COURSE CATALOG

2018-2019 Spring Semester

Yanqihu Campus

International College of UCAS

Course Selection System

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 Dec. 17th-Dec. 28th, 2018 and the students from International College can register first. After Dec. 28th the Chinese students from other colleges will register the courses. Please use the google chrome or 360 browsers. Do not choose two courses schedule overlap.

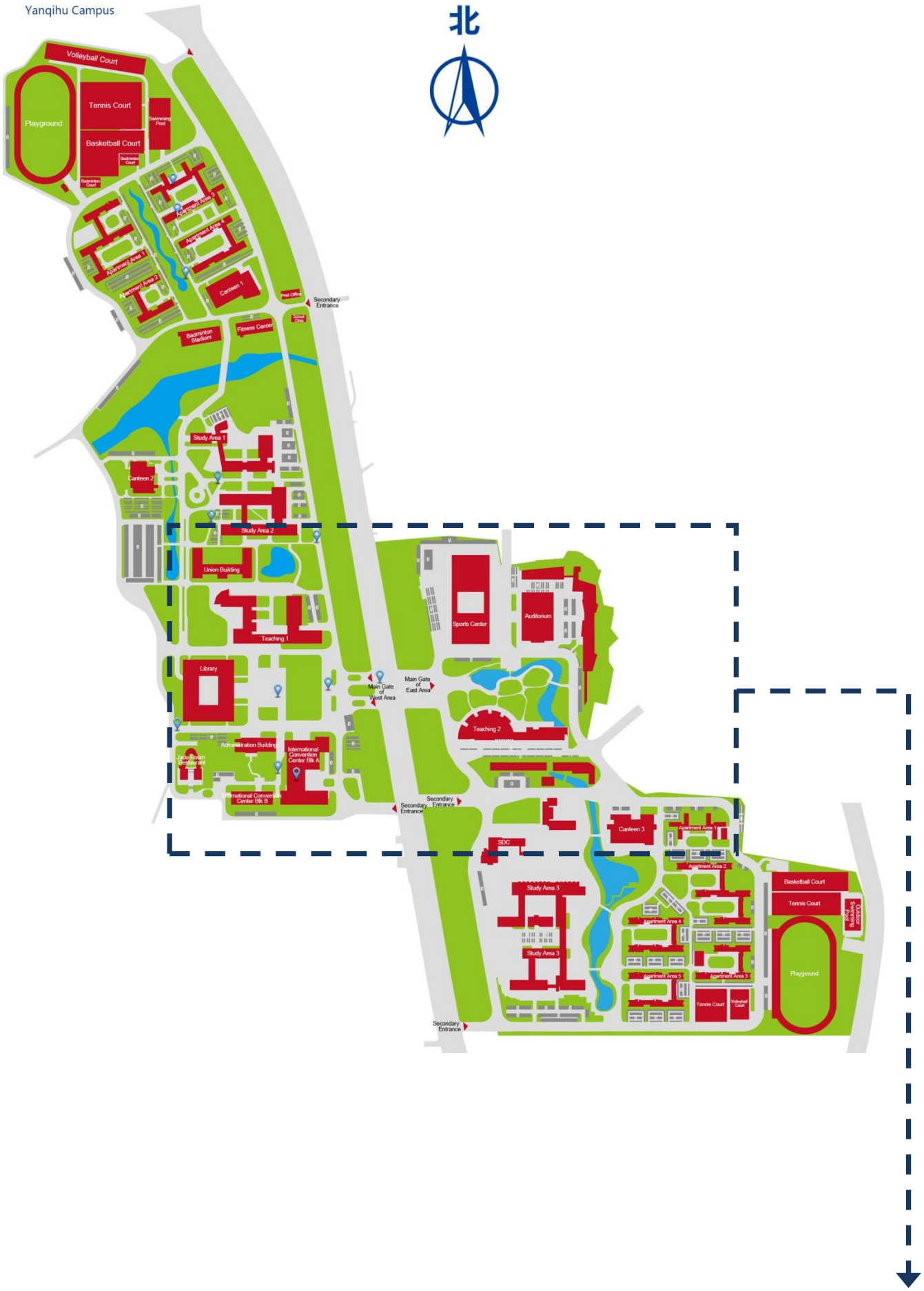
Website: http://ic-course.ucas.ac.cn/
Username: Your email address
Original password: 123456

Date	**Process**
Dec.17-Dec.28	Register professional courses in Course Selection System
March.4	Courses start
March.4-Mar.15	Sign up in the classes for confirmation the courses
Jun. 14	Language classes end
Jun. 21	All the professional courses end

Vocations: Tomb-sweeping Day lasts from Apr.5th-Apr.7th; Labor Day is May.1st; Dragon Boat Festival lasts from Jun.7th-Jun.9th.

