COURSE CATALOG

2019-2020 Spring Semester

Yanqihu Campus

International College of UCAS

General Introduction

1. Course Selection System-for Professional Courses Only

This course selection system is for students registering professional courses online. From this semester all the courses will be opened for all students including Chinese students and International students. Because the capacity of every course is limited and first come first select, this system will be opened during Jan, 1st –Jan. 15th, 2020 and the students from International College can register first. Please use the google chrome or 360 browsers. Do not choose two courses schedule overlap.

Website: http://ic-course.ucas.ac.cn/
Username: Your email address
Original password: 123456

Date	Process
Jan. 1-Jan. 15	Register professional courses in Course Selection System
Feb. 24	Courses start
Feb. 24-Mar.6	Sign up in the classes for confirmation the courses
Jun. 12	Language classes end
Jun. 16	All the professional courses end

Vocations: Tomb-sweeping Day lasts from Apr.4th-Apr.6th; Labor Day lasts from May.1st-May. 5th.

2. General Degree Requirements for Doctors

The requirement of UCAS for Doctor Degree is to get at least 9 credits before graduation. 4 credits should be from Professional Degree Courses. But students from institutes need to check out the requirements of your own institutes. Each institute has different requirement of credits. Please contact the Educational Administration of your own institutes first.

3. General Degree Requirements for Masters

The requirement of UCAS for Masters is to get at least 30 credits before graduation. At least 13 credits should be from Professional Degree Courses. Every master student needs to take at least 2 credits from optional courses.

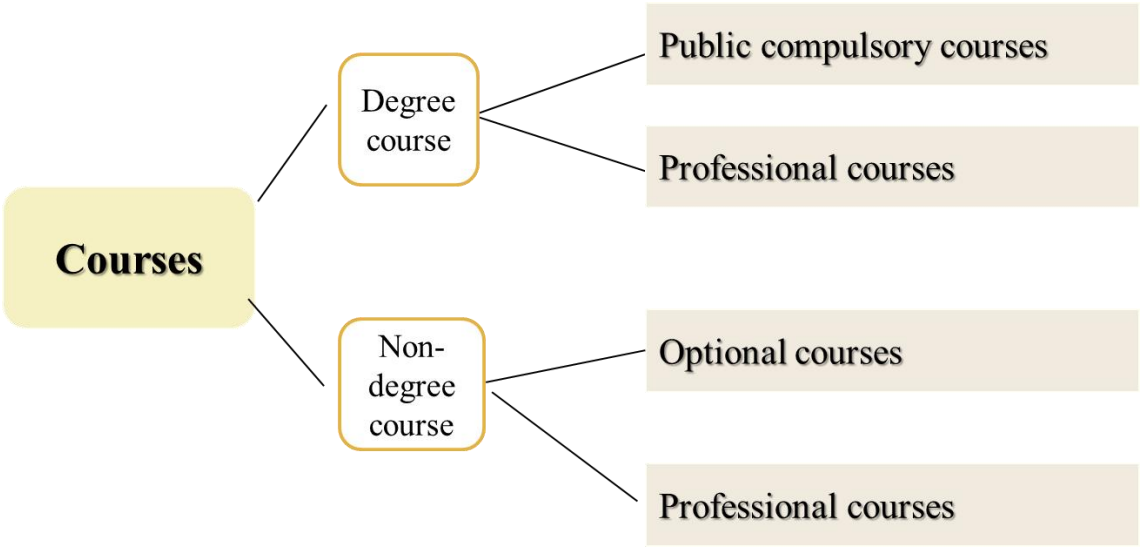
4. General Degree Requirements for MD-PhD Students

The requirement of UCAS for MD-PhD students is to get at least 38 credits before graduation. 12 credits are from the Public Compulsory courses. At least 16 credits should be from Professional Degree Courses. Every student needs to take at least 2 credits from optional courses.

Types	Public compulsory courses	Optional courses	Professional degree courses	In total
Masters	**6 credits**	**≥2 credits**	**≥13 credits**	**≥30 credits**
PhD	**6 credits**	**None**	**≥4 credits and ≥2 courses**	**≥9 credits**
MD-PhD	**12 credits**	**≥2 credits**	**≥16 credits**	**≥38 credits**

5. Courses Type

Courses are classified as degree courses and non-degree courses.



5.1 Public compulsory courses (6 credits in total)—Degree Courses

(1) Elementary Chinese-Reading and Writing (2 credits);
(2) Elementary Chinese-Listening and Speaking (2 credits);
(3) China Panorama (2 credits).

These three Public compulsory courses are Degree Courses for all international students. However, we have a rule about **Course Waiver**. Students who can meet one of the conditions can apply for course waiver and will get 6 credits directly.

A. Providing a certificate of HSK Level 3;
B. Got a bachelor's degree or master's degree which are taught in Chinese.

Students who apply for the course waiver need to contact Ms. Season (**dingdanni@ucas.ac.cn)** before the end of September.

5.2 Professional courses—Degree Courses and Non-degree Courses

Professional courses this year in Yanqihu campus cover several academic areas.

Most Professional courses are once a week and each time lasts 4 class hours. If one professional course has several parts, students who select this course need to complete all parts of this course, otherwise s/he may fail the course.

The professional courses can be classified as one of two types: Degree Courses and Non-degree Courses. This final decision of course classification for each student is left to the supervisor, as s/he is in the best position to assess the courses for the graduate programs. If students find the professional courses are totally not related to his/her major and will not help the research for PhD, then these courses can be seen as Non-degree Courses (Optional Courses). If the professional courses will help the research for PhD, then they should be Degree Courses (Compulsory Courses). This classification of one course will be shown on the course selection form and the final score sheet. All the students have two weeks to attend the professional classes and choose them.

5.3 Optional courses—Non-degree Courses

All the optional courses are non-degree courses.

6. Rules about courses results

Students should drop out of the university under one of the following circumstances:
1、Master candidates who fail two degree courses within one semester and still fail one after relearning the courses, or fail three degree courses during the school years.
2、PhD candidates who fail one degree course and still fail after relearning the course, or fail two courses during their school years.
The Language courses and China Panorama are all Degree courses.

7. Transcript

DO NOT apply it from the International College.

There are two ways to get your transcript before graduation.

Method 1: From Your Institute.

Please check your transcript after the second year of your enrollment from your own institute, usually after the next November. **Do not ask it before that time!**

Ask your institute's teacher print it out and stamp by your institute's Academic Department.

Method 2: From the Academic Affairs Department of UCAS(教务部).

Please ask for it just before your graduation. Only one free copy.

Fill a form by yourself and stamped from your institute. Go to the Academic Affair Office and ask the teacher to print the transcript for you. Please make sure the working time and office address.

Academic Affair Office Working time（教务部）

Campus	Time	具体地址 Address	Tel	Type
Yanqihu	Monday to Friday 13:30-16:00 p.m.	雁栖湖行政办公楼 217 房间 Office Building Room 217	69671069	Free
Zhongguancun	Fridays 8:30-11:00 a.m.\13:30-17:00	中关村校区教学楼东小楼 204 Teaching Building East Building	82640466	Free

		Room 204		
Yuquan Road	Wednesdays 8:30-11:00 a.m.	玉泉路校区办公楼 137 房间 Office Building Room 137	88256199	Free
Yanqihu	Thursdays 13:30-16:00 p.m.	雁栖湖行政办公楼 217 房间 Office Building Room 217	69671069	Charged
Yuquan Road	Wednesdays 8:30-11:00 a.m.	玉泉路校区办公楼 137 房间 Office Building Room 137	88256199	Charged

Every recent graduate student can get one transcript free. More than one copies are charged.

8. Contact Information

Education Coordinator for Professional Courses:

- Phone: 010-82680563, Ms. Sophie
- E-mail: hutian@ucas.ac.cn

Education Coordinator for Language Courses:

