The Undergraduate and Graduate Courses Taught in English and Open to the International Visiting/Exchange Students at Tsinghua University (Fall Semester, 2016)

Note:
(1) The course information provided herein may be subject to change before course registration.
(2) The international visiting/exchange students may choose from both undergraduate and graduate courses.
(3) The courses of a department/school are preferentially open to the exchange students of the department/school.

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1. School of Aerospace

(1)【Course Title】Computational Methods for Reacting Flows
   反应流计算方法
   【Course Code】80310473
   【Credits】3
   【Credit Hours】48
   【Semester】Fall
   【Capacity】30 Graduate Students
   【Instructor】REN Zhuyin 任祝寅
   【Course Description】
   This course focuses on computational methods for flows with chemical reactions. A review of governing equations and fundamental concepts of combustion and turbulent flows is first given. The characteristics of reaction source term and the integration methods for stiff ordinary differential equations (ODE's) governing chemical equations are discussed. The course is then focused on introducing the operator splitting schemes, finite volume and finite difference methods, probabilistic simulation techniques for reacting flows. Properties such as accuracy, stability and implementation will be discussed. Emphasis is made to identify key issues in the applications of the different methods in simulating practical propulsion and power generation systems.

(2)【Course Title】Engineering Mechanics
   工程力学
   【Course Code】20310504
   【Credits】4
   【Credit Hours】72
   【Semester】Fall
   【Capacity】30 Undergraduate Students
   【Instructor】ZHENG Lili 郑丽丽
   【Course Description】
2. School of Architecture

(1) 【Course Title】 Theory and Practice of Regional Architecture
地域建筑理论与实践
【Course Code】 80000891
【Credits】 1
【Credit Hours】 16
【Semester】 Fall
【Capacity】 20 Graduate Students
【Instructor】 LI Xiaodong 李晓东
【Course Description】
The course implements a strong integration between theory in international discourse, and practice in contemporary Chinese architecture. The course is organized in a weekly pattern of one lecture paired with one seminar. For each week there will be one topic. The currently proposed topics are: 1 Classical and Anti-Classical; 2 Autonomy; 3 Critical Regionalism; 4 Events and Sustainability; 5 Centralization and De-Centralization; 6 Reflective Thinking and Innovation; 7 The Representational and the Ontological; 8 The Verticality and the Horizontality.

(2) 【Course Title】 History of Chinese Architecture
中国建筑史
【Course Code】 80000901
【Credits】 1
【Credit Hours】 16
【Semester】 Fall
【Capacity】 20 Graduate Students
【Instructor】 LIU Chang 刘畅
【Course Description】
Development of Chinese Architecture; Cultural Background of Chinese Architecture; Palace; Garden; Urban and Vernacular Architecture.

(3) 【Course Title】 Building Energy Efficiency Diagnostics
大型商业建筑节能诊断方法
【Course Code】 80000942
【Credits】 2
【Credit Hours】 36
【Semester】 Fall
【Capacity】 30 Graduate Students
【Instructor】 XIA Jianjun 夏建军
【Course Description】
Building energy efficiency diagnostics will be mainly focused on the study on commercial building HVAC system and lighting system on-site energy performance investigation, diagnostics and system retrofitting methods introduction. By lecture study and field practicing in the building projects, by the
end of the BEED course, participants should be able to: 1. Understand the present building energy performance in different regions 2. Identify and discuss the key practices of building energy efficiency; 3. Analyze the costs and benefits of incorporation of building energy efficiency measures; 4. Work with architects, designers, builders, building operators, and utilities to improve a building’s energy performance. The lectures will be given by the professors from Tsinghua University (70%) and University of Pennsylvania (30%).

(4)【Course Title】Design Studio I
设计专题一
【Course Code】80001043
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】15 Graduate Students
【Instructor】LI Xiaodong 李晓东
【Course Description】
Design scope of the theme is located in the southwest of the Summer Palace in the Three-hill Five-garden area in BeiJing northwest suburb, reaching BeiWuLu village in the west, the northwest fourth ring road in the south, the Long River in the east, adjacent to the Summer Palace in the north. It includes the south RuYi gate, west gate of the Summer Palace, Back Kiln of the Summer Palace, JingMi canal, the Long River, villages, the South-to-North Water Transfer Channel and proposed "TuanCheng Lake Regulation Pond", the South-to-North Water Transfer Channel garden and modern western suburb tram line etc. We will research, map, and analyze historic, current, and future scenarios of this location in order to propose a new urban relationship between Beijing and the relationship between the various neighborhoods and districts of western Beijing with the this location specifically.

(5)【Course Title】Design Studio II
设计专题二
【Course Code】80001053
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】15 Graduate Students
【Instructor】LI Xiaodong 李晓东
【Course Description】
This 8 weeks course will provide space design training based on architecture or/and urban space design, which should enable students to develop the ability both in theoretical and practical aspect, applying the skills, knowledge and techniques assimilated in the previous architecture course units in an integrated way. This Space Design Studio will consist of lecture courses, seminars, design review, as
well as site survey, providing opportunities to learn from current urban development situation. All topics or issues of the space design studio will be highly appreciated if stemming from the urban public space or architecture in relation with the rapidly urbanized China. The studio system offers a variety of approaches to the process of design, which is considered to be a positive attribute by the students, ensuring scope for debate and discussion. The final assessment is based on the submission and presentation of the space design work.
3. Department of Automation

(1)【Course Title】Network Security
【Course Code】70250332
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】20 Graduate Students
【Instructor】LI Jun 李军
【Course Description】

(2)【Course Title】Fundamentals of Statistical Signal Processing
【Course Code】70250443
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】25 Graduate Students
【Instructor】GAO Feifei 高飞飞
【Course Description】
In this course, we introduce the most comprehensive overview of both the parameter estimation and the signal detection for those involved in the design and implementation of statistical signal processing algorithms. We will (i) cover the important approaches to obtaining an optimal estimator and analyzing its performance; (ii) review the fundamental issues associated with mathematical
You can find almost EVERYTHING related to estimation and detection theory from this course, e.g., Minimum Variance Unbiased Estimation; Best Linear Unbiased Estimation; Maximum Likelihood Estimation; Least Squares Estimation; Bayesian Estimation; Cramer-Rao Lower Bound; Kalman Filters; simple hypothesis testing; Neyman-Pearson Theorem; Bayes Risk; multiple hypothesis testing; composite hypothesis testing to accommodate unknown signal and noise parameters; Detection with non-Gaussian noise, etc. And we will present numerous examples as well as applications to real-world problems.

(3)【Course Title】Advanced Computing Technologies and Applications
【Course Code】80250792
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】15 Graduate Students
【Instructor】CAO Junwei 曹军威
【Course Description】
In 21st century, new challenges in science, research, education and engineering are becoming more and more complicated. Traditional analytical and experimental methods can no longer meet requirements of large scale science exploring and engineering problems. Computation is considered to be the third dimension of science and research and many questions are only now coming within our ability to answer because of advances in computing and related information technology. The course is focused on several typical advanced computing technologies, e.g. cluster computing, grid computing and services computing, from perspectives of theories, methods, tools and applications. The course encourages interactions, demonstration, discussion and experiments and allows a deeper understanding of theories and methods of advanced computing via hand-on experiences of corresponding software toolkits. A better understanding of features and trends of advanced computing is expected via discussion and interactions among students. The course finally aims to improve students with higher creativity, problem-solving ability and software application skills.
4. Department of Automotive Engineering

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

(2) **Course Title** Automotive Engineering I  
【Course Code】70150153  
【Credits】3  
【Credit Hours】48  
【Semester】Fall  
【Capacity】30 Graduate Students  
【Instructor】WANG Xiaofeng 王霄锋  
【Course Description】

(3) **Course Title** Internal Combustion Engines I  
【Course Code】70150203  
【Credits】3  
【Credit Hours】48  
【Semester】Fall  
【Capacity】30 Graduate Students  
【Instructor】MA Fanhua 马凡华  
【Course Description】  

(4) **Course Title** Materials Selection in Mechanical Design  
【Course Code】80150122  
【Credits】2  
【Credit Hours】32  
【Semester】Fall  
【Capacity】30 Graduate Students
(5)【Course Title】Alternative Vehicle Propulsion System
车辆新型驱动系统
【Course Code】80150162
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】30 Graduate Students
【Instructor】ZHANG Junzhi 张俊智
【Course Description】
The subject of this lecture series is alternative concepts for vehicle drive-trains. These lectures deal with the different alternative drive systems, such as unconventional types of combustion engines with the consideration of alternative fuels (alcohol, natural gas, and hydrogen), gas turbines, Stirling engines and fuel cells. Furthermore, these lectures discuss the different types of variable transmissions and power split drive trains. Regenerative drives e.g. electric, flywheel and hybrid drives are a main topic of these lectures. Beside the discussion of the different components (hydraulic machines, electric motors, hydraulic pressure accumulators, batteries, flywheels), possible control strategies (integrated engine-transmission management) are deducted, according to the various drive concepts.

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

(7)【Course Title】Vehicle Control Engineering
车辆控制工程
【Course Code】70150113
【Credits】3
【Credit Hours】48
Based on Control Theory and Vehicle Dynamics, this course will present the control strategies, system design and evaluation method to develop vehicle electronic control devices, and introduce the state of the art and perspectives of vehicle control technology. To introduce the concepts and terminology, the state-of-the-art development, and basic principles of various vehicle control systems. Principles, Rather Than Specifics Will be Emphasized Upon completion of this course, students should be able to follow the literature on these subjects and perform independent design, research and development work in this field.
5. Department of Chemical Engineering

(1)【Course Title】Bioseparation Engineering  
生物分离工程  
【Course Code】70340132  
【Credits】2  
【Credit Hours】32  
【Semester】Fall  
【Capacity】40 Graduate Students  
【Instructor】LIU Zheng 刘铮  
【Course Description】

(2)【Course Title】Chemical Kinetics and Reaction Mechanisms  
化学反应动力学及机理  
【Course Code】80340172  
【Credits】2  
【Credit Hours】32  
【Semester】Fall  
【Capacity】30 Graduate Students  
【Instructor】WANG Dezheng 王德峥  
【Course Description】

6. Department of Chemistry

(1)【Course Title】Chemistry for Sustainable Society
可持续发展社会的化学
【Course Code】40440301
【Credits】1
【Credit Hours】16
【Semester】Fall
【Capacity】70 Undergraduate Students
【Instructor】WANG Meixiang 王梅祥
【Course Description】
This short course is designed specifically for the chemistry students of Tsinghua Elite Program. It is aimed to guide students to scrutinize the importance and contribution of chemistry to humankind and the development of society. It is hoped that the students, after studying the course, will strengthen their interest in chemistry, improve their innovative capacity, and choose chemistry research as their life-time career. This course will discuss a few key issues of chemistry and sustainability of the economic and social development. The topics include: what challenges we are facing in terms of sustainable development, what chemistry can deliver to ensure enough foods and guarantee food safety; chemistry is the devil causing problems of our living environment, or chemistry is the angel to protect our ecosystem and environment; where we can find enough energy to drive our planet; what are the replacement of the fossil resources for chemical industry and manufacture; what chemistry can contribute to improve the quality of life; and the philosophy and the contents of sustainable chemistry.