Code	Name	Type	Hours/ Credits	Time	Classroom (Capacity)	Professors	Date/Times
1709M1019H	Plant Physiology and Ecology	Professional courses	60/4.0	Thur. (13:30-17:00)	Teaching2-123 (58)	Qu Laiye	Mar.7-Jun.13, 15 times
1701M1020H	Nano-biology	Professional courses	45/3.0	Wed. (8:30-12:00)	Teaching2-427 (100)	CHEN Deliang et al.	Mar.13-May.29, (Day-off in May.1), 11 times
1701M1022H	Molecular Entomology and Plant Pathology	Professional courses	60/4.0	Tue. (13:30-17:00)	Teaching2-325 (58)	LIU Jun et al.	Mar.5-Jun.11, 15 times
1701M1023H	Biochemistry	Professional courses	52/3.5	Tue. (8:30-12:00)	Teaching2-418 (58)	ZHONG Liangwei et al.	Mar.5-May.28, 13 times
1701M1024H	Conservation Biology	Professional courses	21/2.0	Tue. (13:30-16:20)	Teaching2-218 (58)	JIANG Zhigang	Apr.9-May.21, 7 times
1701M1021H	Vector and Human Pathogen	Professional courses	60/4.0	Thur. (8:30-12:00)	Teaching2-319 (58)	ZHENG Aihua et al.	Mar.7-Jun.13, 15 times
1701M1025H	Introduction to RNA Silencing and Epigenetics	Professional courses	60/4.0	Thur. (13:30-17:00)	Teaching2-234 (46)	ZHANG Xiaoming et al.	Mar.7-Jun.13, 15 times
1707M1028H	Nanobiological Sensing and Detection	Professional courses	60/4.0	Tue. (13:30-17:00)	Teaching2-318 (58)	LI Lele	Mar.5-Jun.11, 15 times
1707M1026H	Nanotechnology for Solar Energy Utilization	Professional courses	60/4.0	Thur. (13:30-17:00)	Teaching2-227 (100)	HE Tao	Mar.7-Jun.13, 15 times
1707M1027H	Nano Electronic Materials	Professional courses	60/4.0	Wed. (10:30-12:10 &13:30-15:10)	Teaching2-418 (58)	XIE Liming	Mar.6-Jun.19, (Day-off in May. 1), 15 times
1702M1030H	Plate Tectonics and Evolution of Tibetan Plateau	Professional courses	60/4.0	Thur. (13:30-17:00)	Teaching2-338 (46)	DING Lin et al.	Mar.7-Jun.13, 15 times

1705M1031H	Physical Geography	Professional courses	60/4.0	Tue. (13:30-17:00)	Teaching2-227 (100)	FANG Xiaomin et al.	Mar.5-Jun.11, 15 times
1704M1032H	Global Change Ecology	Professional courses	60/4.0	Wed. (13:30-17:00)	Teaching2-206 (156)	PIAO Shilong et al.	Mar.6-Jun.19, (Day-off in May. 1), 15 times
1704M1033H	Climate Change	Professional courses	60/4.0	Mon. (8:30-12:00)	Teaching2-429 (100)	MA Yaoming et al.	Mar.4-Jun.10, 15 times
1707M1034H	Chemical Reaction Engineering	Professional courses	60/4.0	Tue. (8:30-12:00)	Teaching2-423 (58)	LI Chunshan et al.	Mar.5-Jun.11, 15 times
1707M1035H	Energy Chemistry and Chemical Engineering	Professional courses	60/4.0	Mon. (13:30-17:00)	Teaching2-338 (46)	LI Songgeng et al.	Mar.4-Jun.10, 15 times
1707M1036H	Green Chemical Engineering	Professional courses	60/4.0	Wed. (8:30-12:00)	Teaching2-225 (58)	ZHANG Guangjin	Mar.6-Jun.19, (Day-off in May. 1), 15 times
1707M1037H	Fluidization and Multiphase Flow	Professional courses	60/4.0	Tue. (13:30-17:00)	Teaching2-319 (58)	WANG Wei	Mar.5-Jun.11, 15 times
17MGX042H-1	Academic Communication for International Conferences	Optional courses	48/2.0	Tue. (8:30-12:00)	Teaching2-427 (58)	YU Hua	Mar.5-May.14, 11 times
17MGX042H-2	Academic Communication for International Conferences	Optional courses	48/2.0	Wed. (8:30-12:00)	Teaching2-419 (58)	LIU Yunlong	Mar.6-May.22, 11 times
1710M1043H	Applied Statistics	Professional courses	40/2.5	Thur. (13:30-17:00)	Teaching2-421 (58)	WANG Qian	Mar.7-May.9, 10 times


Yanqihu Campus
北
Volleyball Court
Playground
Tennis Court
Swimming Pool
Basketball Court
Badminton Court
Badminton Court
Apartment Area 3
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
International Convention Center Blk A
Jade Room Restaurant
International Convention Center Blk B
Secondary Entrance
Secondary Entrance
Canteen 3
Apartment Area 1
Apartment Area 2
SDC
Study Area 3
Study Area 3
Apartment Area 4
Apartment Area 5
Apartment Area 3
Tennis Court
Volleyball Court
Basketball Court
Tennis Court
Outdoor Pool
Playground
Secondary Entrance


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

Course title:

Plant Physiology and Ecology

Instructor:

Associate Prof. Laiye Qu

Course type: *Lecture*

Schedule of the course:

Thursday afternoon, from 13:30-17:00.