- Phone: 010-82680986, Ms. Season
- E-mail: dingdanni@ucas.ac.cn

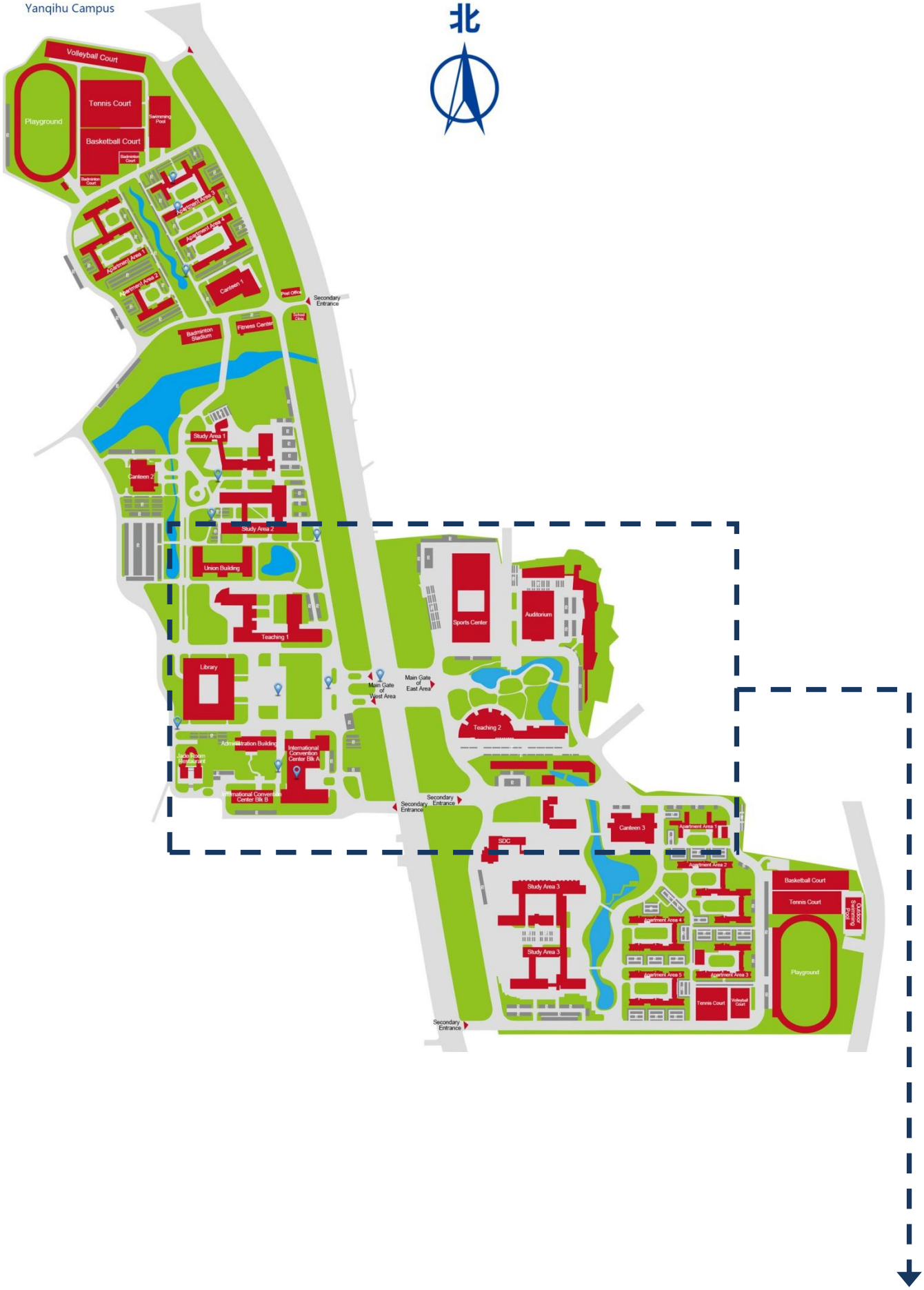
Code	Name	Type	Hours/Credits	Date&Time	Classroom (Capacity)	Professors	First Class Date&Times
0713I0D01001H	Plant Physiology and Ecology	Professional courses	60/4.0	Thur.(5-8)	Teaching2-123(58)	Qu Laiye	Feb.27, 15 times
0710I0D01006H	Nano-biology	Professional courses	45/3.0	Wed. (1-4)	Teaching2-427(100)	CHEN Deliang et al.	Feb.26, 11 times
0710I0D01008H	Molecular Entomology and Plant Pathology	Professional courses	60/4.0	Tue.(5-8)	Teaching2-325(58)	LI Xiangdong et al.	Feb.25, 15 times
0710I0D01009H	Biochemistry	Professional courses	52/3.5	Tue.(1-4)	Teaching2-418(58)	ZHONG Liangwei et al.	Feb.25, 13 times
0710I0D01013H	Conservation Biology	Professional courses	40/2.5	Tue.(5-8)	Teaching2-327(100)	JIANG Zhigang	Mar.24, 10 times
0710I0D01007H	Vector and Human Pathogen	Professional courses	60/4.0	Thur.(1-4)	Teaching2-319(58)	ZHENG Aihua et al.	Feb.27, 15 times
0710I0D01010H	Introduction to Epigenetics and RNA Silencing	Professional courses	60/4.0	Thur.(5-8)	Teaching2-234(46)	ZHANG Xiaoming et al.	Feb.27, 15 times
0710I0D01011H	Nanobiological Sensing and Detection	Professional courses	60/4.0	Tue.(5-8)	Teaching2-318(58)	LI Lele	Feb.25, 15 times
0703I0D01002H	Nanotechnology for Solar Energy Utilization	Professional courses	60/4.0	Thur.(5-8)	Teaching2-418(58)	HE Tao	Feb.27, 15 times
0703I0D01003H	Nano Electronic Materials	Professional courses	60/4.0	Wed.(3-6)	Teaching2-329(58)	XIE Liming	Feb.26, 15 times
0709I0D01001H	Plate Tectonics and Evolution of Tibetan Plateau	Professional courses	60/4.0	Thur.(5-8)	Teaching2-338(46)	DING Lin et al.	Feb.27, 15 times

0705I0D01001H	Physical Geography	Professional courses	60/4.0	Tue.(5-8)	Teaching2-227(100)	FANG Xiaomin et al.	Feb.25, 15 times
0713I0D01002H	Global Change Ecology	Professional courses	60/4.0	Wed.(5-8)	Teaching2-206(156)	WANG Tao et al.	Feb.26, 15 times
0706I0D01001H	Climate Change	Professional courses	60/4.0	Mon.(1-4)	Teaching2-429(100)	MA Yaoming et al.	Feb.24, 15 times
0817I0D01001H	Chemical Reaction Engineering	Professional courses	60/4.0	Tue.(1-4)	Teaching2-423(58)	LI Chunshan et al.	Feb.25, 15 times
0817I0D01003H	Energy Chemistry and Chemical Engineering	Professional courses	60/4.0	Mon.(5-8)	Teaching2-338(46)	LI Songgeng et al.	Feb.24, 15 times
0817I0D01002H	Green Chemical Engineering	Professional courses	60/4.0	Wed.(1-4)	Teaching2-225(58)	ZHANG Guangjin	Feb.26, 15 times
0817I0D01005H	Fluidization and Multiphase Flow	Professional courses	60/4.0	Tue.(5-8)	Teaching2-319(58)	WANG Wei	Feb.25, 15 times
0714I0D01002H	Applied Statistics	Professional courses	40/2.5	Thur.(5-8)	Teaching2-421(58)	WANG Qian	Feb.27, 10 times
050200DGX001H-1	Academic Communication for International Conferences	Optional courses	48/2.0	Tue.(1-4)	Teaching2-218(58)	YU Hua	Feb.25, 12 times
050200DGX001H-2	Academic Communication for International Conferences	Optional courses	48/2.0	Wed.(1-4)	Teaching2-419(58)	LIU Yunlong	Feb.26, 12 times

Class time										
1	2	3	4	5	6	7	8	9	10	11
08:30-09:20	09:20-10:10	10:30-11:20	11:20-12:10	13:30-14:20	14:20-15:10	15:30-16:20	16:20-17:10	19:00-19:50	19:50-20:40	20:50-21:40

Chinese Courses for New Students					
Name	**Type**	**Hours/Credits**	**Time**	**Classroom**	**Teachers**
Elementary Chinese-Reading and Writing	Public compulsory courses	128/2.0	Mon.(1-2)	Teaching2-213	WANG Lei
			Wed.(3-4)	Teaching2-213	
			Thur.(1-2)	Teaching2-213	
			Fri.(3-4)	Teaching2-213	
Elementary Chinese-Reading and Writing	Public compulsory courses	128/2.0	Mon.(3-4)	Teaching2-213	HE Fei
			Wed.(1-2)	Teaching2-213	
			Thur.(3-4)	Teaching2-213	
			Fri.(1-2)	Teaching2-213	
China Panorama	Public compulsory courses	48/2.0	Wed.(9-11)	Teaching1-225	JIANG Hong'en

Class time										
1	2	3	4	5	6	7	8	9	10	11
08:30-09:20	09:20-10:10	10:30-11:20	11:20-12:10	13:30-14:20	14:20-15:10	15:30-16:20	16:20-17:10	19:00-19:50	19:50-20:40	20:50-21:40


Yanqihu Campus
北
Volleyball Court
Playground
Tennis Court
Basketball Court
Swimming Pool
Badminton Court
Badminton Court
Apartment Area 5
Apartment Area 4
Apartment Area 1
Apartment Area 2
Canteen 1
Post Office
Secondary Entrance
School Clinic
Badminton Stadium
Fitness Center
Study Area 1
Canteen 2
Study Area 2
Union Building
Teaching 1
Library
Main Gate of West Area
Main Gate of East Area
Sports Center
Auditorium
Teaching 2
Administration Building
Jade Room Restaurant
International Convention Center Blk A
International Convention Center Blk B
Secondary Entrance
Secondary Entrance
Canteen 3
SDC
Apartment Area 1
Apartment Area 2
Study Area 3
Study Area 3
Apartment Area 4
Apartment Area 5
Apartment Area 3
Basketball Court
Tennis Court
Swimming Pool
Playground
Tennis Court
Volleyball Court
Secondary Entrance


Study Area 2
Union Building
Teaching 1
Library
Sports Center
Auditorium
Teaching 2
Main Gate of West Area
Main Gate of East Area
Administration Building
International Convention Center Blk A
Jade Room Restaurant
International Convention Center Blk B
Secondary Entrance
Secondary Entrance
SDC
Canteen 3
Apartment Area 1

Course title:

Plant Physiology and Ecology

Instructor:

Associate Prof. Laiye Qu

Course type: *Lecture*

Course Assessment:

None

Grading Policy:

Registration (10% of the final score)
one report (40% of the final score)
one quiz (50% of the final score)

Course Prerequisites:

None

Catalog Description:

This course will introduce the plant physiological mechanisms that underlie ecological observation under the changing environment. The course will mainly introduce some general knowledge of photosynthesis, plant water relations, mineral nutrients, growth and allocation, symbiosis associations, and plant-soil interaction. Some general research methods and some basic statistical analysis and statistical plotting also will be introduced.

Schedule of the course

No.	Objectives	Remarks
1.	General Introduction	
2.	Plant adaption	
3.	Photosynthesis	
4.	Respiration	
5.	Plant water relations	
6.	Mineral nutrients	
7.	Growth and allocation	Report
8.	Symbiotic associations	
9.	Biotic interactions	
10.	Decomposition	
11.	Biodiversity	
12.	Succession	
13.	Rehabilitation	
14.	Plant-soil feedback	
15.	Discussion and examination	Presentation

Course title

Nano-biology

Instructor(s)-in-charge:

Assoc. Prof. Chen Deliang & Assoc. Prof. Zhang Zhuqing

Course type:

Lecture

Course Assessment:

Each student is expected to give an oral presentation on a topic related to his/her own interest and to Nanobiology

Grading Policy:

30% assessment, 70% final exam (open).

Course Prerequisites:

No.

Catalog Description:

Nanobiology is to understand the Biological Science in the nanometer scale. Targeting at graduate students in Biology, Chemistry, Physics and Engineering with interest in Biological Science, this course not only introduces the basic concepts, principles and techniques of Nanobiology, but also presents many of the lessons that may be learned from nature and how they are being applied to nanotechnology. Participants will be guided to discuss latest discoveries and hot topics, such as manipulating single molecules and protein design in related interdisciplinary fields.