(2)【Course Title】Introduction to Computational Chemistry
计算化学导论
【Course Code】40440321
【Credits】1
【Credit Hours】16
【Semester】Fall
【Capacity】70 Undergraduate Students
【Instructor】LI Jun 李隽
【Course Description】
In a time of computer revolution, chemistry has become a science with both experiment and theory due to the rapid developments of applying quantum mechanics and relativity mechanics to fundamental chemistry problems. In this course, we will introduce recent developments in theoretical and computational chemistry and the applications in experimental chemistry research.
7. Department of Civil Engineering

(1)【Course Title】Elasticity and Plasticity
    弹塑性力学
【Course Code】70030023
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】40 Graduate Students
【Instructor】CHENG Xiaohui 程晓辉
【Course Description】

(2)【Course Title】Transportation for Tomorrow (C-Campus Course)
    未来交通
【Course Code】20030272
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】30 Undergraduate Students
【Instructor】WU Jianping 吴建平
【Course Description】
“Transportation for Tomorrow” course included in Tsinghua-KTH course
“Creative Learning” is hosted by both Tsinghua University and KTH. The course
is innovative in the teaching mind and approach. Different from the conventional
teaching pattern that focuses on transferring knowledge to students, the course is
based on exploring and researching by interaction between teachers and students.
Students would gather knowledge through discussion in class and self-learning.
Teaching group consists of five teachers from Tsinghua – Jianping Wu, Qing Zhou,
Runhua Guo, Li Li and Yiman Du – and six teachers from KTH - Niki Kringos,
Sebastiaan Meijer, Staffan Hintze, Susanna Toller, Anders Wengelin, Mikael
Nybacka. 15 students will be selected from Tsinghua University and KTH
respectively. Language capability, capability of independent observation and
thinking, teamwork ability constitutes the judging criterion in the selection. The
course aims at training the capability of creative learning within this specific
teaching environment. Likewise, the course will build a new type channel of
communication between teachers and students providing chances for professors
and students to communicate with each other. Teaching pattern is mainly made up
by discussion. During the course, training of capability of observation, raising
questions, analysis and solving question is focused on. In the course, students
would be categorized into 5-6 groups. Each group has 5-6 students, including 2-3
students from KTH and 2-3 students from Tsinghua University, and they will have
a topic related to future transportation. The course lasts 8 weeks. In first 2weeks,
students should raise a question through observation and investigation. In weeks
3-6, the topic will be accomplished by discussion in the whole team. Finally, in
weeks 7-8, seminar and examination in class will be hosted. It’s a brand new exploring course and significant in training of creative learning of students.

(3)【Course Title】Structural Mechanics (2)  
【Course Code】20030142  
【Credits】2  
【Credit Hours】32  
【Semester】Fall  
【Capacity】30 Undergraduate Students  
【Instructor】ZHONG Hongzhi 钟宏志  
【Course Description】  
This course is intended to provide the student majoring in civil, architectural and other related areas skills of structural analysis at an intermediate level. It consists of three major topics: Matrix analysis of structures, Plastic limit analysis and dynamic behavior of structures. The matrix analysis part exposes the student to the elementary skills and procedures in large-scale problems that can only be dealt with using computers. The second topic covers the essential concepts in plastic design of structures. In the third topic, emphasis is placed on the dynamic response analysis of discrete parameter (lumped mass) systems. The behavior and elementary skills of dynamic analysis of discrete parameter systems are studied.

(4)【Course Title】Building Materials  
【Course Code】40030902  
【Credits】2  
【Credit Hours】32  
【Semester】Fall  
【Capacity】30 Undergraduate Students  
【Instructor】WEI Ya 魏亚  
【Course Description】  
This course offers a broad introduction to materials used in civil engineering, including cement, concrete, steel, masonry, asphalt concrete, wood and composites. The characteristics of each type of material are discussed in terms of the following aspects: basic structure and properties of the materials, mechanistic behavior of the material and physical properties, environmental influences, engineering applications etc. Acting as a bridge linking fundamental principles to engineering practice, this course emphasizes on the engineering behaviors of these material systems. Understanding of these behaviors will be approached through detailed examination of the materials’ microstructural characteristics and the associated structure performance. The students will derive benefit from this course in terms of fundamental principles, experiences, and skills.

(5)【Course Title】Traffic Analysis and Design
【Course Code】40030942
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】30 Undergraduate Students
【Instructor】WU Jianping 吴建平
【Course Description】
The course systematically introduces traffic survey methods, road capacity, traffic flow theory, transport modeling, traffic assignments, traffic flow management and traffic simulation theory and technologies, and preliminary introductions of intelligent transport systems, traffic safety and sustainable development of transport. The course will be given with application examples and coursework to deepen and consolidate knowledge, and through reference reading and interactive classroom discussion to increase students' independent thinking and self-learning ability.
8. Department of Computer Science and Technology

(1) 【Course Title】 Combinatorics and Algorithms Design
组合数学与算法设计
【Course Code】 70240384
【Credits】 4
【Credit Hours】 64
【Semester】 Fall
【Capacity】 35 Graduate Students
【Instructor】 ZHAO Ying 赵颖
【Course Description】
This course covers topics in Combinatorics and Algorithms Design. We comprehensively discuss basic concepts, theories, methods, and instances in Combinatorics while focusing on concepts and ideas. Selected topics include: the Pigeonhole Principle, counting, combinations, Polya counting, recurrence relations and generating functions, graph, and linear programming etc. We also discuss basic mathematics concepts in algorithms design including growth of function, Big-O notations and recurrence relations etc., and basic strategies of algorithms design including search, divide and conquer, and greedy etc. Finally, we show examples of algorithms design in Combinatorics, including basic algorithms on Graph, minimum spanning tree algorithms, and algorithms for linear programming etc.

(2) 【Course Title】 Software Development: from Object-oriented to Service-oriented
从面向对象到面向服务的软件开发
【Course Code】 70240393
【Credits】 3
【Credit Hours】 96
【Semester】 Fall
【Capacity】 35 Graduate Students
【Instructor】 XU Bin 许斌
【Course Description】
The content of the course consists of three parts: Part 1 is the object-oriented knowledge in Java programming language, Part 2 is the design of Web application based on Java Enterprise Edition (Java EE), and Part 3 is about web service and service-oriented-architecture (SOA). The goal of the course is to let the students use Java and web service to develop web application.

(3) 【Course Title】 Process and Methods of Software Project Management
软件项目管理过程与方法
【Course Code】 80240543
【Credits】 3
【Credit Hours】 48
【Semester】 Fall
At the end of the course, students should understand basic process and methods of software project management, be familiar with the project management tools. During the practice of software project management, they should be able to integrate the process of software project management and the life cycle of software development, and apply related knowledge to the project management systematically. In this way, they can undertake the software management project confidently.

(4)【Course Title】Topics in Advanced Multimedia Technologies
多媒体前沿技术
【Course Code】80240553
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】25 Graduate Students
【Instructor】WEN Jiangtao 温江涛
【Course Description】

(5)【Course Title】Future Internet Architecture
下一代互联网
【Course Code】80240563
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】25 Graduate Students
【Instructor】LI Dan 李丹
【Course Description】
The development of the Internet makes more and more students get interested in related technologies. The Internet is facing regeneration, and the key technologies of new generation Internet are in dire need of spread. The course aims to enable students further understand and master the key technologies (including technical principles and specific realization) of new generation Internet after an overall understanding, and tentatively cultivate students’ research ability in this field.

(6)【Course Title】Introduction to Distributed Systems
分布式系统导论
This course will introduce the principles of distributed systems as well as some of the current influential distributed systems such as Google File System, MapReduce, Bigtable, Amazon Dynamo etc. The course will emphasize on the internal structure of the corresponding systems and the general principles for designing distributed systems. Here are some of the topics that will be covered in this course: the programming model of distributed systems, distributed locking, data replications, distributed consensus and some issues related to security in real systems.
9. School of Economics and Management

(1) 【Course Title】 Computer Network
计算机网络
【Course Code】 20510082
【Credits】 2
【Credit Hours】 32
【Semester】 Fall
【Capacity】 60 Undergraduate Students
【Instructor】 GUO Xunhua 郭迅华
【Course Description】
This course provides a comprehensive introduction to the concepts and principles about data communication and computer networking, including architectures, protocols, technologies, hardware, software, and applications. Emphasis is put upon the requirement analysis and design of networking applications in organizations, while topics such as management of communications networks, cost-benefit analysis, and evaluation of connectivity options are covered, so as to help students learn to evaluate, select, and implement different communication options within an organization.

(2) 【Course Title】 Public Finance
公共财政学
【Course Code】 30510073 (class 1)
【Credits】 3
【Credit Hours】 48
【Semester】 Fall
【Capacity】 150 Undergraduate Students
【Instructor】 WU Binzhen 吴斌珍
【Course Description】
Public Finance studies the role of the public sector in the economy. In this course, we will study the economic foundations that justify the existence of the public sector, and the economic theory that describes what the role of the public sector should be. We concern when the governments should intervene the economy and how they should do so, including what options they have and what are the effects of the policies. The focus is on the government taxes and spending activities. We will also look at the governments’ policies in the reality, and study how the policies affect individual and corporate decision-making and welfare.

(3) 【Course Title】 Public Finance
公共财政学
【Course Code】 30510073 (class 2)
【Credits】 3
【Credit Hours】 48
【Semester】 Fall
【Capacity】 120 Undergraduate Students
【Instructor】WU Binzhen 吴斌珍
【Course Description】
Public Finance studies the role of the public sector in the economy. In this course, we will study the economic foundations that justify the existence of the public sector, and the economic theory that describes what the role of the public sector should be. We concern when the governments should intervene the economy and how they should do so, including what options they have and what are the effects of the policies. The focus is on the government taxes and spending activities. We will also look at the governments’ policies in the reality, and study how the policies affect individual and corporate decision-making and welfare.

(4) 【Course Title】Data Structures and Algorithms
数据结构
【Course Code】30510273
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】60 Undergraduate Students
【Instructor】WEI Qiang 卫强
【Course Description】
Now we are in an Information era, which roots on a basic fact that, Information Technology (IT) has deeply and widely reshape almost every areas, e.g., production, operation, business, society and personal life. One important characteristic of information era is storing, representing and processing of large-scaled structural data. How to represent and process large-scaled data is the key factor not only for information systems construction, but also for organizations to gain competitive advantages. This course will focus on constructing effective data models using standard data structures as well as efficient processing, which will cultivate the students with the abilities of efficient data modeling and data processing. By the end of the course, the students should: Master the major data structures and efficient processing based on C programming; Master the preliminary abilities to model and analyze some real-world applications; Cultivate the ability for further information analysis, design and implementation. To accomplish this global goal, lecturing is far from enough; case programming and analysis, assignment and Q&A are also important.

(5) 【Course Title】Auditing (1)
审计学（1）
【Course Code】30510393
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】80 Undergraduate Students
【Instructor】LI Dan 李丹
【Course Description】
The course is designed to provide the student with insight about auditing: what it is, why it’s important, what it entails, and why users of financial statements should care about it. It is an introduction to the audit function, audit standards, objectives and procedures, ethical and legal environment, materiality and audit risk, sampling, and reporting.

(6) 【Course Title】General Management
        管理学原理
【Course Code】30510732
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】65 Undergraduate Students
【Instructor】YANG Ling 杨灵
【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.