Date: Mar-7th-Jun-13th, 15 times.

Classroom: Teaching2-123

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.

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 Schedule:

Wednesday mornings, from 08:30-12:00.
Date: Mar-13th-May-29th, 11 times.
Classroom: Teaching2-427

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 Schedule:

Tuesday afternoons, from 13:30-17:00.
Date: Mar-5th-Jun-11th, 15 times.
Classroom: Teaching2-325

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

Course type:

Lectures and project works

Course Schedule:

Tuesday morning, from 8:30-12:00.

Date: Mar-5th-May-28th, 13 times.

Classroom: Teaching2-418

Course Assessment:

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

Grading Policy:

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

Course Prerequisites:

At least the grade Pass at the course Organic Chemistry.

Catalog Description:

Upon completion of the course the students should be able to:

(1) account for the basic properties and functions of amino acids and proteins, as well as the principle for protein separation, purification and identification;

(2) describe the factors affecting enzyme activity, enzyme kinetics and inhibition;

(3) understand protein synthesis, targeting and modifications;

(4) predict the metabolic effects following influence on individual reaction steps;

(5) explain connections among carbohydrate metabolism, lipid metabolism and amino acid metabolism;

(6) evaluate literature in biochemistry and from this retrieve information for giving oral presentation.

Content

The course is divided into the following parts:

Introduction to Biochemistry (Associate 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 and modifications (Professor ZHONG Liangwei)

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 work implies advanced studies in a group with an emphasis on own work, group cooperation and literature studies.

Literature and other teaching aids
Lehninger, Principles of Biochemistry, fourth edition
A. Perl, R. Hanczko, T. Telarico, Z. Oaks, S. Landas, Oxidative stress, inflammation and carcinogenesis are controlled through the pentose phosphate pathway by transaldolase, *Trends Mol Med* **17** (2011) 395-403
S. Zhao, W. Xu, W. Jiang, W. Yu, Y. Lin, T. Zhang, J. Yao, L. Zhou, Y. Zeng, H. Li, Y. Li, J. Shi, W. An, S.M. Hancock, F. He, L. Qin, J. Chin, P. Yang, X. Chen, Q. Lei, Y. Xiong, K.L. Guan, 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.* 2013 Nov 8;288(45):32241-7.
Entrez Medline: http://www.ncbi.nlm.nih.gov/pubmed/

Course title

Conservation Biology

Instructor(s)-in-charge:

Prof. JIANG Zhigang

Course type:

Lecture

Course Schedule:

3hrs/week by instructor. When there is time, a classroom discussion will be led by the teaching assistant.

Tuesday afternoon, from 13:30-16:20.

Date: Apr. 9th- May-21st, 7 times.

Classroom: Teaching2-218

Course Assessment:

Homework: 3 assignments

Grading Policy:

40% homework, 60% final.

Course Prerequisites:

Background in Biological Science, Agricultural Science, Forestry Science and 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, I will give an introduction about the history, scope and missions as well as theoretic frames and practice means of Conservation Biology. I 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 law environment for conservation. 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 landscapes in the country are diverse and climate types in the country are sharply contrasting. Differences in temperature and precipitation determine distribution patterns of wild plants and wild animals in country. Thus, China possesses diversified habitats for wild plants and wild animals. On the other hand, the country with long history of civilization has been developing rapidly since 1980s. Due to intensified human activities, land-cover change, environmental pollution, growing of human population plus the influence of global change, many wild species in country are threatened and natural ecosystems are degraded. 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. Therefore, while reviewing the current development of Conservation Biology in the world, I will give case studies of China's endemic species; represent biomes and conservation practice to enrich the contents of course.