Schedule of the course

section	content	
1	Introduction to Nanobiology	History, Progress and Objectives of Nanobiogy.
2	Structural Mechanism in Bio-nanomaterials	Building Block of Bio-nanomaterials; Protein Nanostructures; DNA Nanostructures; Lipid Nanostructures.
3	Functional Mechanism in Bio-nanomaterials	Energy Conversion; Chemical Synthesis; Transport and Transduction.
4	Progress and hot Topics in Nanobiology	Design of Bio-nanomaterials; Self-assembly and Recognition; Biomolecule Motors; DNA/Protein Computing; Biosensors; Nanomedicines.
5	Techniques and Approaches in Nanobiology	Single Molecule Imaging: STED, STORM, PALM; Single Molecule Manipulating: AFM, STM, OT, MT.
total		

Contents of the course

See the contents in the course schedule

Textbook and any related course material

Bionanotechnology: lessons from nature; 1st edition
David S. Goodsell,
Wiley-Liss, Inc. 2004
References will be provided in class.

Course title

Molecular Entomology and Plant Pathology

Instructor(s)-in-charge:

Prof. LI Xiang-Dong; Prof. ZOU Zhen; Prof. LIU Jun

Course type:

Lecture

Course Assessment:

Quiz, exams, and home work

Grading Policy:

Final scores will be determined by 33.3%(LI),33.4%(ZOU), and 33.3%(LIU).

Course Prerequisites:

Without

Catalog Description:

This course will cover the basis of modern agriculture biotechnology, molecular entomology and plant pathology. In the first part, we will explain the importance of insect science and its impact on agriculture, forest, and human health. We will also discuss several important aspects of molecular insect such as metabolism, endocrinology, immunity, locomotors system etc. The basic knowledge of insect physiology, molecular biology, and biochemistry, which were used to study entomology, will be provided during the class. The second part of the course will give students the general view of the history and development of plant pathology. Particularly, the concepts of plant innate immunity and plant epidemiology will be introduced and emphasized, including PAMPs triggered immunity, effector triggered immunity and basal defense of plants. In addition, plant pathogen isolation and identification and plant protection will be discussed in the course.

Schedule of the course

section	content	Lecturer
1	Introduction to entomology	Zhen Zou
2	DNA synthesis, transcription, and translation	Zhen Zou
3	Insect transgenesis and comparative genomics	Zhen Zou
4	Molecular Systematics and Phylogeny	Zhen Zou
5	Circulatory system, Endocrinology and Reproduction /First Exam	Zhen Zou
6	Insect Nervous Systems	Xiangdong Li
7	Insect Visual Signaling	Xiangdong Li
8	Insect Chemical Communication	Xiangdong Li
9	Insect Mechanical Communication	Xiangdong Li
10	Insect Locomotor Systems /Second Exam	Xiangdong Li
11	Introduction to plant pathology	Jun Liu
12	Plant basal defense	Jun Liu
13	Plant innate immunity	Jun Liu
14	Plant epidemiology	Jun Liu
15	Disease management and plant protection/Third Exam	Jun Liu
Total		60

Textbook and any related course material:

Marc J. Klowden (2007) Physiological Systems in Insects. 2nd Ed. Elsevier Inc. (One annotated version permitted to publish in PRC)

George N. Agrios (2005) Plant Pathology, Fifth Edition Acadmeic Press, London, UK.

Reg Chapman (1997) The Insects Structure and Function 4th Ed. University Press, Cambridge, UK.

Lawrence I. Gilbert (2012) Insect Biochemistry and Molecular Biology. Acadmeic Press, London, UK.

Course title

Biochemistry

Instructor(s)-in-charge:

Prof. ZHONG Liangwei and Associate Professor ZHANG zhuqing

Course type:

Lectures and project works

Course Assessment:

A written final examination and an oral presentation of a project work.

Grading Policy:

An open written final examination (60%), an oral presentation of a project work (30%) and attendance (10%).

Course Prerequisites:

A knowledge on organic chemistry.

Catalog Description:

Upon completion of the course, the students should: (1) be familiar with the basic properties and functions of amino acids and proteins, as well as the principle for protein separation, purification, identification; (2) know how to analyze enzyme activity, enzyme kinetics and protein-protein interaction; (3) understand protein synthesis, targeting and modifications; (4) understand the association of abnormal glucose, lipid and amino acid metabolism with diseases; (5) be able to explain connections among carbohydrate metabolism, lipid metabolism and amino acid metabolism; (6) be able to evaluate biochemical literatures and give an oral presentation.

Content

The course is divided into the following parts:

Introduction to Biochemistry (Professor ZHONG liangwei)

Section A – Amino acids and proteins (Professor ZHONG liangwei)

- A1. Amino acids and proteins
- A2. Structures and functions of proteins
- A3. Purification of proteins

Section B – Enzymes (Professor ZHONG Liangwei)

- B1. Properties of enzymes
- B2. Factors affecting enzyme activity
- B3. Enzyme kinetics and inhibition

Section C – Protein synthesis, targeting, modifications and folding (Professor ZHONG Liangwei and Associate Professor ZHANG zhuqing)

- C1. Protein synthesis
- C2. Protein targeting
- C3. Protein modifications
- C4. Protein folding and structure-based drug design (Associate Professor ZHANG zhuqing)

Section D – Carbohydrate metabolism (Professor ZHONG Liangwei)

- D1. Basic properties of carbohydrates
- D2. Metabolic pathways
- D3. Digestion and absorption
- D4. High glucose and oxidative stress

Section E – Lipid metabolism (Professor ZHONG Liangwei)

E1. Structure and roles of fatty acids

E2. Fatty acid breakdown and synthesis

E3. Cholesterol metabolism

E4. Lipoproteins

Section F – Nitrogen metabolism (Professor ZHONG Liangwei)

F1. Nitrogen fixation and assimilation

F2. Amino acid metabolism

F3. Urea cycle

Teaching methods

The teaching includes lectures and project works.

Project works encourage intensive reading of literatures, giving an oral presentation.

Suggested Textbook, References, and Link

- ✧ Lehninger, Principles of Biochemistry, fourth edition.
- ✧ Oxidative stress, inflammation and carcinogenesis are controlled through the pentose phosphate pathway by transaldolase, *Trends Mol Med* **17** (2011) 395-403.
- ✧ Regulation of cellular metabolism by protein lysine acetylation, *Science* **327** (2010) 1000-1004.
- ✧ Thioredoxin 1 Is Inactivated Due to Oxidation Induced by Peroxiredoxin under Oxidative Stress and Reactivated by the Glutaredoxin System, *J Biol Chem.* **288** (2013) 32241-32247.
- ✧ Entrez Medline: http://www.ncbi.nlm.nih.gov/pubmed/

Course title

Conservation Biology

Instructor(s)-in-charge:

Prof. JIANG Zhigang and Associate Professor LIU Xuecong

Course type:

Lecture

Course Schedule:

4hrs/week by instructors. When there is time, a classroom discussion will be led by the teaching assistant.

Course Assessment:

Homework: 3 assignments

Grading Policy:

30% homework, 70% final.

Course Prerequisites:

University level with background in Biological Science, Agricultural Science, Forestry Science, Environmental Science, Management Science or Medical Science

Catalog Description:

Conservation Biology is a science of protecting biodiversity, preventing human introduced species extinctions and maintaining sustainable development of human society. As a new branch of science, Conservation Biology was established in mid-1990s in the United States of America, and have fully grown into a main stream science since its' born. In this course, the professor will start with a brief review of human civilization, particularly, the concepts such as public goods, consumerism, consumer behavior in modern society, and will argue rethinking about Tao Te Ching *and social norms. Then the professor will give an introduction about the history, scope and missions as well as theoretic frames and practice means of Conservation Biology. In the second class, the professor will talk about the principles, methods and characteristics of Conservation Biology, which now is transforming into a new science—Conservation Sciences. Basic research skill and tool in experimental design and data analyses in conservation will be given will a classroom training in using statistic package. Species diversity is the core of biodiversity. The professor will introduce the concept of species in evolution, the Tree of Life, elaborate the speciation and extinction of species and the last effort of reviving an extinct species—the de-extinction, plus the famous question in science: "how many species are there on the Earth?". The professor will outline the mega biodiversity countries, biodiversity hot spots, global vs. China vegetation. China is one the countries with mega-biodiversity in the world. The geological environment in the country experienced major geophysical events like tectonic movement and the up-lifting of the Qinghai-Tibetan Plateau since the Late Tertiary. The professor will also introduce the diverse landscapes, the sharply contrasting climate types, different habitats and rich fauna and flora in the country. Primates are the flagship species in ecosystems, an introduction about the status, ecology and behavior, conservation of primates with the charismatic golden snub-nosed monkey as an example. The professor will talk about the threatened wild species and degraded natural ecosystems in the country due to intensified human activities, land-cover change, environmental pollution, growing of human population plus the influence of global change. The professor will talk about the legend of giant panda as an example of flagship species and the down-listing of giant panda in 2016, the professor will introduce the IUCN Red List Criteria for Endangered Species and China's Red List for Vertebrate, with exercise in assessing species using the IUCN Red List Criteria for Endangered Species. The*

professor will elaborate the biodiversity relevant international treaties like Convention on Biological-Diversity (CBD), Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES), which provide the international environment for conservation and the country 's endeavor in implementation its commitments. Besides to conduct basic research in classifying, inventorying and monitoring biodiversity, the scientists in country also carried out conservation researches to back up the commitments of the government to implementation of CBD and CITES, such as rescuing endangered species, reforesting the mountains and deserts, as well as protecting habitat of wild species and maintaining ecosystem functioning and services. All these be covered in the course. Therefore, while reviewing the current development of Conservation Biology in the world, the professor will give case studies of China's endemic species; represent biomes and conservation practice to enrich the contents of course. The professor will explain why should we carry out ex situ conservation and how to carry out it, with examples of ex situ conservation from Saudi Arabia and China. The professor will introduce the translocation of endangered species and reintroduction of local extinct species. With practice in computer simulation, the students will understand the genetic problems in small populations. In situ and ex situ conservation are major approaches in preserving biodiversity. The professor will introduce the protected areas (PAs) such as, natural reserves, wildlife refuge, national parks, World Natural Heritage Sites, as well as the "Green for Grain", "Green for Grass" projects in China as examples of in situ *conservation, and will review the development and analyze the achievements and shortfalls in management of PAs.*