(7) 【Course Title】Intermediate Microeconomics
        中级微观经济学
【Course Code】30510743
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】250 Undergraduate Students
【Instructor】ZHENG Jie 郑捷 LI Daokui 李稻葵
【Course Description】
The course presents basic theories of microeconomics and its applications. Topics covered include consumer theory, firm theory, market supply and demand, externality and public goods, industrial organization, and general equilibrium. The economic modeling methods and analytical tools are emphasized throughout the course. The purpose of this course is to make students well trained and proficient in analyzing with systematic microeconomics theory. As a core course
in economics, this course has been contiguously endeavoring to keep pace with the leading level. The written materials are English mainly while the oral expression is both in English and Chinese. The lectures delivered by Professor will be in English, the corresponding tutorial classes delivered by TAs will be in Chinese and English.

(8) 【Course Title】Financial Statement Analysis
财务报表分析
【Course Code】30510893
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】90 Undergraduate Students
【Instructor】LI Dan 李丹
【Course Description】
The objectives of this course are to gain a more thorough understanding of financial accounting techniques and to explore the accounting theory underlying such techniques. Assets, revenue recognition, and income items, investments in other companies and stockholders’ equity will be covered in this course. Students will also learn how to apply the skills of financial analysis to realistic situations, such as, valuations decisions or forecasting.

(9) 【Course Title】Business Communication
商务沟通
【Course Code】30510912 (class 2)
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】30 Undergraduate Students
【Instructor】Nancy Han 韩杨郁文
【Course Description】
Business Communication （taught in English）is a course training students to be able to deliver a business presentation effectively and efficiently. The training is very important for students who aim at being successful in the business world. Followings are the course outline that helps students having a specific idea about the course requirement so as to complete this course fruitfully. The course is delivered in English with many training activities which eventually get students to be an efficient business presenter in English. It helps the learner aware of the communication principles and therefore able to apply them to create an efficient and effective business presentation either on a business plan or a proposal. Students develop their project in a group. Therefore, it requires ultimate team work to make the final presentation successful. It also requires the class to give feedback to one another. Being able to work with a team is an important element for a manager’s future leadership. Being able to listen plays an equally
important role. This course equips the students’ presentation ability and listening skill.

(10)【Course Title】Financial Institution
【Course Code】30510962
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】80 Undergraduate Students
【Instructor】PANG Jiaren 庞家任
【Course Description】A well-functioning financial system is crucial to economic growth and development as it promotes efficient capital allocation, provides risk sharing, and reduces transaction costs. This course aims to help students understand the role of the financial system by focusing on its major components: financial markets and institutions. It will discuss the economic foundations of financial markets and management of financial institutions. It will also introduce the development of China’s financial system and compare it with its U.S. counterpart.

(11)【Course Title】Topics on International Accounting
【Course Code】40510093
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】60 Undergraduate Students
【Instructor】HAO Zhenping 郝振平
【Course Description】To understand the development of accounting and financial reporting models in the world, and to enable you to evaluate the reasons and evolution of international accounting harmonization and convergence; To provide you with the key technical issues in international accounting area and their impact on financial reporting, such as accounting for foreign currency transactions, translation of foreign financial statements and accounting for changing prices; To understand some management accounting issues in multinational operations, for instance, the establishment of management control and information system, financial risk management, international taxation, and international transfer pricing. Many of the topics in an international accounting course have a domestic counterpart. However, new factors and complications arise in the international arena. Some of these are (1) laws, practices, customs, cultures, and diversity of competitive circumstances; (2) risks associated with fluctuating exchange rates, differential rates of inflation, and unstable property rights; and (3) variations in taxes and tax
rates. International accounting discusses issues from the perspective of companies that have internationalized their finance and/or operations. It also has a comparative aspect, comparing accounting across countries. It also deals with convergence of worldwide financial reporting standards. This course is designed to provide you with an understanding of the significant issues in international accounting. The teaching approach will be mainly classroom lectures with some discussions and presentations.

(12)【Course Title】Management Systems Simulation
管理系统模拟
【Course Code】40510193
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】50 Undergraduate Students
【Instructor】WEI Qiang 卫强
【Course Description】
Many analytical models and mathematical tools have been used in business decision to improve the operational efficiency and seize the competitive advantage. Since, however, the real world business situation and environment, regarded as a system, is very complex, which results that the traditional analytical methods and tools cannot fit properly. This course will introduce a new methodology – simulation – into the business management systems. As its name says, in complex systems, where the number of related variables is huge and they are also closely interdependent, simulation method is to mimic the real parameters in computer system, using the time-advance mechanism, to generate the evolutionary results over time. In so doing, after enough replications of simulation, statistically confident results could be derived. Clearly, the computational load is extremely high. But, with mainstream personal computer nowadays, this process could be performed efficiently. In this course, we will cultivate the students with the abilities of modeling, simulation and analysis with computer and software. By the end of the course, the students should: 1. Master the methodology of simulation and can modeling complex business systems; 2. Master the abilities of modeling with EXCEL and ProModel. 3. Cultivate the ability for further simulation analysis, design and implement. To accomplish this global goal, lecturing is far from enough; case programming, modeling and analysis, assignment and Q&A are also important.

(13)【Course Title】Introduction to Electronic Business
电子商务
【Course Code】40510842
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】70 Undergraduate Students  
【Instructor】LI Xixi 李希熙
【Course Description】
The central goal of this course is to develop an integrative knowledge of the digital economy. It focuses on the information superhighway as the technological enabler that has dramatically changed the way in which companies orchestrate their value creation. This course, with a strategic perspective in mind, looks into the knowledge-enabled enterprises and the influence of electronic commerce in shaping the rules of modern business environments. From a managerial point of view, the course will delineate the skills and knowledge required in the digital world. Finally, this course also offers a technology perspective that touches upon the underlying IT mechanisms for electronic commerce.

(14)【Course Title】Enterprise Resource Planning  
企业资源规划
【Course Code】40510992
【Credits】2  
【Credit Hours】32  
【Semester】Fall  
【Capacity】40 Undergraduate Students
【Instructor】YI Cheng 易成
【Course Description】
ERP systems are enterprise-wide information systems that integrate various functional operations and streamline business processes. This course aims to introduce the concepts of ERP systems as well as the application, implementation, and management of ERP. In particular, the course will help you to obtain the knowledge of ERP at three levels. 1. At the system level. Through hands-on experience with SAP in lab sessions, you will learn SAP commands and functions. You will be able to handle basic business processes in the SAP environment. 2. At the business process level. You will learn how functional operations interact and coordinate to complete business processes and how ERP can enable and facilitate business process integration. 3. At the organizational level. You will be able to recognize and understand organizational and managerial issues associated with enterprise systems, such as planning, vendor evaluation and selection, as well as system implementation.

(15)【Course Title】Financial Management  
财务管理
【Course Code】40511093
【Credits】3  
【Credit Hours】48  
【Semester】Fall  
【Capacity】90 Undergraduate Students
【Instructor】JIA Ning 贾宁
【Course Description】
Financial strategies encompass those financial decisions that affect the long-run value of the firm. The objective of this course is to build on the concepts of financial management learned in Corporate Finance (1) and other relevant courses to provide a bridge to understanding the underlying principles behind why these decisions are made and to offer explanations for observed behaviors on the part of financial decision makers. Focus will be placed on developing a comprehensive framework of conceptual knowledge that builds on the principle of value maximization. Capital budgeting, business valuation, investment analysis, capital structure, option theory, risk management, and long-term financing are integral parts of this conceptual framework.

(16)【Course Title】International Business
国际商务
【Course Code】40511202
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】90 Undergraduate Students
【Instructor】XIE Zhenzhen 谢真臻
【Course Description】
International Business differs in important ways from business conducted within national borders. It poses additional challenges but also offers new opportunities. This course focuses on the strategic challenges confronting firms that compete in the global economy. Material from strategic management, economics, organizational behavior, and other related areas are covered. Our objective is to have an enhanced understanding of the most fundamental question in international business: What determines the success and failure of companies in an international context? We emphasize the use of analytical tools and concepts but provide many real-world examples. Course projects help students develop their research and writing skills. The course is integrative by design, which leads to some overlap with material taught in other courses. The course topics may not follow the chapters of the textbook.

(17)【Course Title】Investment
投资学
【Course Code】40511423 (class 1)
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】120 Undergraduate Students
【Instructor】WANG Yintian 王茵田
【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 derivatives. 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. A project of portfolio management is specially designed to let students apply the theoretical knowledge to practice.

(18)【Course Title】Investment
投资学
【Course Code】40511423 (class 2)
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】120 Undergraduate Students
【Instructor】LI Minwen 李旻文
【Course Description】
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. We will also examine financial markets in China. 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:
- The risk-return tradeoff in financial markets; computing security risk and return and equity indices.
- Basics of investing mechanism, including buying securities on margin, selling short securities, asset allocation strategies, and active versus passive investment management.
- Overview of different asset classes such as equity, fixed-income securities and derivatives; introduction to the concepts of fixed-income securities and derivatives.
- Measuring portfolio risk and return, forming optimal portfolio using mean-variance analysis, portfolio diversification, deriving efficient frontier.
- The security market line and capital asset pricing model (CAPM)
- Understanding the concepts of financial market efficiency and anomalies; examining evidence on profitable trading strategies in US and around the world.
- Investigating different types of mutual funds and hedge funds; developing performance measures of mutual funds; using these measures to evaluate mutual fund performance in the U.S.

(19)【Course Title】Business Innovation in an Interconnected World  (MBA Course)
全球互联时代的商务创新
Course Code】 80515122
【Credits】 2
【Credit Hours】 32
【Semester】 Fall
【Capacity】
【Instructor】 Prof. CHEN Yubo 陈煜波
【Course Description】
Advances in information technology and globalization have made the world more interconnected than ever. Consumers, firms, media, regulators, investors, and NGOs are becoming increasingly interdependent on each other. Interactions among various stakeholders are playing a critical role in shaping the market landscape. The course introduces a social interaction strategic framework to help companies to manage business innovations to build and sustain their competitive advantage. We will use this framework to analyze both the business model innovations in emerging sectors (e.g., Web 2.0, social media, mobile internet) and corporate business innovations in traditional sectors (e.g., airline, automobile, banking). The objective of this course is to help students develop a cutting edge theoretical framework to anticipate and prepare for the trends that, while novel and less unexplored today, will be mainstream in the next decade.

The career focus of students of this course is likely to include:

- Students planning entrepreneurial ventures
- Students whose careers as managers, investors, or consultants will focus on business innovations.

(20)【Course Title】 China Roots Seminar (MBA Course)
中国根基系列讲座
【Course Code】 80516321
【Credits】 1
【Credit Hours】 16
【Semester】 Fall
【Capacity】 60 Graduate Students
【Instructor】 Prof. Jack LI Jinliang 郦金梁
【Course Description】
Course objectives:
The course provides an overview of China’s social, economic and political system and its challenges. Students may gain industrial insights from invited industry experts, and grasp some unique philosophy deeply rooted in Chinese. A company visit will be arranged to help students to experience real business in China. China Roots Seminar will cover more social and management-specific topics. Different industries will be introduced at both parts.

