization management or work method, and the experiences from other countries based on the theory, method and technology of modern management science to improve the people's health status. This course covers the framework of the health organization, health resource management, health policy analysis, health insurance system and all kinds of health affairs.

(2) **【Course Title】** Epidemiology

流行病学

【Course Code】 74000293

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 10 Undergraduate Students, 50 Graduate Students

【Instructor】 ZHANG Linqi 张林琦

【Course Description】

Epidemiology is a population level research on diseases and health science. Course content includes general and special theory. Its general theory describes the basic concepts, basic knowledge and general theory of the Epidemiology. The special part aims to the introduction on the application of epidemiology in disease prevention and control, mainly involving large current human health hazard of infectious diseases and chronic non-infectious diseases, such as cardiovascular diseases, cancer, the respiratory system and the digestive system diseases, sexually transmitted diseases, AIDS, injuries etc.

21. Department of Microelectronics and Nanoelectronics

(1) **【Course Title】** PLL Design and Clock/Frequency Generations

PLL 设计与时钟/频率产生

【Course Code】 80260042

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 40 Graduate Students

【Instructor】 LI Yugen 李宇根

【Course Description】

This course gives insights into phase-locked clock generation as well as the ability of gaining system perspectives and circuit design aspects of phase-locked loop (PLL) for wireless and wireline communications. In the first half of the course, basic theoretical analysis of the PLL and system/circuit design considerations will be discussed. The second half of the course consists of extensive lectures covering practical design aspects in various PLL applications and more advanced topics; frequency synthesis, clock-and-data recovery, delay-locked loops, on-chip testability and compensation, coupling in SoC design, and future challenges.

22. Department of Physics

(1) **【Course Title】** Physics (1)

大学物理 (1)

【Course Code】 10430344

【Credits】 4

【Credit Hours】 64

【Semester】 Spring

【Capacity】 150 Undergraduate Students

【Instructor】 BI Kaijie 毕楷杰

【Course Description】

We introduce Newtonian mechanics of both mass point and rigid body. After that a basic concept of Lagrangian mechanics will be introduced. Besides those, we will introduce the physics of oscillation, fluid, and waves including travelling wave, standing wave and Doppler Effect. In the last several week, we will discuss thermodynamics.

(2) **【Course Title】** Physics (2)

大学物理 (2)

【Course Code】 10430345

【Credits】 4

【Credit Hours】 64

【Semester】 Autumn

【Capacity】 150 Undergraduate Students

【Instructor】 BI Kaijie 毕楷杰

【Course Description】

(3) **【Course Title】** Fundamentals of Physics (2)

基础物理学(2)

【Course Code】 20430234

【Credits】 4

【Credit Hours】 64

【Semester】 Spring

【Capacity】 100 Undergraduate Students

【Instructor】 Jiangshuo 蒋硕

【Course Description】

As the first fundamental course on physics for the physics major and related science or engineering major students, we shall systematically study Mechanics, Special Relativity and Wave Optics, laying a solid foundation for future study of Physics and related subjects.

(4) **【Course Title】** General Relativity

大学物理 (1)

【Course Code】 30430094

【Credits】 4

【Credit Hours】 64

【Semester】 Spring

【Capacity】 40 Undergraduate Students

【Instructor】 BI Kaijie 毕楷杰

【Course Description】

This course is designed to be an introduction to the theory of General Relativity (GR) as developed by Einstein and those who followed him. It is designed for advanced undergraduate students (or starting graduate students) who have already completed some basic physics courses, including an introduction to special relativity. I will develop most or all of the additional mathematical tools required basically from scratch. This is NOT a course on current topics in GR or quantum gravity. Though I plan to touch on some aspects of current research, most of the material covered will be well-established concepts. The textbook I will mostly follow for this course is “Spacetime and Geometry: An Introduction to General Relativity” by Sean Carroll. There is an Asian edition of this book available for about 70 yuan. I will also draw some material from “A First Course in General Relativity” by Bernard F. Schutz. I will NOT always follow either book line by line. One semester is NOT long enough to cover well all topics considered standard in GR. So I will mainly discuss: review of special relativity, equivalence principle, manifolds and tensors, EM field tensor, curvature, formulation of Einstein’s field equations, Lagrangian approach, alternative theories to GR, perfect fluids, cosmological constant, Schwarzschild metric and applications, conformal diagrams, black holes in general.

23. Center for Earth System Science

(1) **【Course Title】** Atmosphere–Ocean Interactions

海气相互作用

【Course Code】 80460072

【Credits】 2

【Credit Hours】 32

【Semester】 Spring

【Capacity】 30 Graduate Students

【Instructor】 Wright Jonathon Stanley

【Course Description】

This course will focus on the physics and climate effects of atmosphere–ocean interactions at a variety of scales. The course will be subdivided into four parts: 1. an introduction to the atmosphere–ocean system and general circulation, including brief reviews of the relevant thermodynamics and dynamics; 2. an examination of boundary layers on both sides of the ocean surface and exchanges of heat, water, salt, and carbon across this boundary; 3. an overview of coupled atmosphere–ocean variability in the tropics and extratropics, including the El Niño–Southern Oscillation, coupled monsoon systems, the Madden–Julian Oscillation, and interannual and decadal variations in the northern Pacific and Atlantic Oceans; and 4. a discussion of the role of atmosphere–ocean interactions in climate change. Special attention will be paid to the mechanisms responsible for modes of coupled atmosphere–ocean variability, the interactions among these modes of variability, and the influences that they exert on global climate.

24. School of Social Sciences

(1) **【Course Title】** Fundamentals in International Political Economics

国际政治经济学基础

【Course Code】 40700573

【Credits】 3

【Credit Hours】 48

【Semester】 Spring

【Capacity】 30 Undergraduate Students

【Instructor】 CHEN Maoxiu 陈懋修

【Course Description】

This introductory undergraduate course provides an overview of the field of international political economy (IPE) to students who have little to no previous background knowledge. The main aim is to help students to understand the interaction between international political and economic systems, forces and actors. The course asks two main questions: first, how do states, social forces and various kinds of institutions affect the flow of economic resources across national boundaries? Second, how do economic forces constrain the behavior of political actors at the international level? The course will also emphasize the importance of economic and political ideas in understanding both international and domestic political and economic systems.