Schedule of the course

Lecture	Contents	Hours
1	History of Conservation	4
2	Principles, Ideas and Methods in Conservation Science	4
3	Introduction to Experimental Design and Data Analyses in Conservation	4
4	Speciation, Extinction and De-Extinction	4
5	Biodiversity in China	4
6	Status, Behavior and Conservation of Primates	4
7	Endangered Species Criteria and IUCN Red lists	4
8	Protected Areas	4
9	Ex-situ Conservation	4
10	Examination	4
Total		40

Contents of the course

Lecture 1: History of Conservation

(1) Human civilization
(2) The biodiversity crisis
(3) The nascent of Conservation Biology
(4) Public goods, consumerism and consumer behavior
(5) Environment problems we confronted
(6) Rethink about *Tao Te Ching* and Social Norms
(7) The nascent of Conservation Biology

Lecture 2 Principles, Ideas and Methods in Conservation Science
(1) Mega biodiversity countries
(2) Biodiversity hot spots
(3) Physical geography of China
(4) Case study: Video BBC Wild China
(5) Vegetation: global vs. China
(6) Origin centers of crops in the world
(7) Crops, fruits and garden plants native to the far east

Lecture 3 Introduction to Experimental Design and Data Analyses in Conservation
(1) Experimental design in Conservation
(2) Descriptive statistics
(3) Hypothesis testing
(4) Introduction to SPSS
(5) A classroom practice

Lecture 4 Speciation, Extinction and De-Extinction
(1) Evolution of species concept
(2) The Tree of Life
(3) "How many species are there on the Earth?"
(4) Speciation
(5) Extinction of species
(6) The De-Extinction

Lecture 5 Biodiversity in China
(1) Mega biodiversity countries
(2) Biodiversity hot spots
(3) Physical geography of China
(4) Video BBC Wild China
(5) Vegetation: global vs. China
(6) Origin centers of crops in the world
(7) Crops, fruits and garden plants native to the far east

Lecture 6: Criteria of endangered species and IUCN Red lists
(1) Criteria of endangered species
(2) The Down-listing of giant panda in 2016
(3) The legend of giant panda
(4) IUCN Red List for Endangered Species
(5) China's Red List for Vertebrates

Lecture 7: Status, Behavior and Conservation of Primates
(1) Primates of the world
(2) Primate societies
(3) Conservation status of primates in China
(4) Ecology of endangered golden snub-nosed monkeys
(5) Vocal behavior of golden snub-nosed monkeys

Lecture 8: Ex-situ Conservation
(1) Why ex situ conservation?
(2) How to carry out ex situ conservation?
(3) Case study: Wildlife Conservation Center in Saudi Arabic
(4) Genetic problems in small populations
(5) Case study: Web PopGen® simulation
(6) Reintroduction of Saiga in China
(7) Behavioral problems in captive bred animals
(8) A synthesis: Captive Breeding of Giant Panda

(9) Ex situ conservation of plants: Germplasm resource repository and botanical gardens
(10) Artificial propagation of *Drebremium*

Lecture 9: Protected Areas
(1) The definition of Protected Areas (PAs) by IUCN
(2) IUCN categories of PAs
(3) The growth of PAs in the world and in China
(4) The challenges in the PAs management
(5) The conservation migratory species: the example of Mongolian gazelle
(6) The Half-Earth Initiative--How much we can set aside?

The final mark of the student will be 30% classroom performance (attendance and exercise) + 70% final exam. The final exam will be an open class exam.

Textbook and any related course material:

Gaston, K. J. 1996. *Biodiversity: A Biology of Numbers and Differences*. Oxford: Blackwell Science.
Hannah L.2012. *Saving a Million Species: Extinction Risk from Climate Change*. Washington, DC: Island Press.
Jeon Yonung-jae. 2012. Journey to the Ecosystem of the DMZ and CCL. Seoul: Korea National Park Serves, Ministry of Environment.
Jiang, Z. 2016. The deterministic effect of the CITES and nominal impacts of social norms on global wildlife trade. RE: "Collective Action: Social norms as solutions" Science 354:42-43. http://science.sciencemag.org/content/354/6308/42.e-letters.
Jiang, Z. 2016. The responsibility and readiness of young conservation scientists. E-letter to P. Gluckman. The science–policy interface. Science 353: 969. http://science.sciencemag.org/content/353/6303/969.e-letters
Jiang Z. 2002. *Key Topics in Biodiversity and its Conservation*, an English training book for UNDP/UNEP/GEF Biodiversity Support Program for the Northwest and East Central Asia Region.
McCord E L. 2012. *The Value of Species.* New Haven: Yale University Press.
Novacek, M.J. 2001. *The Biodiversity Crisis.* New York: The New Press.
Primack, R. B. 2010. *Essentials of Conservation Biology*. 5th ed. Sinauer Associates, Inc. Sunderland, USA.
Stearns, BP and Stearns SN. 1999. *Watch, from the Edge of Extinction*. New Haven: Yale University Press.
Wilson, E. O. 2001. *The Diversity of Life*. London: Penguin Books. [Twice winner of Pulitzer Price]

Video BBC Wild China

Expected level of proficiency from students entering the course:

Biology or applied biology sciences like Agricultural Science, Forestry Science，Environmental Science, Aquatic and Oceanic Sciences, Medical and Vet Science as well as in Science and Management Science: university level

Course title

Vector and human pathogen

Instructor(s)-in-charge:

Prof. Aihua Zheng
Prof. Xiangjiang Zhan
Prof. Zhen Zou

Course type:

Lecture

Course Assessment:

mini-tests in each section

Grading Policy:

mini-tests scores

Course Prerequisites:

Without

Catalog Description:

This course will introduce the principle of molecular entomology and microbiology. In the first part, we will introduce the importance of insect transmitted diseases and their impact on human health, economy and safety. In the second part, we will discuss several kinds of important human pathogens including the bacteria, plasmodium, and particularly virus. The basic knowledges of virus isolation, virus structure, virus life cycle will be provided in this course. In the third part, we will discuss several important aspects of molecular entomology such as metabolism, endocrinology, immunity, and their relations to the transmission of pathogens. During this course, the progress and application of some of the hottest technologies including CRISPR-Cas9 and deep sequencing will also be discussed.

Schedule of the course

section	Content	Lecturer
1	Introduction to vector biology and human pathogens	Aihua Zheng
2	Genomes and genetics/virus life cycle	Aihua Zheng
3	Virus structure	Aihua Zheng
4	Virus receptor and entry	Aihua Zheng
5	Virus replication, transcription and assembly	Aihua Zheng
6	Infection basics and acute infection	Aihua Zheng
7	Immunology	Aihua Zheng
8	Basic of pathogenesis/HIV	Aihua Zheng
9	Vaccine	Aihua Zheng
10	Tick biology and tick-borne disease	Aihua Zheng
11	Deep sequencing and genome biology	Xiangjiang Zhan
12	Animal migration and epidemic	Xiangjiang Zhan
13	Insect vectors transmitting human and plant pathogens	Zhen Zou
14	Interactions between insect vectors and pathogens	Zhen Zou
15	Emerging virus/virus evolution	Aihua Zheng

Textbook and any related course material:

David M. Knipe, Peter Howley (2013) Fields Virology， 6th edition, Lippincott Williams & Wilkins.
Michael G. Rossmann, Venigalla B. Rao (2012), Viral Molecular Machines, Springer.
Marc J. Klowden (2007) Physiological Systems in Insects. 2nd Ed. Elsevier Inc. (One annotated version permitted to publish in PRC)
Reg Chapman (1997) The Insects Structure and Function 4th Ed. University Press, Cambridge, UK.
Lawrence I. Gilbert (2012) Insect Biochemistry and Molecular Biology. Acadmeic Press, London, UK.

Course title

Introduction to Epigenetics and RNA silencing

Instructor(s)-in-charge:
Prof. Xiaoming Zhang 010-64807550 zhangxm@ioz.ac.cn
Prof. Xianhui Wang 010-64807220 wangxh@ioz.ac.cn
Prof. Weiqiang Qian (Peking University)010-62768230 wqqian@pku.edu.cn
Teaching assistant:
Dr. Qi Li 010-64807550 liqi@ioz.ac.cn

Course type:
Lecture
Course Assessment:
mini-tests in each section
Grading Policy:
mini-tests scores
Course Prerequisites:
Without
Catalog Description:

RNA Epigenetics and RNA silencing are two of the hottest topics in the past two decades. Epigenetics is the study of heritable changes in gene expression that do not change DNA sequence.RNA silencing is a general regulation mechanism in eukaryotes that regulates gene expression by 20-30 nt sRNAs in transcription or post-transcription levels. In this Epigenetics, we will introduce how DNA methylation, histone modification, chromatin remodeling, long non-coding RNAs and RNA modification regulate gene expression in eukaryotes. In the second part, we will study RNA silencing on sRNA generation, amplification, loading, action, turnover, and function. The most popular technologies used in Epigenetic studies and non-coding RNAs will also be discussed.

This course not only will provide students the basic concepts of RNA silencing and Epigenetics, but also will provide student the requisite methods in these two fields. At the same time, we will share the students a story in RNA silencing or Epigenetic fields in each class. These stories include but not limit to: Transgenic technology, Cross-kingdom RNA silencing, anti-viral function of RNA silencing, X-inactivation, Transgenerational epigenetic inheritance, Imprinting, disease, Honey bee epigenome, and flowing. After the course, the students should understand the biogenesis and function of small RNAs, lncRNAs, the difference between genetic and epigenetic regulation and how to study projects relate to Epigenetics and RNA silencing.