(21)【Course Title】 Crisis Management (MBA Course)
危机管理
【Course Code】 80511511
From time to time, every organization is confronted with a crisis that draws intense external scrutiny, paralyzes normal operations, and threatens high-level goals. How an organization responds during such a trying episode can profoundly influence the organization's reputation and the willingness of its stakeholders to remain engaged.

This course explores the causes and effects of crisis, as well as how managers can both reduce the probability of encountering crisis and achieve positive outcomes should a crisis occur. Best practices are offered for crisis preparation, crisis communication, and crisis leadership. Examples drawn from China and elsewhere illustrate factors that most influence crisis outcome. Principles of good crisis communications in traditional and social media are presented and practiced in team crisis simulations.

(22)【Course Title】Leadership in A New Era  (MBA Course)  
麦肯锡课程：全球领导力
【Course Code】80515182  
【Credits】2  
【Credit Hours】32  
【Semester】Fall  
【Capacity】200 Graduate Students  
【Instructor】DUAN Zhirong  段志蓉  
【Course Description】  
The course is designed to convey deep insights on new trends across 10 key themes of business functions (strategy, operations, organization, corporate finance, marketing, “big data”, technology, CAPEX, sustainability, macroeconomics) with a field-and-forum approach.

(23)【Course Title】Personnel Assessment and Selection  (MBA Course)  
人才测评
【Course Code】80512922  
【Credits】2  
【Credit Hours】32  
【Semester】Fall  
【Capacity】  
【Instructor】Prof. WANG Lei  
【Course Description】  
This course will address classic theory and recent practice in personnel selection and placement. The course will focus on the prediction of employee
performance and employee selection methodology.
I will lecture for a portion of the class, and will also use group activities, lab exercises etc. to increase your understanding of the topic(s) for that class. In-class activities are designed to enhance your understanding of the topic by providing ‘hands-on experience,’ generating discussion in addition to textbook perspectives, as well as hearing the viewpoints of your classmates. I look forward to an interactive classroom, and am interested in your thoughts and experiences.

Please note, that although the full content of the assigned readings may be used for test purposes, I will not lecture on each chapter in its entirety. I believe our class time will be better spent by adding different learning experiences into the format rather than reiterating what is already stated in the textbook.

(24) 【Course Title】 Strategic Alliance and Cooperative Strategy  （MBA Course）
战略联盟与合作战略
【Course Code】 80514802
【Credits】 2
【Credit Hours】 32
【Semester】 Fall
【Capacity】 10 Graduate Students
【Instructor】 WU Rui 吴蕊
【Course Description】
This course is targeted at graduate students in the program of Master in Management (MiM). As interfirm cooperation has become a norm rather than an exception in business practices, we design this course to prepare graduate students in the skills of utilizing management-related knowledge and of analyzing the dynamics in competitive and cooperative situations among businesses. Combining academic research and case studies, we will discuss topics about strategic alliances including the formation incentives, governance mechanisms, conflict resolutions, and cooperative dynamics under technological innovations.

(25) 【Course Title】 Technology Driven Business Innovation  （MBA Course）
技术驱动商业创新
【Course Code】 80515462
【Credits】 2
【Credit Hours】 32
【Semester】 Fall
【Capacity】 80 Graduate Students
【Instructor】 ZHU Yan 朱岩
【Course Description】
The course is designed to include several speech lecturing sessions. The purpose is to enable the students to understand the real technology driven business
innovation practices through the sessions of the invited speakers from BT and other renowned leading companies and government associations. For this semester, the course will start by introducing the importance of technology in business innovation process, using BT—one of the biggest Information and Communication Technology companies—as the example. BT’s internal approach to research and innovation will be introduced, moreover, how BT establish its research ecosystem through collaborating with universities, industries and start-ups and its practices on identifying and developing new services and technology innovations. There will be the comparison among different innovation strategies deployed by Chinese and International companies. Besides the general knowledge of innovation, there will be sessions explaining how advanced ICT technologies continuously transform different industries, e.g. financial service industries, etc. This course will also introduce the role of Intellectual Property in the world of innovation and technology and how international MNCs maintain their technology/business leading edge by effectively generating and protecting their IPRs. This course will also introduce the future view of industrial innovation from the angle of UK government and the future of industrial research and innovation from CTOs.

(26)【Course Title】Theory of Investment （MBA Course）
投资学
【Course Code】80510312
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】70 Graduate Students
【Instructor】Prof. LI Minwen 李旻文
【Course Description】
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. We will also examine financial markets in China. 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.

(27)【Course Title】Chinese Institution and the Innovations in Business Models
中国制度与商业模式创新 （MBA Course）
【Course Code】80516022
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】
【Instructor】ZHANG Jiayin 张佳音
【Course Description】
(28) 【Course Title】Technology Strategy  (MBA Course)
技术战略
【Course Code】80511412
【Credits】2
【Credit Hours】32
【Semester】Fall
【Instructor】GAO Xudong 高旭东
【Course Description】

(29) 【Course Title】Leadership in A New Era  (MBA Course)
麦肯锡课程：全球领导力
【Course Code】80515182 (2)
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】50 Graduate Students
【Instructor】DUAN Zhirong 段志蓉
【Course Description】
The course is designed to convey deep insights on new trends across 11 key themes of business functions (strategy, operations, organization, corporate finance, marketing, “big data”, technology, CAPEX, sustainability, macroeconomics) with a field-and-forum approach.
10. Department of Electrical Engineering

(1) 【Course Title】 Automatic Control Systems
自动控制原理
【Course Code】30220363
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】30 Undergraduate Students
【Instructor】SHEN Chen 沈沉
【Course Description】
Upon completion students should understand the basic concepts in both classical and modern control theory: characteristics of a linear system, linearization, how to build up mathematical models for linear systems in different mathematical forms such as differential equations, transfer functions and state-space equations, be able to do system analysis (stability and performance assessment), master different tools for doing system analysis (classical time domain and frequency domain methods, state space methods), be able to do system synthesis based on different system description using appropriate tools; understand the differences between continuous and discrete-data control systems, effects of sampling rates and quantization, be able to analysis and synthesis a digital control system including stability and performance assessment using time- and frequency-domain methods, be able to design simple digital controllers either directly using discrete-date controller design methods or using continuous controller design method then converting it into a digital one.

(2) 【Course Title】 Design & Analysis for Electronic Machine System
电子电机设计与分析
【Course Code】40220682
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】30 Undergraduate Students
【Instructor】ZHAO Zhengming 赵争鸣
【Course Description】
The course is about the fundamental theory and design methods of electronic machine system, which covers the definition of electronic machines, the design, performance analysis, transient analysis, and the electromagnetic field analysis of the electronic machines.
11. School of Environment

(1) 【Course Title】 Fundamentals of Environmental Biotechnology
环境生物技术原理
【Course Code】 70050313
【Credits】 3
【Credit Hours】 48
【Semester】 Fall
【Capacity】 25 Graduate Students
【Instructor】 WANG Hui 王慧
【Course Description】
Recently, environmental biotechnology has become a very important, extremely active and exciting research field. As an important part of environmental science and engineering, environmental biotechnology has produced many important effects on it. The contents of environmental biotechnology involves the principles and applied technology of multiple disciplines, such as microbiology, molecular biology, biochemistry and molecular ecology. The goal of this course is to impart the students the basic knowledge on the important principles and advanced technology of environmental biotechnology, and to help students understand how to make use of environmental biotechnology to the practice of environmental science and engineering. The course of environmental biotechnology comprises three parts which will be carried out in different teaching models. The first part is classroom teaching, which mainly focus on introducing principles, methodology and applications of environmental biotechnology. The second part is academic presentation and discussion basing on literature reading. The third part includes two times of field visits to help students understand the contents of the course deeply. The total class hours of the course will be 48, in which the first part is 30 hours and the rest parts will be 8 hours respectively. In the first part of course three teaching units were designed. The first unit mainly focuses on introducing principles of environmental microbiology, evolutionary microbiology, microbial ecology, and other disciplines involved in environmental biotechnology. The second unit addresses methodology of environmental biotechnology, which includes stoichiometry, microbial bioenergetics, microbial kinetics and molecular microbiology techniques. The third unit provides a general introduction of some important applications and development of environmental biotechnology with emphasis of typical biological processes in wastewater treatment.

(2) 【Course Title】 Advanced Water Distribution System and Management
高等网管系统与管理
【Course Code】 80050193
【Credits】 3
【Credit Hours】 48
【Semester】 Fall
【Capacity】25 Graduate Students
【Instructor】LIU Shuming 刘书明
【Course Description】
This course focuses on the establishment and application of water distribution network model. Its main contents covers: Introduction to Water Distribution Modelling; Modelling Theory; Assembling a Model; Water Consumption; Data for Modelling; Introduction to EPANET; Calibration Hydraulic Network Models; Using Models for Water Distribution System Design; Water Quality in Distribution System; and Water System Security. This course emphasizes students’ capacity of using water distribution models and team-working. All students should complete an assignment in this course. The assignment provides a platform to implement a all-stage model establishment and application. Techniques of data collection, digitization, model calibration and model application will be trained through this assignment. The model application lectures focuses on using a calibrated model for network design and network management.

(3)【Course Title】Advanced Water Supply Engineering
高等给水工程
【Course Code】80050203
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】25 Graduate Students
【Instructor】LIU Wenjun 刘文君
【Course Description】
This course provides the modern theoretical knowledge, engineering application and frontier research to the graduates who have the basic knowledge of water supply engineering. The main contents consist of: physical, chemical and microbiological parameters of water quality and their implications; the principle of water quality standards and its development; reaction, mass transportation, and separation principle; adsorption model and application, the biological treatment of oligo-nutrient source water; the advanced oxidation processes and application, membrane separation; modern disinfection principle and application, the control of biological and chemical stability of water in distribution.

(4)【Course Title】Integrated Solid Waste Management
固体废物综合管理
【Course Code】80050273
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】25 Graduate Students
【Instructor】LU Wenjing 陆文静
【Course Title】
Air Pollution Control Technology

【Course Code】80050283
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】25 Graduate Students
【Instructor】WU Ye 吴烨

【Course Description】
This course, Air Pollution Control Technology, primarily focuses on the fundamentals of air pollution control and the typical air pollution control technologies and their engineering practice worldwide. The course is first to discuss topics that are common to all air pollutants, such as the history, characteristics and effects of air pollution, and the laws and regulations for air pollution control. Prior to targeting to the individual air pollutant, the general philosophies of air pollution control are discussed, including the fate and measurements of air pollutants, combustion fundamentals, and general logistics on designing air pollution control systems and equipment. For each of the following four typical air pollutants, particulate matter, VOCs, NOX, and SO2, each major control technology adapted for that pollutant (e.g., electrostatic precipitators for PM, adsorption for VOCs, etc.) and its engineering practice in China and other countries will be detailed discussed. Further, the course covers a typical source, motor vehicles, which play a unique role in air pollution and contribute significantly to urban air pollution problems. Specifically, the mainstream control technologies of evaporative and tailpipe emissions, and those technologies for future autos (such as alternative fuels and advanced vehicle technologies) will be presented respectively.
The field practice will provide international graduate students the opportunity to gain experience in environmental science, engineering and management fields, and help the students learn how to apply theory and principles to the realities of work situations and to develop and expand professional skills. The international students will have internships in some distinguished research institutes, environmental management authorities, environmental companies, facilities including water supply, waste water treatment, air pollution control, and solid waste treatment, and circular economy parks. The students will learn the practical technology and progress of environmental protection in China through the field practice. Finally, the results of field practice will be submitted in hard copy and orally presented.

(7)【Course Title】Challenges for Advanced Water Technology: Global Seminars
国际前沿水处理技术：全球视野下的学习与研讨

(8)【Course Title】Biofilms: Fundamentals to Applications
生物膜基础与应用
Biofilms play an important role in the biological wastewater treatment process. This course relies on the fundamentals and hot-topics in biofilm studies, mainly introducing the characteristics, reaction mechanism and mathematical modeling of biofilms, and advances in biofilm studies and applications in wastewater treatment due to the drive functions in the fields of biotechnologies and sensor technologies. This course aims at the graduate students, who have basic backgrounds in the environmental engineering and science. This course will start with an introduction to biofilms, the biodegradation kinetics of biofilms and mass transport mechanism in the biofilms. Subsequently, this course will especially introduce the architecture, population structure and function of biofilms, then introduce the interpretation of biofilm characteristics based on the microelectrode technology. In the end, the course will cover the mathematical modeling of biofilm, its comparison with suspended microorganisms, and biofilm reactors used for wastewater treatment. The major researchers in biofilm studies will be mentioned in this course. Students will be required to do literature investigation aiming at on a selected researcher and/or topic related to biofilms and give a presentation at the end of the course. The course will provide abundant application cases and include a visit to a biofilm wastewater treatment plant.
12. Department of Hydraulic Engineering

(1)【Course Title】Professional English for Water and River Sciences
水利专业英语
【Course Code】70040291
【Credits】1
【Credit Hours】16
【Semester】Fall
【Capacity】40 Graduate Students
【Instructor】WANG Zhaoyin 王兆印
【Course Description】

(2)【Course Title】Hydraulics (2)
水利学（2）
【Course Code】30040393
【Credits】3
【Credit Hours】56
【Semester】Fall
【Capacity】47 Undergraduate Students
【Instructor】LIN Binliang 林斌良
【Course Description】
Open Channel Steady Flow classification, uniform flow, energy equation, specific energy, gradually varied flow, water surface profiles, backwater analysis Rapid varied flow, hydraulic jump, subcritical, critical, supercritical flow. Open Channel unsteady Flow One-dimensional continuity and momentum equations, two-dimensional continuity and momentum equations, the method of Characteristics Hydraulic Structures Weirs, orifices, sluice gates, spillways. Flow through porous media Governing equations, Darcy's law, Flow through porous media finite element method solutions.
13. Department of Industrial Engineering

(1)【Course Title】Engineering Economy
工程经济学
【Course Code】30160152
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】85 Undergraduate Students
【Instructor】ZHOU Wanshan 朱万山
【Course Description】

(2)【Course Title】International Logistics
国际物流
【Course Code】40160522
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】30 Undergraduate Students
【Instructor】ZHANG Lei 赵磊
【Course Description】
Discuss and study the issues related to international logistics, understand both the commonalities and differences between international and domestic logistics, and learn to apply these concepts in real world applications.

(3)【Course Title】Quality Engineering
质量工程学
【Course Code】70160023
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】50 Graduate Students
【Instructor】WU Su 吴甦、WANG Kaibo 王凯波
【Course Description】

(4)【Course Title】Production Management
生产管理
【Course Code】70160033
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】50 Graduate Students
【Instructor】CHENG Ye 成晔, ZHANG Zhihai 张智海
【Course Description】

(5)【Course Title】Ergonomics
工效学
【Course Code】70160613
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】50 Graduate Students
【Instructor】RAO Peilun 饶培伦
【Course Description】
This lecture covers the basic theory of physiology, psychology and management. It will discuss the following topics like system analysis and optimization of the relations among human, computer and environment and so on. That is to say, the working efficiency and product competition can be improved; on the other hand, the comfortable and safety working environment can be realized.

(6)【Course Title】Introduction to Decision Making
决策方法学
【Course Code】70160513
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】50 Graduate Students
【Instructor】ZHAO Lei 赵磊
【Course Description】

(7)【Course Title】Industrial Practice
工业工程实践
【Course Code】70160591
【Credits】1
This course includes mainly two parts: 1. Manufacturing Industries in China and Industrial Engineering, 2. Business communication under Chinese Culture.

(8)【Course Title】Systematic Product Design and Development
【Course Code】80160283
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】50 Graduate Students
【Instructor】CHENG Ye 成晔, ZHANG Wei 张伟
【Course Description】
The objective of this course is to develop the interdisciplinary knowledge and skills required for systematically executing a given design task and to prepare students qualified for engineering work in modern enterprises. In addition, effective communication skills and ability for synthesizing different perspectives of product design are expected to be developed. Students will be exposed to the theories, methodologies and tools assisting product planning and management, project management, cost management for product development, rationalization of design process, variant development, quality assurance for product development. New tools assisting engineering design work will be introduced. Hands-on design experience and skills will be gained and learned through problem sets. Besides regular lectures, weekly exercises, projects and in-class discussion sessions will be held. An understanding of complex design issues in real-world will be developed through a collaborative design and development project throughout the semester.

(9)【Course Title】Systematic Product Design and Development
【Course Code】80160393
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】50 Graduate Students
【Instructor】DENG Tianhu 邓天虎
【Course Description】
This course is designed to provide an understanding of probability and statistics. In this course, we cover materials such as discrete and continuous random variable, probability distribution, statistical inference, hypothesis testing, experimental
design and linear regression. We focus on applications in the field of production management and supply chain management.
14. Institute of Interdisciplinary Information Sciences

(1)【Course Title】Advanced Computational Economics
高等计算经济学
【Course Code】80470063
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】10 Undergraduate Students, 20 Graduate Students
【Instructor】TANG Pingzhong 唐平中
【Course Description】
The course covers classic and state-of-the-art results on computational and game-theoretic questions related to computational economics.

(2)【Course Title】Hot Topics in Computational Biology
计算生物学热门课题
【Course Code】80470073
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】10 Undergraduate Students, 20 Graduate Students
【Instructor】ZENG Jianyang 曾坚阳
【Course Description】
The course covers research progress and hot topics in Computational Biology and introduces topics including basic computational theory and methods, three-dimensional structure determination and dynamic study of proteins, protein and drug molecular design, Proteomics, and Biology evolution model.

(3)【Course Title】Quantum Electronics & Advanced Atomic Physics
量子电子学和高等原子物理学
【Course Code】80470173
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】10 Undergraduate Students, 30 Graduate Students
【Instructor】Kim Kihwan
【Course Description】
This course provides a practical knowledge of quantum electronics and advanced atomic physics for graduate students who are performing atomic and optical experiments. First, we provide a fairly conventional discussion of Gaussian beams, cavities, nonlinear optics and modulation techniques. Then we seriously discuss the knowledge of atomic structure and atom-photon interaction. Finally we connect them for the amplification of light and spectroscopy for the laser frequency stabilization. A number of very recent developments are discussed, such as
frequency metrology using femtosecond lasers, laser cooling and trapping, and Ion traps.

(4)【Course Title】General Physics (2)
普通物理（2）
【Course Code】20470034
【Credits】4
【Credit Hours】64
【Semester】Fall
【Capacity】40 Undergraduate Students
【Instructor】SUN Luyan 孙麓岩
【Course Description】

(5)【Course Title】Introduction to Computer Science
计算机入门
【Course Code】30470013
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】50 Undergraduate Students
【Instructor】De Melo Gerard Mario Anthony
【Course Description】
Designed to appeal to a diverse audience, this course examines some of the fundamental ideas of the science of computing. Lectures and hands-on assignments cover a wide variety of topics such as hardware organization, the Internet, computer programming, limits of computing, and graphics. No prerequisite.

(6)【Course Title】Machine learning
机器学习
【Course Code】30470104
【Credits】4
【Credit Hours】64
【Semester】Fall
【Capacity】50 Undergraduate Students
【Instructor】WANG Liwei 王立威
【Course Description】
Machine learning studies how computers can learn from experiences. Combining ideas from theoretical computer science and statistics, researchers have developed many learning methods and their applications to computer vision, bioinformatics, natural language processing etc. are highly successful. Machine learning theory addresses the fundamental problems in learning. It studies the power and theoretical limits of learning. The aim is to provide deep understand of learning and the guidance for the development of practical algorithms.
(7) Course Title: Algorithm Design
算法设计
Course Code: 30470124
Credits: 4
Credit Hours: 64
Semester: Fall
Capacity: 45 Undergraduate Students
Instructor: Li Jian 李建
Course Description:
This course gives an introduction to the basics of algorithm, common algorithm design techniques, and the analysis of running time (complexity). The main contents include: tools of algorithm analysis, divide and conquer algorithms, dynamic programming, greedy algorithms etc. algorithm design techniques, and NP complete, randomized algorithms, approximation algorithms and other advanced topics.

(8) Course Title: Quantum Information
量子信息
Course Code: 40470094
Credits: 4
Credit Hours: 64
Semester: Fall
Capacity: 40 Undergraduate Students, 5 Graduate Students
Instructor: Chiribella Giulio
Course Description:
Quantum Information is a course offered to upper level undergraduate students (junior or senior students in the Yao Class, physics, EE, and computer science departments) and graduate students. The course will cover many topics at the forefront of the new field of quantum information science, including, for instance, quantum entanglement theory, quantum cryptography, quantum communication theory, quantum computing models, quantum algorithms and complexity theory, quantum error correction and fault-tolerant computation, physical implementation of quantum computation, communication and networks.
15. International Chinese Language and Culture Center (ICLCC)

(1)【Course Title】Elementary Chinese
初级汉语
【Course Code】60610162 (1)
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】15 Undergraduate Students, 15 Graduate Students
【Instructor】Li Yuan 李园
【Course Description】
For Exchange Students (Beginner).

(2)【Course Title】Elementary Chinese
初级汉语
【Course Code】60610162 (8)
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】15 Undergraduate Students, 15 Graduate Students
【Instructor】Zhang Yi 张怡
【Course Description】
For Exchange Students (Beginner).

(3)【Course Title】Elementary Chinese
初级汉语
【Course Code】60610162 (9)
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】15 Undergraduate Students, 15 Graduate Students
【Instructor】Zhang Yi 张怡
【Course Description】
For Exchange Students (Beginner).
16. Department of International Relations

(1)【Course Title】Ancient Chinese Thought & Modern Rising 中国古代外交思想
【Course Code】80615412
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】35 Graduate Students
【Instructor】YAN Xuetong 阎学通
【Course Description】

(2)【Course Title】Research Design and Writing 研究设计与编写
【Course Code】80700242
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】35 Graduate Students
【Instructor】YAN Xuetong 阎学通
【Course Description】

(3)【Course Title】The Politics of Israel and the Middle East 以色列与中东政治
【Course Code】80700832
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】35 Graduate Students
【Instructor】CHEN Qi 陈琪
【Course Description】

(4)【Course Title】Contemporary Theories in International Politics 当代国际关系理论
【Course Code】70612872
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】35 Graduate Students
【Instructor】ZHANG Chuanjie 张传杰
【Course Description】

(5)【Course Title】Theory and Practice of Chinese Foreign Policy 中国对外政策
(6)【Course Title】Overview of International Energy and Environment Governance
国际能源与环境治理概论
【Course Code】80700602
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】35 Graduate Students
【Instructor】WANG Tao 王韬
【Course Description】

(7)【Course Title】China and Developing World
中国与发展中国家
【Course Code】80700212
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】35 Graduate Students
【Instructor】TANG Xiaoyang 唐晓阳
【Course Description】

(8)【Course Title】Financial Economics and Chinese Financial Markets
金融经济学与中国金融市场
【Course Code】80700612
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】35 Graduate Students
【Instructor】TANG Ke 汤珂
【Course Description】
17. School of Journalism and Communication

(1) 【Course Title】 Corporate Strategies: Case Studies of Chinese and Global Companies
公司策略个案报道
【Course Code】70670182
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】40 Graduate Students
【Instructor】Lee J. Miller
【Course Description】
The course will primarily be taught by use of case studies of important multi-national corporations. These cases will be provided to students.