Schedule of the course

section	Content	Hours
1	Introduction to Epigenetics and RNA silencing	*4*
2	Histone modification / X-inactivation	*4*
3	Histone variation / Epigenetics regulation in disease	*4*
4	Chromatin remodeling / Epigenetics in flowering	*4*
5	DNA methylation-establishment and maintenance / Imprinting	*4*
6	DNA demethylation / Molecular tools to study DNA methylation	*4*
7	Transgenerational epigenetic inheritance / Honey bee epigenome	*4*
8	sRNA processing / Genetic engineering	*4*
9	sRNA amplification and loading / RNA silencing function in plant	*4*

	immunity to virus	
10	Target recognition and action of sRNAs / Popular tools to study RNAi	*4*
11	The modification and degradation of sRNAs / Animal virus and RNA silencing	*4*
12	The movement of RNA silencing / Cross-kingdom RNAi	*4*
13	The application of RNA silencing in research, human health and crop production	*4*
14	Long non-coding RNA, Circular RNA and RNA modifications	*4*
15	Bioinformatics tools to study RNA silencing and Epigenetic	*4*
Total		60

Textbook and any related course material:

C. David Allis, Marie-Laure Caparros, Thomas Jenuwein, Danny Reinberg (2015) Epigenetics，2nd Ed, CSHL press.

Narendra Tuteja, Sarvajeet Singh Gill (2013) Plant Acclimation to Environmental Stress, Springer.

Kenneth Alan Howard (2013) RNA Interference from Biology to Therapeutics (Advances in Delivery Science and Technology), Springer.

Tamas Dalmay (2017), Plant Gene Silencing: Mechanisms and Applications, CABI press.

Course title

Nanobiological Sensing and Detection

Instructor(s)-in-charge:

Prof. Lele Li

Course type:

Lecture

Course Assessment:

Homework: 7 assignments

Grading Policy:

Assignments 50%, Final 30%, Attendance 20%

Course Prerequisites:

College Chemistry, College Materials, English.

Catalog Description:

Biosensing and imaging using nanomaterials and nanotechnology has the potential to revolutionize scientific research and medical diagnostics. This course will focus on the principles, construction, and application of Nano-biosensing and imaging systems, and particularly the impact of nanotechnology on the development of biosensors. The course will be started with an introduction of the solid background on the nano-biological sensors, bioimaging, nanomaterials and nanotechnology, biorecognition units, biomarkers, and disease diagnostics. Then, examples of biosensing and imaging systems created from various nanomaterials are introduced, including fluorescent/luminescent nanoparticles, magnetic nanoparticles, carbon nanomaterials, gold nanoparticles, porous materials, and DNA nanostructures, with a distinct emphasis on the need to tailor nanosensor designs to specific biotargets. The topic of cancer-specific nano-biosensors will also be addressed and discussed to provide deep insight into the recent advances of using nano-biosensors for disease diagnostics and therapy.

Schedule of the course

No.	content
1	Introduction of nano-biosensing and imaging technology
2	Nanostructured materials used for construction of biosensing and imaging systems
3	Surface functionalization of nanomaterials with biorecognition unit
4	Principles of biosensing and imaging design for overcoming biological barriers
5	Quantum dots-based fluorescent biosensing and imaging
6	Lanthanide ions-doped nanomaterials for luminescent biosensing and imaging
7	Gold nanomaterials-based biosensing and imaging
8	Magnetic nanomaterials-based biosensing and imaging
9	Carbon nanomaterials-based biosensing and imaging
10	Mesoporous silica-based biosensing and imaging
11	Metal-organic frameworks-based biosensing and imaging
12	DNA nanotechnology for biosensing and imaging
13	Fluorescent biosensors based on aggregation-induced emission
14	Biosensing and imaging systems for theranostics
15	Current trends and perspectives for Nano-Biosensors

Textbook and any related course material:

No textbook, and electronic course reading materials will be provided one week before each class.

Course title

Nanotechnology for Solar Energy Utilization Applications

Instructor(s)-in-charge:

Prof. HE Tao

Course type:

Lecture

Course Assessment:

Four assignments: Exercise & Presentation

Grading Policy:

Typically 40% presentation, 40% exercise, 20% final

Course Prerequisites:

Materials physics, materials chemistry, solid state physics, semiconductor physics, physical chemistry, general chemistry

Catalog Description:

Because of concerns regarding energy security, environmental crisis, and the rising costs of fossil-fuel-based energy, there has been significant, resurgent interest in utilization of solar energy recently due to its clean nature and abundance of the source. Unfortunately, the utilization efficiency is still pretty low, which dramatically limits the wide use of solar energy. Nanotechnology may afford a solution to this. Thus, the major goal of this course is to provide the students general concepts and state-of-the-art developments in the field of nanotechnology for solar energy utilization. The course begins with a brief introduction of fundamentals of nanotechnology and solar energy. Then photon (light) management is discussed in detail, followed by a thorough description of conversion of light into electric energy (photovoltaics) and chemical energy (artificial photosynthesis). Detailed discussion of environmental remedy is covered too. Other applications such as thermoelectricity and thermochemistry are presented in the final session.

Schedule of the course

Section	*Content*	*Hours*
1	*Chapter 1. Fundamentals of nanotechnology and solar energy* *Chapter 2. Optical properties of nanomaterials and nanostructures*	*4*
2	*Chapter 3. Light harvesting and conversion*	*4*
3	*Exercise I & Student presentation I*	*4*
4	*Chapter 4. Photovoltaic device physics on the nanoscale*	*4*
5	*Chapter 5. Inorganic photovoltaic devices*	*4*
6	*Chapter 6. Organic solar cells* *Chapter 7. Dye-sensitized & perovskite solar cells*	*4*
7	*Exercise II & Student presentation II*	*4*
8	*Chapter 8. Photosynthesis and bioenergy* *Chapter 9. Fundamentals of photocatalysis*	*4*
9	*Chapter 10. Water splitting*	*4*
10	*Chapter 11. Photoreduction of carbon dioxide*	*4*
11	*Chapter 12. Environmental remediation (organic pollutants, heavy metals, water purification, etc.)*	*4*
12	*Exercise III & Student presentation III*	*4*
13	*Chapter 13. Thermoelectricity* *Chapter 14. Thermochemistry*	*4*
14	*Chapter 15. Energy storage*	*4*

	Chapter 16. Photodetection and imaging *Chapter 17. Summary and outlook*	
15	*Exercise IV & Student presentation IV*	*4*
Total		*60*

Textbook and related documents:

No specific textbooks, though the following ones are listed. More reading materials will be provided during the lecture.

Nanostructured and photoelectrochemical systems for solar photon conversion, Edited by Mary D. Archer and Arthur J. Nozik, Imperial College Press, London, 2009

Nanostructured materials for solar energy conversion, Edited by Tetsuo Soga, Elsevier Science, 2007

Nanotechnology for Photovoltaics, Edited by Loucas Tsakalakos, CRC Press, Boca Raton, 2010

Course title

Nano Electronic Materials

Instructor(s)-in-charge:

Prof. XIE Liming

Course type:

Lecture

Course Assessment:

Homework: 12 assignments

Grading Policy:

Typically 20% attendance, 20% in-class performance, 40% homework, 20% final.

Course Prerequisites:

Solid state physics, physical chemistry

Catalog Description:

This course will first give a general review on nano electronic materials, including structure, synthesis and properties. And then introduce typical nano electronic materials in details. The typical nano electronic materials include quantum dots, nanowires, carbon nanotubes, graphene, two-dimensional materials beyond graphene.

Schedule of the course

section	content	hours
1	Motivation and surface effect	4
2	Quantum confinement effect	4
3	Synthesis methods of nano electronic materials	4
4	Characterization methods	4
5	Characterization methods	4
6	Device fabrication techniques	4
7	Electrical measurement	4
8	Quantum dots	4
9	Nanowires	4
10	Carbon nanotubes	4
11	Graphene	4
12	Transition-metal dichalcogenides and Other 2D materials	4
13	Presentation skills and discussion	4
14	Presentations by students	4
15	Presentations by students	4
total		60

Textbook and any related course materials:

[1] **Introduction to the Physics of Nanoelectronics**, Edited by: S.G. Tan and M.B.A. Jalil, ISBN: 978-0-85709-511-4

[2] **Fundamentals of Nanoelectronics**, Edited by: George W. Hanson, ISBN-10: 0131957082

[3] **Nanotechnology and Nanoelectronics: Materials, Devices, Measurement Techniques**, Edited by: W. R. Fahrner, ISBN 3-540-22452-1

Expected level of proficiency from students entering the course:

Mathematics: strong

Physics: strong

Chemistry: strong

Course title

Plate Tectonics and Evolution of Tibetan Plateau

Instructor(s):

Prof. Lin Ding et al.

Course type:

Lecture

Course type:

Lecture

Catalog Description:

Plate tectonics is the integrated theory of how the large-scale geologic structures on Earth are created. Plates are created where they separate and recycled where they converge, in a continuous process of creation and destruction. The lithosphere—Earth's strong, rigid outer shell of rock—is broken into about a dozen plates, which slide by, converge with, or separate from each other as they move over the weaker, ductile asthenosphere. Continents, embedded in the lithosphere, drift along with the moving plates. The theory of plate tectonics describes the movement of plates and the forces acting between them. This moving and other related concepts cause all the physical features that we see on the planet: mountain ranges, deep canyons, large continents separated by wide and deep oceans. To begin our explanation of the key elements of plate tectonics theory, we will learn about the physical and chemical structures of the earth, three types of plate boundaries, subduction zones and other special locations on plates. We will see how continents break apart, how they collide, and what makes plates move. Because plate tectonics theory is geology's grand unifying theory, it is now an essential foundation for the discussion of all geology.

Collision between India and Asia was perhaps the most spectacular geological event to occur over the last 500 million years ago (Ma). However, although there are numerous records of ocean closures and continental collisions in geological history, the connection between India and Asia has attracted a great deal of attention because of the resultant formation of the vast and high-altitude Tibetan Plateau. The ongoing process of collision also affected Tibet as well as central and southeast Asia. As a result, collision between India and Asia as the resultant formation of the Tibetan Plateau likely includes a number of unique processes of both continental collision and mechanisms of intracontinental deformation. The initial collision between India and Asia also provides important data to studies of continental lithospheric deformation, environmental change, and paleoaltitude reconstruction. Thus, this collision has significance to our understanding of plate tectonics, continental dynamics, and multilayer interactions. It will cover the following topics:

Schedule of the course

Section	Content	hours
1	**Plate tectonics and its developing history** 1. Introduction to Plate Tectonics 2. The Structure of the Earth 1) Three Layers 2) Physical Properties 3) Chemical Compositions 3. Continental Drift 1) Principal Observations 2) The Implications	12

	4. Seafloor Spreading 1) Seafloor Topography 2) Age of the Seafloor 3) Oceanic Ridge System 5. Accreting Plate Boundaries 1) Divergent Plate Boundaries 2) Convergent Plate Boundaries 3) Transform Plate Boundaries 6. Subduction 1) Distribution of Subduction zones 2) Deep Structure of the Subduction Zones 7. Continents 1) The Growth of Continents 2) Continental Margins 8. Hotspots and Mantle Plumes 1) Mantle Convection 2) Surface Volcanisms 3) Deep Origin of Mantle Plumes 9. The Wilson Cycle 1) Traditional Wilson Cycle Model 2) The Implications 10. Planetary Perspective 1) The Early History 2) Comparative Planetary	
2	**Petrology and Plate Tectonics** 1. Introduction to Petrology and Plate Tectonics 1.1 Material composition of the Earth: -the Earth's interior (Crust, Mantle and Core; five principal mechanical subdivisions: Lithosphere, Asthenosphere, Mesosphere, Outer core, Inner core); -the Earth's inorganic chemistry (seven most common elements); -the Earth's ordered character (common rock-forming minerals). -the Earth's three main types of rocks (Igneous, Metamorphic, Sedimentary) 1.2 What's the petrology? -Definition (Studying the genesis of the rocks: Igneous petrology, Metamorphic petrology, Sedimentary petrology) -Transformation among the three main types of rocks 1.3 Research methods -Field works (Collecting samples/field trip) -Laboratory works (Determination of chemical composition, Dating methods, Thermobarometry methods and others) 1.4 Plate Tectonics Review -Plate move evidence -Plate boundaries 1.5 Rocks in plate boundaries -Diverging boundaries (e.g. mid-ocean ridges) -Convergent boundaries (e.g. subduction zone)	12

	1.6 Rocks in inner plate -Ocean basin -Continental basin 2. Igneous Petrology 2.1 Fundamental concepts -magma/melts, fractional crystallization, eruption, emplacement, intrusive rocks, volcanic rocks, volcano, dike, country rocks 2.2 Common rocks -granite, andesite, basalt 2.3 Magma Generation -composition, temperature, pressure and fluids -partial melting of mantle 2.4 Magmatism and Plate Tectonics -Mid-Ocean Ridges -Intra-continental Rifts -Island Arcs -Active Continental Margins -Back-Arc Basins -Ocean Island -Miscellaneous -Intra-Continental Activity 3. Metamorphic Petrology: 3.1Fundamental concepts -metamorphic rock, metamorphism 3.2 Subduction-related “Paired metamorphic belts” 3.3 P-T-t path and contributions to Plate tectonics 4. Sedimentary Petrology: 4.1 Fundamental concepts -sedimentary rock, sedimentation, sedimentology, sedimentary facies 4.2 Common rocks -mudstone, sandstone, limestone 4.3 “Bouma sequence” and “Galileo’s free fall” 4.4 “Facies” and Palaeoenvironments 5. “Ophiolite” 5.1 What’s ophiolite? -a Special Suite of three types of rocks 5.2 Contribution to the Tibetan Plateau	
3	**Paleomagnetism and Plate Tectonics** 11. Introduction to Geomagnetism 1) Earth Magnetic Field 2) History 3) Study Fields 12. Basic Rock Magnetism 4) Magnetic Properties 5) Magnetic Mineralogy 6) Magnetic Domains 7) Hysteresis 8) Natural Remanent Magnetism (NRM)	12

	13. Sampling, Measurement, Analysis and Field Tests 1) Collection of Paleomagnetic Samples 2) Demagnetization Techniques 3) Display and Bedding-tilt Correction 4) Identification of Ferromagnetic Minerals 5) The Fold Test 6) Synfolding Magnetization 7) Conglomerate Test 8) Reversals Test 9) Baked Contact and Consistency Tests 10) Other Tests 14. Magnetic Reversals and Inclination Shallowing 4) Magnetic Reversals 5) Paleomagnetic Geochronlogy 6) Inclination Shallowing 15. Plate Tectonics and Sea Floor Spreading 1) Plate Tectonic Theory and Paleomagnetism 2) Sea Floor Spreading Hypothesis and Paleomagnetism 16. Paleomagnetic Poles and Paleogeographic Reconstruction 4) Procedure for Pole Determination 5) Types of Poles 6) Sampling of Geomagnetic Secular Variation 7) Paleogeographic Reconstruction 17. Regional Tectonics-Collision and Shortening 3) Evolution of the Tibetan Plateau and Tethys 4) India-Asia Collision Time and Shortening 18. Regional Tectonics-Regional Rotations 1) Rotations of the NE Tibetan Plateau 2) Rotations of the SE Tibetan Plateau 3) Rotations of the Tibetan Plateau	
4	**Fundamentals of geodynamics** 1. A brief introduction on geodynamics 1.1 The deforming earth 1.2 Plate tectonics: what it can tell us? 1.3 What is geodynamics? 1.4 What this course will tell you? 2. Stress and strain in solids 2.1 Force and stress 2.2 Stress state in 2D and 3D 2.3 Pressure in the deep interiors of the earth 2.4 Strain 2.5 Measurements of stress and strain 3. Elasticity and flexure of the solid earth 3.1 Linear elasticity 3.2 Uniaxial stress and strain 3.3 Plane stress and strain 3.4 Pure and simple shear 3.5 Bending and flexure of plate in two dimensions 3.6 Flexure with basin and mountain tectonics 4. Rock Rheology	12

	4.1 Diffusion creep 4.2 Dislocation creep 4.3 Temperature- and stress-dependent rheology 4.4 Crustal rheology and viscoelasticity 4.5 Mantle convection and plate motions 5. Faulting 5.1 Classification of Faults 5.2 Mohr-circle theory 5.3 Friction on faults 5.4 Anderson theory of faulting 5.5 Coulomb failure criterion and strength envelop 5.6 Earthquake faulting 6. Geodynamic remarks of on the Tibetan plateau 6.1 Deformation from plate boundary to plate interior 6.2 Decadal to millennia time-dependent deformation 6.3 Available geodynamic models of the Tibetan plateau	
5	**Plate Tectonic in Tibet Plateau** 1. Introduction of the Tibet plateau 1.1 Why is the Himalayan-Tibetan orogen so wide? 1.2 Why is the Tibetan Plateau so flat? 1.3 Why are the boundarys so steep? 1.4 Why is the Tibetan plateau just so high and no higher? 2. The process of Gondwana split and the Asian continent aggregation 2.1 The Gondwana super continent 2.2 The split of the Gondwana 2.3 The suture zones and aggregation in Tibet 3. India and Eurasia collision 3.1 Methods to constrain the initial timing of collision High Pressure-Ultra High Pressure continental metamorphism Ophiolite obduction Cessation of marine sedimentation Molasse basin Mid-ocean ridge spreading rate Change in direction of plate motion Strike slip faults Crustal deformation Apparent polar wander path (APWP) Peripheral foreland basin Leucogranite Magmatic transition from oceanic to continental subduction Faunal migration Numerical and physical simulations 3.2 History of research on the initial timing of Indian and Asian collision 3.3 Deformation of the northern THS in the early collisional stage 3.4 Foreland basin system 3.5 Collision patterns and suturing processes between the Indian and Asian continents	8

	4. The Raising of Tibet plateau 4.1 Index of paleoelevation 4.2 The raising of Himalaya 4.3 The raising of Tibet	
5	Exam of Oral Presentation: I EXPECT you to be creative and raise novel.	4
Total		60

Course title

Physical Geography

Instructor(s):

Prof. XiaoMin Fang et al.

Course type:

Lecture

Catalog Description:

Physical Geography 2020 spring semester is designed as an introduction course for research graduate students majored in the earth and environmental sciences. As a foundation in the study of geography, this course introduces the physical elements of the earth and the environment in which people live. The focus is on natural processes that create physical diversity on the earth, covering topics like weather and climate, vegetation and soils, landforms, ecosystems, their distribution and significance. This course is designed in an interactive way, combining basic theories and current research progress in several key fields. It enables the students to develop a broad understanding of geographic processes, and how human activity affects physical geography, especially in the Tibetan Plateau. The course is structured as a series of lectures with the topics listed as following:

Schedule of the course

Section	Content
1	**Introduction of Physical Geography** 1.1 Brief introduction 1.2 The earth and its rotation 1.3 Coordination system 1.4 The earth in the solar system
2	**Global Energy Balance** 2.1 Insolation to the earth 2.2 Global energy system 2.3 Energy redistribution and climate change
3	**Air Temperature, Moisture and Precipitation** 3.1 Air temperature and vertical temperature structure 3.2Temperature change 3.3 Moisture and humidity 3.4 Precipitation formation and types
4	**Global Climates and Climate Change** 4.1 Climate and classification 4.2 Climate with latitude 4.3 Climate change and causes 4.4 Climate change impacts
5	**Winds and Global Circulation** 5.1 Air pressure, wind and cyclones-anticyclones 5.2 Wind circulation 5.3 Ocean circulation
6	**Weather Systems** 6.1 Air masses and fronts 6.2 Midlatitude anticyclones an cyclones 6.3 Tropic and equatorial weather systems
7	**Earth materials** 7.1 The structure of the earth 7.2 Earth materials and rocks
8	**Tectonics and Landforms** 8.1 Plate tectonics and global topography

	8.2 Tectonic landforms 8.2 Volcanic activity and landforms
9	**Weathering and Mass Wasting** 9.1 Weathering 9.2 Mass Wasting **Freshwater of the Continents** 10.1 Hydrologic Cycle 10.2 Groundwater
10	10.3 Streamflow 10.4 Lakes 10.5 Hydrological Model 10.6 Water as a Natural Resource
11	**Landforms Made by Running Water** 11.1 Erosion, Transportation, and Deposition 11.2 Stream Gradation and Evolution 11.3 Fluvial Landforms 11.4 Fluvial Processes in an Arid Climate
12	**Global Biogeography and Biogeographic Process** 12.1 Global Natural Vegetation and Climatic Belts 12.2 Terrestrial Ecosystem-Components, structure and function 12.3 Energy and Matter Flow in Ecosystem 12.4 Biodiversity 12.5 Human Disturbance to Natural Ecosystem 12.6 Methods of Ecosystem Studies
13	**Global Soils** 13.1 The Nature of the Soil 13.2 Soil Chemistry 13.3 Soil Moisture 13.4 Soil Development 13.5 The Global Scope of Soils
14	**Landforms Made by Wave and Wind** 14.1 The Work of Waves and Tides 14.2 Coastal Landforms 14.3 Wind Action 14.4 Eolian Landforms
15	**Glacial and Periglacial Landforms** 15.1 Glaciers and Their Types 15.2 Glacial Processes and Their Landforms 15.3 Periglacial Processes and Landforms 15.4 Glaciations and Climatic Changes

Course title

Global Change Ecology

Instructor(s)-in-charge:

Prof. WANG Tao et al.