(2) 【Course Title】 Economics and Accounting Basics for Journalists
新闻记者经济学与会计学基础
【Course Code】70670253
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】40 Graduate Students
【Instructor】HANG Min  杭敏
【Course Description】
This course gives an introduction to principles and basic theories of economics and accounting. It aims at providing students new perspectives and greater understandings about economics and accounting, social activities and financial news reporting. The course instructor will review the history and development of economics and accounting, introduce fundamental theories and analytical tools of macroeconomics and microeconomics. The instructor will also use cases, excerpts from newspapers, articles written by prominent economists for discussion. These methods, together with the brief introductions, will show how basic economic theories can be applied and accounting practices can be understood.

(3) 【Course Title】 Introduction to Mass Communications and Society in Contemporary China  当代中国大众传媒与社会
【Course Code】80670513
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】30 Graduate Students
【Instructor】DAI Jia 戴佳
【Course Description】

(4)【Course Title】News Writing and Multi-media Reporting  
新闻写作与多媒体报道
【Course Code】80670793  
【Credits】3  
【Credit Hours】48  
【Semester】Fall  
【Capacity】40 Graduate Students  
【Instructor】  
【Course Description】
This course contains two main modules: news writing and multi-media reporting. In the news writing module, students are trained with basic knowledge of writing and reporting, with a focus on business news. In the multi-media reporting module, students are trained with basic skill of applying multi-media devices for business report.

(5)【Course Title】Business News Writing and Editing  
财经新闻写作与编辑
【Course Code】80670803  
【Credits】3  
【Credit Hours】48  
【Semester】Fall  
【Capacity】40 Graduate Students  
【Instructor】  
【Course Description】
This course focuses on the business news writing and editing. The tutor will provide students basic knowledge and skills of news writing and editing. Cases will be used in this course to illustrate how business news are presented. Students will also get opportunities to listen to lectures from industrial practitioners.

(6)【Course Title】English News Reporting and Writing  
英语新闻采写
【Course Code】80670862  
【Credits】2  
【Credit Hours】32  
【Semester】Fall  
【Capacity】35 Graduate Students  
【Instructor】SI Jiuyue 司久岳  
【Course Description】
This course teaches fundamental knowledge and skills in English reporting and writing with stress on lead writing and inverted pyramid structure. It also introduces other news styles from AP and Xinhua News Agency. This course prepares students for further development in advanced English news writing.

(7)【Course Title】China-Korea Dialogue
中韩对话
【Course Code】00670313
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】23 Undergraduate Students
【Instructor】CAO Shule 曹书乐
【Course Description】

(8)【Course Title】English News Reporting (1)
英语新闻 (1)
【Course Code】30670502
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】84 Undergraduate Students
【Instructor】Lee J. Miller
【Course Description】

(9)【Course Title】Advanced English News
英语新闻 (3)
【Course Code】30670552
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】84 Undergraduate Students
【Instructor】Richard S. Dunham
【Course Description】
18. School of Law

(1) 【Course Title】 Legal English
法律英语
【Course Code】 40660072
【Credits】 2
【Credit Hours】 32
【Semester】 Fall
【Capacity】 30 Undergraduate Students
【Instructor】 SANG Guoya 桑国亚
【Course Description】

(2) 【Course Title】 Basic Concepts of International Arbitration
国际商事仲裁的基本理论
【Course Code】 80661832
【Credits】 2
【Credit Hours】 32
【Semester】 Fall
【Capacity】 50 Graduate Students
【Instructor】 Gary Born
【Course Description】
The course would provide an overview of the features of international arbitration. Basic concepts from arbitration agreement, jurisdiction of the tribunal, the arbitration process, and the award will be covered. The objective of the module is to provide the students with a comprehensive understanding of the core concepts of international commercial arbitration.

(3) 【Course Title】 Uncitral Model Law and Arbitration Rules
联合国国际贸易法委员会示范法与仲裁规则
【Course Code】 80661963
【Credits】 3
【Credit Hours】 48
【Semester】 Fall
【Capacity】 50 Graduate Students
【Instructor】 Teresa Chang
【Course Description】
The course will discuss the most widely adopted principles and rules in international arbitration. The Model Law was firstly promulgated by UNCITRAL in 1985 and the new Arbitration Rules in 2010.

(4) 【Course Title】 Investment Arbitration
投资仲裁
【Course Code】 80661953
【Credits】 3
Investment arbitration conducted under the UNCITRAL rules or under the auspices of ICSID is increasingly being invoked in relation to disputes involving investor and states. This course will provide an overview of investment law, and special features in Bilateral Investment Treaty and procedures and practice of ICSID.

(5)【Course Title】Basic Chinese
汉语和中国文化（初级）
【Course Code】80661472
【Credits】2
【Credit Hours】
【Semester】Fall
【Capacity】
【Instructor】LI Yanhui
【Course Description】

(6)【Course Title】Advanced Chinese
汉语和中国文化（高级）
【Course Code】80661472
【Credits】2
【Credit Hours】
【Semester】Fall
【Capacity】
【Instructor】LI Yanhui
【Course Description】

(7)【Course Title】International Community As a Legal Community
国际法前沿问题
【Course Code】80660562
【Credits】2
【Credit Hours】
【Semester】Fall
【Capacity】
【Instructor】John Anthony Carty
【Course Description】

(8)【Course Title】Comparative Corporate Governance
比较公司治理
【Course Code】40661512
【Credits】4  
【Credit Hours】  
【Semester】Fall  
【Capacity】  
【Instructor】TANG Xin  
【Course Description】

(9)【Course Title】Foreign Trademark Law  
外国商标法  
【Course Code】80661793  
【Credits】3  
【Credit Hours】  
【Semester】Fall  
【Capacity】TBD  
【Instructor】John Anthony Carty  
【Course Description】

(10)【Course Title】Foreign Copyright Law  
外国专利法  
【Course Code】80661773  
【Credits】3  
【Credit Hours】  
【Semester】Fall  
【Capacity】  
【Instructor】Randall Rader  
【Course Description】

(11)【Course Title】Chinese Arbitration System & Chinese International Arbitrationy  
中国仲裁制度与中国国际仲裁  
【Course Code】80661822  
【Credits】2  
【Credit Hours】  
【Semester】Fall  
【Capacity】  
【Instructor】TAO Jingzhou  
【Course Description】

(12)【Course Title】Chinese Criminal & Criminal Procedure Law  
中国刑法与刑事诉讼法  
【Course Code】80669062  
【Credits】2  
【Credit Hours】  
【Semester】Fall  
【Capacity】
(13)【Course Title】Chinese Civil Procedure & The Conflict of Laws
中国民事诉讼与法律冲突法
【Course Code】80661763
【Credits】3
【Credit Hours】
【Semester】Fall
【Capacity】
【Instructor】CHEN Weizuo
【Course Description】

(14)【Course Title】Chinese Commercial Law in Practice
中国商事法律实践
【Course Code】80661902
【Credits】2
【Credit Hours】
【Semester】Fall
【Capacity】
【Instructor】TAO Jingzhou
【Course Description】

(15)【Course Title】Chinese Contract Law
中国合同法
【Course Code】80669152
【Credits】2
【Credit Hours】
【Semester】Fall
【Capacity】
【Instructor】ZHANG Mo
【Course Description】
19. School of Life Sciences

(1)【Course Title】Introduction to Life Sciences
现代生物学导论
【Course Code】10450072
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】100 Undergraduate Students
【Instructor】YANG Yang 杨扬
【Course Description】
This introductory course includes the fundamental principles of biochemistry, genetics, molecular biology, and cell biology. Biological function at the molecular level is particularly emphasized and covers the structure and regulation of genes, as well as, the structure and synthesis of proteins, how these molecules are integrated into cells, and how these cells are integrated into multicellular systems and organisms. In addition, each version of the subject has its own distinctive material. All these knowledge are applied to more advanced subjects, like immunology, neurobiology, endocrinology and human behavior. This course also focuses on the exploration of current research in cell biology, immunology, neurobiology, genomics, and molecular medicine.

(2)【Course Title】Microbiology
微生物学
【Course Code】30450263
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】180 Undergraduate Students, 5 Graduate Students
【Instructor】CHEN Guoqiang 陈国强
【Course Description】
Microbiology is a compulsory course for students in biology department. This course covers multiple disciplines in microorganism, molecular biology, biochemistry, immunology and microbial diseases. Students taking this course will learn systematic knowledge of microorganism, as well as basic experimental skills. The most popular book Biology of Microorganisms for North American college students is used in this course. Biology of Microorganisms will be updated every two years. New knowledge and technique in microbiology will be added in each update. It is very helpful for student to improve their knowledge and scientific understanding of microbiology.

(3)【Course Title】Biochemistry (2)
生物化学（2）
【Course Code】30450444 (1)
Biochemistry II is divided into two parts. The first part, which include Chapter 13-23, is bioenergetics and metabolism. The second part, which include Chapter 24-27, is information pathways.

(4)【Course Title】Biochemistry (2)
生物化学（2）
【Course Code】30450444 (2)
【Credits】4
【Credit Hours】64
【Semester】Fall
【Capacity】135 Undergraduate Students
【Instructor】LI Zhen 李珍
【Course Description】
Biochemistry II is divided into two parts. The first part, which include Chapter 13-23, is bioenergetics and metabolism. The second part, which include Chapter 24-27, is information pathways.

(5)【Course Title】Molecular Basis of Human Diseases
重大疾病的分子机制
【Course Code】40450263
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】70 Undergraduate Students
【Instructor】LI Peng 李蓬
【Course Description】
This course aims to provide students with in-depth knowledge of the basic mechanisms of common human diseases such as cancer, diabetes, obesity, atherosclerosis, Alzheimer’s disease etc., and to prepare them for future translational research. The course focuses on the current molecular mechanisms underlying the pathogenesis of each disease. There will be extensive discussion on results from current cutting-edge research. Prospective students should have basic knowledge of biochemistry, molecular and cell biology and immunology before registering for this course. Brief knowledge on human physiology and the pathogenesis of each disease will be introduced but students are expected to read extensive reference paper and textbook to understand the content of the lecture.
20. School of Materials Science and Engineering

(1) 【Course Title】 Engineering Materials
工程材料
【Course Code】 20350042 (4)
【Credits】 2
【Credit Hours】 36
【Semester】 Fall
【Capacity】 30 Undergraduate Students
【Instructor】 SHAO Yang 邵洋
【Course Description】

(2) 【Course Title】 Electron Microscopy
电子显微分析
【Course Code】 40350033
【Credits】 3
【Credit Hours】 48
【Semester】 Fall
【Capacity】 100 Undergraduate Students
【Instructor】 ZHANG Xiaozhong 章晓中
【Course Description】
The mechanical, physical and chemical properties of materials are determined by the microstructure, phase and composition of the materials. Electron microscopy is used to know the microstructure, phase and composition of the materials in a small area by use of the information generated by the interaction of electron and materials. The course is mainly composed of 39 hours lectures and 3 lab sessions. The teaching language is English.