Course type:

Lecture

Grading Policy:

The grading for this course will be based on:

- Participation (30% of grade)

- Report (70% of grade)

**Participation in lectures, discussions, and other activities is an essential part of the instructional process. Students are expected to attend class regularly. Those who are compelled to miss class should inform the instructor of the reasons for absences. Unexcused late assignments will have at a minimum 5 points deducted. To avoid this penalty you must contact the instructor prior to the due date. Each student should be expected to give a report at the end of the course.*

Course Prerequisites:

This course does not have any pre-requisites.

Catalog Description:

This course is designed as an introductory course in ecology for graduate students majored in Earth Sciences. The class is intended to provide an introduction to main ecological processes, with particular attention to the responses of these processes to global change at local, regional, and global scales. It will also introduce the basic principles of local field measurement techniques, remote sensing, and land surface modeling in relation to carbon and nitrogen cycles. The course is structured as a series of lectures in which individual research cases are discussed with faculty tutors. It will cover the following topics:

Schedule of the course

Section	Content	hours
1	**Introduction of global change ecology**	4
2	**Plant ecophysiological response** 2.1 Concepts 2.2 Methods - controlled experiment and stable isotope record 2.3 Responses to elevated CO2 and nitrogen availability 2.4 Responses to warming and drought 2.5 Impacts of multiple factors and their interaction	8
3	**Responses of terrestrial ecosystems** 3.1 Forests 3.1.1 Cambial activity and wood structure of trees 3.1.2 Elevational and latitudinal distribution of forests 3.1.3 Global change and forest growth 3.2 Grasslands 3.2.1 Plant phenology 3.2.2 Plant composition and diversity 3.2.3 Plant production and decomposition 3.2.4 Greenhouse gas fluxes 3.2.5 Carbon sequestration 3.3 micro-organisms 3.3.1 The origin and evolution of microorganims 3.3.2 Classification of microorganims	24

	3.3.3 The role of microorganims in the response of terrestrial ecosystems to climate change 3.3.4 Methods: controlled microcosms experiments and field investigation 3.3.5 Methods to study the microbial ecology 3.3.6 Responses to warming, precipitation and drought 3.3.7 Responses to eCO2 and N availability (GeoChip or high throughput seq)	
4	**Regional and global responses** 4.1 Approaches: Satellite observations 4.2 Approaches: Land surface modeling 4.3 Terrestrial vegetation dynamics 4.4 Carbon cycle 4.5 Nitrogen cycle	20
5	**Mitigation and adaption** 5.1 Concepts 5.2 Land use and reduce of GHG emissions 5.3 Accounting methodology of GHG reduction and monitoring 5.4 Carbon trade	4
Total		60

Course title

Climate Change

Instructor(s)-in-charge:

Prof. Dr.MA Yaoming et al.

Course type:

Lecture

Course Schedule:

4hrs/week by instructor.

Course Assessment:

Homework: 4 assignments for each instructor

Grading Policy:

Typically 60% homework (each instructor's report), 20% each midterm, 20% final.

Course Prerequisites:

Atmospheric science, general climate change knowledge

Catalog Description:

Climate Change 2020 spring semester is designed as an introductory course plus our research aspect in ITP and IAP CAS (Institute of Tibetan Plateau, and Institute of Atmospheric Physics, Chinese Academy of Sciences) in the Climate Change for graduate students majored in Earth Sciences. This class is a synthesis of current knowledge of the climate system and past and present climates. It provides solid background information and includes critical assessments of issues that remain incompletely understood. There, it is up to the students to logically evaluate climate change issues presented daily by the media. This class will introduce related reference for climate researchers and students, especially for issues of climate change in Earth system. The class presents the basics surrounding climate change in a simple way while pointing out the complexity of climate data collection, processing, and interpretation. Our research aspect in ITP and IAP CAS will introduce climate change related topics, for example, land surface heat flux retrieve from in-situ data, satellite remote sensing data and numerical model; land surface model development and data assimilation; black carbon in the mountain glacier area; hydrological model, Asian monsoon simulation and so on. All of these topics will enhance our theoretical questions about climate change, especially in the Tibetan Plateau.

Schedule of the course

Section	Content	hours
1	**Overview of Climate Change** 1.1 Weather and climate 1.2 What do we mean by climate variability and climate change? 1.3 Connections, timescales and uncertainties 1.4 The big picture	4
2	**Radiation and the Earth's energy balance** 2.1 Solar and terrestrial radiation 2.2 Solar variability 2.3 Summary	4
3	**The elements of the climate** 3.1 The atmosphere and oceans in motion	4

	3.2 Atmospheric circulation patterns 3.3 Radiation balance 3.4 The hydrological cycle 3.5 The biosphere 3.6 Sustained abnormal weather patterns 3.7 Atmosphere–ocean interactions 3.8 The Great Ocean Conveyor 3.9 Summary	
4	**Evidence of climate change** 8.1 Peering into the abyss of time 8.2 From greenhouse to icehouse 8.3 Sea-level fluctuations 8.4 The ice ages 8.5 The end of the last ice age 8.6 The Holocene climatic optimum 8.7 Changes during times of recorded history 8.8 The medieval climatic optimum 8.9 The Little Ice Age 8.10 The twentieth-century warming 8.11 Concluding observations	4
5	**The natural causes of climate change** 6.1 Auto-variance and non-linearity 6.2 Atmosphere–ocean interactions 6.3 Ocean currents 6.4 Volcanoes 6.5 Sunspots and solar activity 6.6 Tidal forces 6.7 Orbital variations 6.8 Continental drift 6.9 Changes in atmospheric composition 6.10 A belch from the deep 6.11 Catastrophes and the ‘nuclear winter’ 6.12 Summary	4
6	**Human activities** 7.1 Greenhouse gas emissions 7.2 Dust and aerosols 7.3 Desertification and deforestation 7.4 The ozone hole 7.5 Summary	4
7	**The measurement of climate change** 7.1 In situ instrumental observations 7.2 Satellite measurements 7.3 Re-analysis work 7.4 Historical records 7.5 Proxy measurements 7.6 Dating 7.7 Isotope age dating 7.8 Summary	4
8	**Statistics, significance and cycles** 8.1 Time series, sampling and harmonic analysis	4

	8.2 Noise 8.3 Measures of variability and significance 8.4 Smoothing 8.5 Wavelet analysis 8.6 Multidimensional analysis 8.7 Summary	
9	**Consequences of climate change** 9.1 Geological consequences 9.2 Flora and fauna 9.3 Mass extinctions 9.4 Sea levels, ice sheets and glaciers 9.5 Agriculture 9.6 The historical implications of climatic variability 9.7 Spread of diseases 9.8 The economic impact of extreme weather events 9.9 Summary	4
10	**Climate modeling context and system** 10.1 Basic processes of climate modeling 10.2 Understanding climate change 10.3 Climate modeling and weather forecasting 10.4 Framework of climate models 10.5 Climate model development	4
11	**Climate modeling, projection and uncertainties** 11.1 Coupled Model Inter-comparison Project (CMIP) 11.2 Climate ensemble 11.3 Modeling historical climate change 11.4 Projecting future climate change 11.5 Modeling biases and uncertainties 11.6 Improving climate modeling over the TP 11.7 Simulation over the TP and Asian summer monsoon	4
12	**Hydrological modelling and its applications for integrated water resources management**	4
13	**Simulation of the climate change of Asian summer monsoon** 13.1 Impact of Land-sea distribution on Asian summer monsoon formation 13.2 Impact of Tibetan Plateau 13.3 Climate change of Asian summer monsoon 13.4 Simulation of the Tibetan Plateau impacts	4
14	**Back carbon in the glacier area**	4
15	**Land surface heat flux retrieve from in-situ data, remote sensing data and numerical model**	4
Total		60

Contents of the course

Content

Overview of Climate Change

1.1 Weather and climate

1.2 What do we mean by climate variability and climate change?

1.3 Connections, timescales and uncertainties

1.4 The big picture

Radiation and the Earth's energy balance
2.1 Solar and terrestrial radiation
2.2 Solar variability
2.3 Summary
The elements of the climate
3.1 The atmosphere and oceans in motion
3.2 Atmospheric circulation patterns
3.3 Radiation balance
3.4 The hydrological cycle
3.5 The biosphere
3.6 Sustained abnormal weather patterns
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3.8 The Great Ocean Conveyor
3.9 Summary
The measurement of climate change
4.1 In situ instrumental observations
4.2 Satellite measurements
4.3 Re-analysis work
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4.6 Dating
4.7 Isotope age dating
4.8 Summary
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5.1 Time series, sampling and harmonic analysis
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7.2 Dust and aerosols
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Consequences of climate change
9.1 Geological consequences
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9.3 Mass extinctions
9.4 Sea levels, ice sheets and glaciers
9.5 Agriculture
9.6 The historical implications of climatic variability
9.7 Spread of diseases
9.8 The economic impact of extreme weather events
9.9 Summary
Context of climate modeling
Climate modeling system
Coupled Model Inter-comparison Project (CMIP)
Historical climate modeling
Future climate projection
Uncertainties in climate modeling
Textbook and any related course material:
Climate Change-A Multidisciplinary Approach (Second Edition), By William James Burroughs.
Cambridge University Press, 2007, 378 pages, ISBN 978-0-52169-033-1
Expected level of proficiency from students entering the course:
Earth science: strong
Atmospheric science: strong

Course title

Chemical Reaction Engineering

Instructor(s)-in-charge:

Prof. Li Chunshan, Prof. Xu Baohua, Associate Prof. Li Minjie

Course type:

Lecture

Course Assessment:

Homework: 6 assignments, will be given after each class, extensive literature reading is expected.