Course contents
• Basic electron optics
• Interaction of electron and materials
• Transmission electron microscopy (electron diffraction, electron diffraction contrast image)
• Scanning electron microscopy and microanalysis
• Scanning probe microscopy (STM, AFM)
• Other electron microscopy methods (HREM, NED, CBED, EELS)
• Latest development of electron microscopy

Lab sessions
1. Sample preparation
2. Electron diffraction and TEM imaging
3. SEM imaging and EDS
21. Department of Mechanical Engineering

(1)【Course Title】Manufacturing Technology I
制造技术 (1)
【Course Code】70120223
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】20 Graduate Students
【Instructor】RONG Yiming 融亦鸣
【Course Description】
The course ‘Manufacturing technology’ is co-lectured by Prof. Yiming Rong and Dr. Xuekun Li to the students major in mechanical engineering. This course gives the students a fundamental and in-depth understanding of the basics in manufacturing engineering and its development, including the manufacturing process planning, precision manufacturing, and non-traditional manufacturing. The lectures are given in English, and focuses on the learning through interpreting and team-working on real word projects. Therefore, the course could cultivate the students with the international vision, team-work capability, and the innovative thinking.

(2)【Course Title】Machine Design Process
机械设计进程
【Course Code】70120233
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】35 Graduate Students
【Instructor】ZHAO Jingshan 赵景山
【Course Description】
This lecture is opened particularly for Tsinghua-Aachen Dual Master Degree Program in mechanical engineering. But it is also opened for all postgraduate students in Tsinghua University.

(3)【Course Title】Computer-Aided Tissue Engineering (CATE)
计算机辅助组织工程
【Course Code】80120612
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】10 Undergraduate Students, 30 Graduate Students
【Instructor】SUN Wei 孙伟
【Course Description】
Introduction to Computer-Aided Tissue Engineering (CATE) is designed for graduate and senior undergraduate students in engineering and bioengineering major who are interested in acquiring the knowledge and skill in utilizing computer-aided technologies for tissue engineering application. The course will introduce: 1) the engineering and bioengineering aspect of tissue regeneration; 2) basics of computer-aided design, computer-aided engineering, and computer-aided manufacturing (CAD/CAM/CAE); 3) knowledge on the use of integrated CAD/CAE/CAM technology in tissue engineering application; and 4) a hand-on experience on using enabling CAD, medical imaging processing and three-dimensional reconstruction software, and solid freeform fabrication system for tissue scaffold design, modeling, simulation, and freeform fabrication.

(4) 【Course Title】 Fundamentals of Finite Element Method for Engineers
    工程有限元法基础
    【Course Code】 80120742
    【Credits】 2
    【Credit Hours】 32
    【Semester】 Fall
    【Capacity】 20 Graduate Students
    【Instructor】 CHANG Baohua 常保华
    【Course Description】
    This course covers both fundamental theories and engineering applications of finite element method (FEM). By means of lectures in class, projects on computers, and solutions to practical engineering problems, the students are enabled to learn the fundamental mathematical and mechanic theories of finite element method, and obtain the capabilities of modeling and analyzing in handling the practical engineering problems with finite element method.

(5) 【Course Title】 Advanced control of mechatronic systems
    精密机电系统的先进控制
    【Course Code】 80120772
    【Credits】 2
    【Credit Hours】 32
    【Semester】 Autumn
    【Capacity】 20 Graduate Students
    【Instructor】 ZHANG Zhen 张震
    【Course Description】
    This is a new graduate course taught in English within Mechanical Engineering, Automatic Control or other related areas. Combining precision machine design and electrical knowledge, the course will emphasize precision mechatronic system design and servo control techniques. Applications from automotive industry to advanced manufacturing will be covered, and the approach of design, modeling and control will be emphasized throughout the course.
22. School of Medicine

(1)【Course Title】Principles of Pharmacology
药理学原理
【Course Code】34000433
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】30 Undergraduate Students
【Instructor】XIAO Bailong 肖百龙
【Course Description】

(2)【Course Title】Management on Public Health Services
卫生事业管理
【Course Code】74000283
【Credits】3
【Credit Hours】48
【Semester】Fall
【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.

(3)【Course Title】Epidemiology
流行病学
【Course Code】74000293
【Credits】3
【Credit Hours】48
【Semester】Fall
【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, and injuries etc.

(4) 【Course Title】 Health Communication  
健康传播  
【Course Code】 74000373  
【Credits】 3  
【Credit Hours】 48  
【Semester】 Fall  
【Capacity】 10 Undergraduate Students, 50 Graduate Students  
【Instructor】 LI Xiguang 李希光  
【Course Description】  
This course gives a firm foundation in planning and delivering messages and understanding health communications to create higher levels of health literacy within a society as a means to inform and influence individual, community and government decisions that enhance health.
23. Department of Microelectronics and Nanoelectronics

(1)【Course Title】Integrated Circuit Fabrication Processes
微电子工艺技术
【Course Code】30260112
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】40 Undergraduate Students
【Instructor】WU Huaqiang 吴华强
【Course Description】
Integration density and performance of digital and analog integrated circuits have undergone an astounding revolution in the last few decades. Although innovative circuit and system design can account for some of these performance increases, technology has been the main driving force. This course will examine the basic micro fabrication process technologies that have enabled the integrated circuit revolution and investigate newer technologies. The goal is to first impart a working knowledge of the methods and processes by which micro and nano devices are constructed, and then teach approaches for combining such methods into process sequences that yield arbitrary devices. Although the emphasis in this course is on transistor devices, many of the methods to be taught are also applicable to MEMS and other micro-devices. This course is designed for students interested in the physical bases and practical methods of silicon VLSI chip fabrication, or the impact of technology on device and circuit design.

(2)【Course Title】Digital Integrated Circuit Analysis and Design
数字集成电路分析与设计
【Course Code】40260173
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】40 Undergraduate Students
【Instructor】LIU Leibo 刘雷波
【Course Description】
Based on the knowledge of digital circuit and logic design and semiconductor devices, this course is dedicated in introducing the fundamental knowledge and technologies of the digital integrated circuit analysis and design, therefore make a good preparation for the following corresponding courses.

(3)【Course Title】Communication Systems and Circuits
通信系统与电路
【Course Code】40260223
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】40 Undergraduate Students
【Instructor】LI Yugen 李宇根
【Course Description】
This course gives insights into analog/digital communication systems with practical circuit design examples. Students are expected to learn both system and circuit design perspectives in modern communication IC design.

(4) 【Course Title】Introduction to Quantum Information Science
量子信息学引论
【Course Code】40260262
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】35 Undergraduate Students, 5 Graduate Students
【Instructor】CHEN Wei 陈炜
【Course Description】
This course will introduce the main ideas and techniques of the field of quantum computation and quantum information. One will learn the background material in computer science, mathematics and physics necessary to understand quantum computation and information. Latest progress in quantum information process will be introduced and discussed as well.
24. Department of Physics

(1) 【Course Title】 Physics (2)
    大学物理 (2)
    【Course Code】 10430354
    【Credits】 4
    【Credit Hours】 64
    【Semester】 Fall
    【Capacity】 180 Undergraduate Students
    【Instructor】 BI Kaijie 毕楷杰
    【Course Description】

(2) 【Course Title】 General Relativity
    广义相对论
    【Course Code】 30430094
    【Credits】 4
    【Credit Hours】 64
    【Semester】 Fall
    【Capacity】 40 Undergraduate Students
    【Instructor】 BI Kaijie 毕楷杰
    【Course Description】
25. School of Social Sciences

(1)【Course Title】The Principles of Area Studies
    地区研究
    【Course Code】30700242
    【Credits】2
    【Credit Hours】32
    【Semester】Fall
    【Capacity】30 Undergraduate Students
    【Instructor】CHEN Maoxiu 陈懋修
    【Course Description】
    This course will focus on area studies research with a particular emphasis on Latin America. In particular it will touch on the politics, economics and social problems both in historical and contemporary Latin America. The course will also pay special attention to Latin America’s relations with China and the United States.
26. Department of Thermal Engineering

(1) 【Course Title】 Optimization of Energy Systems
【Course Code】 80140262
【Credits】 2
【Credit Hours】 32
【Semester】 Fall
【Capacity】 30 Graduate Students
【Instructor】 LIU Pei 刘培
【Course Description】
Energy systems appear in every single stage of energy conversion, and their performances and efficiency decide the overall energy utilization efficiency of a society. There exist many optimization issues in planning, design, and operation of energy systems. Solving these problems would help to increase the overall energy utilization efficiency, thus reduce energy consumption, air pollution and greenhouse gas emissions. An energy system usually comprises many sub-systems or sub-processes, and optimization of energy systems is mainly about how to integrate these sub-systems or sub-processes, so that they can work together with each other with enhanced overall efficiency. These sub-systems or sub-processes are usually nonlinear and difficult to model or optimize. In this course, we will cover state-of-the-art optimization methods, and illustrate how to apply these methods in real life problems via case studies.

(2) 【Course Title】 Numerical Methods in Heat Transfer
【Course Code】 80140032
【Credits】 2
【Credit Hours】 32
【Semester】 Fall
【Capacity】 25 Graduate Students
【Instructor】 DAVID MICHAEL CHRISTOPHER
【Course Description】
Course Objectives:
* To study numerical methods used for solving the Navier-Stokes equations and the energy equation for laminar and turbulent flow in various geometries.
* To introduce widely-used commercial software used to solve the Navier-Stokes and energy equations (Fluent)
Course syllabus:
I. Types of Governing Equations and Boundary Conditions
II. Conduction Heat Transfer
   A. Steady State One-Dimensional Conduction Finite Difference Concepts
   B. Two-Dimensional Conduction Finite Difference Concepts
   C. Boundary Fitted Coordinates
D. Transient Conduction  
E. Commercial Heat Transfer Software, Fluent  
F. Grid generation with Gambit  

III. Convection Heat Transfer  
A. Governing Equations  
B. Turbulence  
C. Natural Convection Heat Transfer  
D. Convective Heat Transfer Analyses using Fluent  
E. Convergence considerations  

IV. Advanced Topics  
A. Radiation  
B. Two-Phase Flow (VOF method)  
C. Porous Media  
D. Periodic Flows (turbomachinery)  

Grading:  
30% Homework  
30% Research project  
40% Final exam

(3)【Course Title】Principles of Coal Combustion Pollutant Formation and Control
燃煤污染形成和控制原理
【Course Code】80140072  
【Credits】2  
【Credit Hours】32  
【Semester】Fall  
【Capacity】20 Graduate Students  
【Instructor】ZHUO Yuqun , 禚玉群  
【Course Description】Coal is the most important primary energy source in China. Its related pollution is also one of the biggest challenges in environment protection in China and even the world. This course covers all the major pollutants formed during coal combustion, including SO2, NOx, particulate matters, trace elements, and CO2, and focuses on:  
• the environmental impacts of each pollutant;  
• the fundamentals of pollutant formation in and after coal combustion;  
• the mechanisms of pollutant removal and corresponding emission control technologies;  
• the pros and cons of each technology in application;  
• and, the future trends of emission control;
The aim of the course is to give students a comprehensive yet in-depth view on the environment protection efforts made by Chinese power industry.

(4) 【Course Title】Principles of Coal Combustion Pollutant Formation and Control 火焰与气体燃烧
【Course Code】80140172
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】12 Graduate Students
【Instructor】ZHANG Hai, 张海
【Course Description】
The course is on combustion science and technology, focusing on the flame and gas combustion. It covers and mathematically describes in detail various fundamental flame phenomena. It also emphasizes on chemical kinetics, which is essential to understand the non-equilibrium combustion processes and control mechanisms. The course not only covers the basic laws and phenomena related to chemical reaction, reaction rate and path, but also illustrates the importance and complexity of the role of chemical kinetics in combustion examples. The roles of chemical kinetics, together with molecular transport, aerodynamics, heat and mass transfer are discussed for the flame structure and dynamics of the laminar, turbulent, premixed and non-premixed flames. Through the course study, students are expected to more deeply understand the fundamentals of flames and gas combustion, including the reaction mechanisms and physical insights in the processes of flame propagation, ignition, stabilization and extinction, and pollutant formation. The course is divided into 11 chapters.
The first chapter is a general introduction of the course. Chapter 2 reviews equilibrium thermodynamics which relates the initial and final states of a chemical–reacting thermodynamic system; Chapter 3 examines the mechanisms and rates of these reactions, and illustrates the importance of the role of chemical kinetics in combustion with the examples of oxidation processes of some conventional fuels; and Chapter 4 discusses the non-equilibrium processes of heat, mass and momentum transport which non-uniformities in temperature, concentration and velocity exist in the flow, Chapter 5 presents the general governing equations for chemical-reacting flows and their application in some special cases.
Chapter 6 starts our study of combustion system by examining the structure of diffusion flames. In Chapter 7, we study the physical and mathematical description of the flame structure, laminar flame speed and its measurements of premixed flames, and discuss the principles of flame stabilization. In Chapter 8 the critical phenomena of ignition and extinction are analyzed, with physical and mathematical description. The aerodynamic response of convective and diffusive non-uniformities is studied in Chapter 9. Chapter 10 studies the flames in the
turbulent flow. It discusses the turbulent effect on the flame structure, propagation and stabilization of premixed and non-premixed flames.
The course ends with Chapter 11 of the NOx Formation and Control, an application example of chemical kinetics and gas combustion.

(5)【Course Title】Gas Turbine: Key Technologies and Application
燃气轮机关键技术应用
【Course Code】80140232
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】20 Graduate Students
【Instructor】REN Jing，任静
【Course Description】
The course is aimed to provide the information of the key technologies regarding the stationary power generation gas turbine, and other turbine based systems aimed at zero-emission. The course will start with a short introduction to the history of the gas turbine and the clean energy system. The main part of the course includes the key technologies of turbine cooling, combustor and high temperature materials. The turbine system economics and operation is provided as the end part of the course to build up an overview concept of the gas turbine for the students. During the course, the students is asked to develop their own ideas on the key technologies of the gas turbine based on the innovation methodologies (Reverse engineering/SCAMPER/Six Hats and so on). As a main part of the course, the selected idea will be manufactured and tested on the test rig by the students in group. The general outline of the course is as following:

Introduction (history and features of the gas turbine)
Clean Energy System
  2.1 Simple and Combined Cycle
  2.2 Integrated Coal Gasification Combined Cycle (IGCC)
  2.3 Zero-emission Power (Oxyfuel, Hydrogen)
3. Key Technology of Turbine Cooling
  3.1 Basic Concept of Turbine Cooling
  3.2 Enhanced Internal Cooling
  3.3 Enhanced External Cooling
  3.4 Coupled Aero thermal Optimization
  3.5 Cooling idea: generation, evaluation and realization
4. Key Technology of Combustor
  4.1 Type and Feature of the Conventional Combustor
  4.2 Pre-mixed Combustion
  4.3 Multi-swirl Combustion
5. High Temperature Materials
  5.1 Super Alloy Development and Performance
5.2 Protective Coating-Bond Coat and Top Coat  
5.3 Failure Mechanisms of Coating  
6. Turbine System Economics and Operation (RAM)  
   6.1 The Power Market Drivers  
   6.2 Operating Strategies and Options

(6)【Course Title】Radiative Heat Transfer in Participating Media
辐射介质传热理论与应用
【Course Code】80140242
【Credits】2
【Credit Hours】32
【Semester】Fall
【Capacity】20 Graduate Students
【Instructor】ZHOU Huaichun , 周怀春
【Course Description】
Radiative heat transfer is the main heat transfer mode in high temperature circumstances, especially in traditional energy utilization and power generation industry, as well as in modern technology fields such as utilization of solar energy as renewable energy resources, biomedical diagnostics via optoelectronic technologies, and is related to the key issue of global warming where the radiative heat from the sun transfers through the atmospheric space of the earth. In this course, the basic concepts and laws on radiation are briefly introduced, and then four major parts are organized to cover the main aspects of the topics of the course. The first part deals with the concepts, theory, and simplifications related to traditional radiative heat transfer issues, such as the Radiative Transfer Equation (RTE) and the simplifications at some extreme cases, and optically-thin and –thick media.

The second part focuses on the solution of RTE numerically. This part is very useful for students to analyze qualitatively and quantitatively the radiative heat transfer problems in practice. Main methods, such as Discrete Ordinate method (DOM), Monte Carlo method (MCM), and DRESOR method, will be described fundamentally with computation codes for simple cases.

The third part is radiative properties of gases, particles and particle cloud suspended in the space, and solid surfaces. For the gas radiative properties, the development of high-resolution spectral databases, the main spectral models such as Narrow-Band model, Wide-Band model and Global-Band model are introduced, focusing on the Statistical Narrow-Band (SNB) model. For the radiative property of particles, the Rayleigh scattering theory, the Mie theory, and the property of particle cloud, are briefly outlined. For the surface property, the influence of roughness is emphasized.

The fourth part is given for the application of radiative heat transfer in traditional energy and power industry, and some new technology fields. The first area is the radiative transfer in gradient refractive index media where the change of transferring direction of radiation plays a key role and should be taken account for.
The second area is the radiative transfer in combustion processes, which is the main power source in thermal engineering, such as boilers, furnaces, inner combustion engines, and gas turbines. As an inverse radiative transfer problem, radiative images are used to reconstruct the two- or three-dimensional temperature distributions inside boilers and furnaces.

(7)【Course Title】Combustion Chemistry
【Course Code】80140333
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】12 Graduate Students
【Instructor】YOU Xiaoqing, 游小清
【Course Description】
This course is to provide students with the understanding of the fundamental and application of combustion chemistry with topics ranging from a review of thermodynamics, thermochemical properties, basic quantum and statistical mechanics, reaction mechanisms and modeling, transition state theory, combustion kinetic model development and validation, fundamental combustion experiments, to surrogate fuels and kinetic mechanism for practical fuels. The Course focuses on the development, validation and analysis of the combustion kinetic models, which will help students advance the understanding of combustion at molecular level and learn the frontier of the combustion kinetic research.

1. Introduction (2)
2. Basic concepts in quantum chemistry and statistical mechanics (6)
   2.1 Valence bond theory and molecular orbital theory
   2.2 Chemical bonds in organic molecules
   2.3 Group additivity and bond energy
   2.4 Statistical mechanics description of thermochemical properties
3. Chemical kinetics and reaction rate rules (8)
   3.1 Chemical reaction rate (reaction type, the law of mass action, chain reaction, the Arrhenius law)
   3.2 Chemical reaction mechanism (explosion limit of hydrogen, NTC behavior)
   3.3 Collision theory
   3.4 Transition state theory
   3.5 Unimolecular reaction and RRKM theory
4. Combustion kinetic model development (8)
   4.1 Reaction network (low temperature, high temperature)
   4.2 Reaction rate determination
   4.3 Thermal database and transport database
   Mid-term exam
5. Combustion kinetic model validation – homogeneous systems (6)
5.1 Jet-stirred reactor
5.2 Flow reactor
5.3 Shock tube/ Rapid compression machine
6. Combustion kinetic model validation – non-homogeneous systems (8)
   5.4 Premixed flame
   5.5 Coflow / counterflow nonpremixed flame
   5.6 Combustion bomb
   5.7 Experiments for elementary chemical steps
7. Combustion kinetic mechanisms for practical fuels (10)
   7.1 Surrogate fuels
   7.2 C0-C4 core mechanism
   7.3 Kinetic mechanism for surrogate fuels
   7.4 Kinetic mechanism for biofuels
   7.5 Kinetic model for pollutant formation

(7)【Course Title】Combustion Chemistry
    气体物理及非平衡现象
【Course Code】80140363
【Credits】3
【Credit Hours】48
【Semester】Fall
【Capacity】12 Graduate Students
【Instructor】XU Haitao，徐海涛
【Course Description】
This course covers the physical foundation and mathematical treatment that lead to
continuum descriptions of flows of microscopically discrete particles, including
both molecules and inelastic hard spheres. Materials taught include introductory
kinetic theory, molecular velocity distribution at equilibrium (Maxwellian
distribution), molecular collisions and the mean free path, molecular transport,
non-equilibrium kinetic theory, the Boltzmann equation, binary collisions and
collision integrals, the Chapman-Enskog solution of the Boltzmann equation,
successive approximations, Euler Equation, Navier-Stokes equation, transport
coefficients.

Chapter 1: Introduction of the course
   1.1 Objectives, contents, evaluation, etc.
   1.2 Review of mathematical tools
Chapter 2: Introductory kinetic theory
   2.1 Distribution of molecular velocity function
       molecular model, velocities, the distribution of molecular velocities,
       mean values
   2.2 Flow of molecular properties
   2.3 Pressure, temperature and internal energy
Chapter 3: Boltzmann equation
3.1 Derivation of Boltzmann equation
3.2 Molecular encounters and dynamics of binary collision
3.3 Equilibrium solution of Boltzmann equation and Maxwellian velocity distribution

Chapter 4: Introduction of molecular transport
  4.1 Mean free path, collision frequency and persistence of velocity
  4.3 Elementary theories of the transport phenomena

Chapter 5: The non-uniform state of a simple gas
  5.1 General method of solution of Boltzmann equation
  5.2 The first approximation, Euler equation
  5.3 The second approximation, Navier-Stokes equation

Chapter 6: Transport phenomena
  6.1 Transport coefficients: shear and bulk viscosity
  6.2 Transport coefficient: thermal conductivity
  6.3 Transport coefficients: comparison of theory with experiment

Chapter 7: Gas mixture (6)
  7.1 Gas mixture at equilibrium (1)
  7.2 The non-uniform state of a gas mixture (2)
  7.3 Transport coefficients of a gas mixture (3)