Grading Policy:

Assignments 40%, Final 40%, Attendance 20%

Course Prerequisites:

College Chemistry, College Mathematics, English.

Catalog Description:

The course is mainly focusing on the essentials of kinetics, catalysis and chemical reactor engineering. The main issue of chemical reaction engineering is to analyze the physical chemistry of sub-processes in a reactor by a mathematical model method. Each process is expressed as an appropriate mathematical expression, thereby providing the analytical solution or numerical solution. Various typical reaction types and the proper reactor design theory will be introduced.

Schedule of the course 20×3

section	content	hours
1	Introduction of Chemical Reaction Engineering.	4
2	Homogeneous Reaction Kinetics	4
3	The Kinetics of Gas-Solid Phase Catalysis	4
4	Macro-Kinetics of Gas-Solid Phase Catalysis	4
5	Autoclave Type and Homogeneous Tubular Reactor	6
6	Gas-Solid Phase Catalytic Reaction Fixed Bed Reactor	6
7	Gas-Solid Phase Catalytic Reaction Fluidized Bed Reactor	6
8	Gas-Liquid Reaction and Bubbling Reactor	6
9	The Gas-Liquid Reaction Process and the Reactor	4
10	Liquid-Solid Reaction and Fluidized Bed Reactor	4
11	Gas-Liquid-Solid Reaction Engineering	4
12	Safety of chemical reaction process	4
13	Design of reactor, examination	4
Total		60

Textbook and any related course material:

No textbook, and electronic course reading materials will be provided one week before each class.

Course title

Energy Chemistry and Energy Chemical Industry

Instructor(s)-in-charge:

Prof. Li, Songgeng, Associate prof, Fan, Chuigang

Course type:

Lecture

Course Assessment:

Homework: 10 assignments

Grading Policy:

Assignments 40%, Final 40%, Attendance 20%

Course Prerequisites:

Familiar with the basic knowledge of Chemistry, Thermodynamics, and Flow and Transport Process.

Catalog Description:

This course covers the fundamentals of energy conversion in thermomechanical, thermochemical, electrochemical, and photoelectric processes with emphasis on efficiency, environmental impact and performance. The topics include coal utilization, petro chemistry, bio-energy, fuel cell, battery and some new energy resources like hydrogen, solar, etc. Systems utilizing fossil fuels, renewable resources and hydrogen over a range of sizes and scales are discussed. Different forms of energy storage and transmission are also involved in this course. It is expected that after taking this course, students will be familiar with basic chemistry principles on energy processing, and most common energy processing technologies together with some environmental issues related.

Schedule of the course

section	content	hours
1	Energy chemistry: a general review	4
2	Coal conversion: part I : pyrolysis and gasification	4
3	Coal conversion: part II: liquefaction and combustion	4
4	Petroleum processing	4
5	Processing technologies for natural gas and unconventional hydrocarbon resources	4
6	Bioenergy: fundamentals and application I	4
7	Bioenergy: fundamentals and application II	4
8	Pollutants formation and control in energy conversions	4
9	Solar energy: basic principles, direct utilization, photoelectric conversion, chemical conversion	4
10	Hydrogen: features of hydrogen, storage tech. applications and relative technologies.	4
11	Fuel cell: overview, fundamentals, AFC, PEMFC, DMFC,SOFC, flow cell, others	4
12	Geothermal utilization	4
13	Wind energy and Ocean energy:	4
14	Energy storage technologies I : Batteries	4
15	Energy storage technologies II: Other technologies	4
Total		**60**

Textbook and any related course material:

Ripudaman Malhotra, Fossil Energy, Springer, 2013,
Handbook of Alternative Fuel Technologies, CRC Taylor & Francis, 2015
Giafranco Pistoia, Battery Operated Devices and Systems，Elsevier, 2009

Course title

Green Chemistry and Engineering

Instructor(s)-in-charge:

Prof. Zhang, Guangjin,

Course type:

Lecture

Course Assessment:

Homework: 10 assignments, presentations

Grading Policy:

Assignments 40%, Final 40%, Attendance 20%

Course Prerequisites:

Familiar with the basic knowledge of Chemistry, Thermodynamics.

Catalog Description:

The purpose of this course includes: Increase the interest to Chemistry and Chemical Engineering, extend scope of knowledge, make the idea of "Green" into mind. Knowing the basic knowledge of green chemistry and engineering, the definition, developments, theory and some examples; Getting the ideas on how to develop a green process and can applied the learned knowledge in your further research works. The topics include basic principles of green chemistry, task of green chemistry, Catalysis and Green Chemistry. Biocatalysis, Photo/electrical Catalysis, Solid catalyst, Acid and base, Ionic liquid and other non-organic solvents, Chemical separation, Alternate Energy sources, New synthetic route, Functional materials, Design of safe and harmless chemicals.

Schedule of the course

section	content	hours
1	Green Chemistry: a general review	4
2	Task of green chemistry	4
3	Green chemistry and catalysis	4
4	biocatalysis	4
5	Photo-catalysis	4
6	Electro-catalysis	4
7	Solid catalyst, Acid and Base	4
8	Ionic liquid and other non-organic solvents	4
9	Chemical separation	4
10	Working without organic solvent	4
11	Agrochemicals	4
12	Sustainable materials	4
13	Design of safe and harmless chemicals	4
14	chemistry of long wear	4
15	examination	4
Total		**60**

Textbook and any related course material:

Mukesh Doble, Green Chemistry and Processes,elsevier, 2009,
Albert Matlack, Introduction to Green Chemistry, CRC Press, 2012

Course title

Fluidization and Multiphase Flow

Instructor(s)-in-charge:

Prof. WANG Wei

Course type:

Lecture

Course Assessment:

Homework: 2 home exercises are to be solved individually. 2 course assignments are to be solved in groups of 2-3 students and extensive literature reading is expected.

Grading Policy:

Assignments 40%, Final 40%, Attendance 20%

Course Prerequisites:

Principle of Chemical Engineering

Catalog Description:

This course will provide comprehensive knowledge of fluidization and multiphase flow with fundamentals and applications related to chemical engineering and energy conversion. A student who has met the objectives of the course will be able to:

- *Understand the flow regime of gas-solid flow and state of the art of research and application*
- *Manage basic calculations and solve practical problems related to fluidization*
- *Overview the modeling approached*
- *Design a fluidized bed reactor with preliminary requirement*

Schedule of the course

section	content	hours
1	Fluidization phenomena and history, multiphase flow-history and development, class exercise	4
2	particle characterization, Single particle motion,	4
3	flow regime diagram, criteria of transition, particulate and aggregative fluidization, stability analysis, class exercise	4
4	Bubbling fluidization, bubble dynamics,	4
5	distributor design, entrainment and elutriation	6
6	Scale-up and scale-down of fluidized bed	4
7	Circulating fluidized bed, generalized fluidization, choking phenomena	6
8	cyclone and separation, downer, mixing, mass and heat transfer	6
9	Particle-fluid mass transfer and heat transfer, wall-to-bed heat transfer	4
10	Introduction to multiphase fluid dynamics, two-fluid model,	6
11	Introduction to kinetic theory, drag force, multiscale models	6
12	Introduction to simplified solution, bubbling simulation, clustering simulation, reactive simulation, perspective	4
13	Final test	2
total		60

Textbook and any related course material:

The textbook mainly refers to:

Kunii, D., Levenspiel, O. Fluidization Engineering. Butterworth-Heinemann.1991.

Electronic course reading materials will be provided before each class. The following references are recommended, including:

Grace, J. et al. Fluidized Beds. Multiphase Flow Handbook. Taylor & Francis. 2006.

Gidaspow, D. Multiphase Flow and Fluidization, Academic Press, 1994.

Course title

Applied Statistics

Instructor(s)-in-charge:

Assoc. Prof. Qian WANG Email: wangqian@ucas.ac.cn

Course type:

Lecture

Grading Policy:

Participation (20%), Homework (40%), Project (40%)

Catalog Description:

This course is an introduction to applied statistics and data analysis. Topics are chosen from descriptive measures, sampling and sampling distribution, estimation and confidence interval, hypothesis test, linear regression, ANOVA, goodness-of-fit and contingency analysis. Data analysis is difficult without some computing tools and the course will introduce some statistical computing with Excel.

Textbook and any related course material:

1. *Tamhane, Ajit C., and Dorothy D. Dunlop. Statistics and Data Analysis: From Elementary to Intermediate. Prentice Hall, 2000.*
2. *Pawel Lewicki and Thomas Hill. Statistics: Methods and Applications. http://www.ebook3000.com/Statistics--Methods-and-Applications_21438.html.*

Course title

Academic Communication for International Conferences

Instructor(s)-in-charge:

Course type:

Lecture

Grading Policy:

1. 40% given to the final group presentations

2. 60% given to the attendance, assignments and group reports

Schedule of the course

- *Lecture 1: Course Introduction*
- *Lecture 2: Interview for academic purposes--1*
- *Lecture 3: Interview for academic purposes--2*
- *Lecture 4: Discussion with examples*
- *Lecture 5: Discussion with comparison and contrast*
- *Lecture 6: Discussion with cause-effect*
- *Lecture 7: Presentation—introduction and overview*
- *Lecture 8: Presentation—reporting your research*
- *Lecture 9: Making posters*
- *Lecture 10: Presenting more effectively*
- *Lecture 11: Final Group Presentations*