Schedule of the course

Lecture	Contents	Hours
1	History of conservation and the born of conservation biology	3
2	Principles and methods in Conservation science	3
3	Biodiversity in China	3
4	Extinction and IUCN Red lists	3
5	Protected areas	3
6	Sustainable use and trade of bio-resource	3
Exam.		3
total		21

Contents of the course

Lecture 1: History of conservation and the born of conservation biology

(1) History of conservation
(2) Environment problems we confronted
(3) The Sixth Massive Extinction
(4) The born of Conservation Biology
(5) The scope and mission of Conservation Biology

Lecture 2: Principles and methods in Conservation science

(1) Legal frames
(2) Human wellbeing consideration
(3) Ethical consideration
(4) Genetics consideration
(5) Ecological consideration
(6) Behavioural consideration

Lecture 3: Biodiversity in China

(1) Main Biomes
(2) Biodiversity
(3) Endemic species

Lecture 4: Extinction and IUCN Red lists

(1) The extinction of species
(2) The IUCN Red List of Endangered Species
(3) The China's Endangered Species Red Lists

Lecture 5: Protected areas

(1) The definition of IUCN
(2) The growth of PA in the world and in China
(3) The challenges in the PA management

Lecture 6: Sustainable use and trade of bio-resource

(1) Livelihood of indigenous people

(2) CITES
(3) Hunting, trade and sustainable use

Textbook and any related course material:

Primack, R. B. 2010. *Essentials of Conservation Biology*. 5th ed. Sinauer Associates, Inc. Sunderland, USA.
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.
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.
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]

Expected level of proficiency from students entering the course:

Biology or applied biology like Agricultural Science, Forestry Science Medical and Vet 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 Schedule:

Thursday morning, from 8:30-12:00.
Date: Mar-7th-Jun-13th, 15 times.
Classroom: Teaching2-319

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	Zhen Zou

	plant pathogens	
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 RNA silencing and Epigenetics

Instructor(s)-in-charge:
Prof. Xiaoming Zhang
Prof. Xianhui Wang
Prof. Weiqiang Qian (Peking University)
Teaching assistant:
Dr. Qi Li
Course type:
Lecture
Course Schedule:
Thursday afternoon, from 13:30-17:00.
Date: Mar-7th-Jun-13th, 15 times.
Classroom: Teaching2-234
Course Assessment:
mini-tests in each section
Grading Policy:
mini-tests scores
Course Prerequisites:
Without
Catalog Description:

RNA silencing and Epigenetics are two of the most hot topics in the past two decades. 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 the first part, we will study RNA silencing on sRNA generation, amplification, loading, action, turnover, and function. Epigenetics is the study of heritable changes in gene expression that do not change DNA sequence. In the second part, we will introduce how DNA methylation, histone modification, chromatin remodeling, long non-coding RNAs and RNA modification regulate gene expression in eukaryotes. We will also talk about the most popular technologies used in Epigenetic studies.

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 sRNA, the difference between genetic and epigenetic regulation, and how to study projects relate to RNA silencing and Epigenetics.

Schedule of the course

section	Content	Lecturer
1	Introduction to RNA silencing and Epigenetics	*Xiaoming Zhang*
2	RNA silencing-discovery and sRNA biogenesis Transgenic technology	*Xiaoming Zhang*
3	RNA silencing-sRNA amplification and loading	*Xiaoming Zhang*

	Virus and VSR	
4	sRNA-action and degradation Molecular tools to study RNAi	*Xiaoming Zhang*
5	sRNA-Function: immunity and development Animal virus and RNA silencing	*Xiaoming Zhang*
6	The movement of RNA silencing Cross-kingdom RNAi	*Xiaoming Zhang*
7	sRNA-apply RNA silencing and disease	*Xiaoming Zhang*
8	DNA methylation-establishment and maintenance Imprinting	*Weiqiang Qian*
9	DNA demethylation Molecular tools to study DNA methylation	*Weiqiang Qian*
10	Transgenerational epigenetic inheritance Epigenetics and flowering	*Xiaoming Zhang*
11	Histone modification Honey bee epigenome	*Xianhui Wang*
12	Histone modification X-inactivation	*Xianhui Wang*
13	Histone variants and Chromatin remodeling Epigenetics and disease	*Xiaoming Zhang*
14	RNA modification Environment and epigenetics	*Xiaoming Zhang*
15	Long non-coding RNA Circular RNA	*Xiaoming Zhang*
Total		

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 Schedule:

Tuesday afternoons, from 13:30-17:00.
Date: Mar-5th-Jun-11th, 15 times.
Classroom: Teaching2-318

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

section	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 Schedule:

Thursday afternoon, from 13:30-17:00.

Date: Mar-7th-Jun-13th, 15 times.

Classroom: Teaching2-227

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* *Chapter 16. Photodetection and imaging* *Chapter 17. Summary and outlook*	*4*
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 Schedule:

Wednesday, from 10:30-12:10&13:30-15:10.

Date: Mar-6th-Jun-19th, 15 times.

Classroom: Teaching2-418

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 Schedule:

Thursday afternoon, from 13:30-17:00.
Date: Mar-7th-Jun-13th, 15 times.
Classroom: Teaching2-338

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	12

	2) Physical Properties 3) Chemical Compositions 3. Continental Drift 1) Principal Observations 2) The Implications 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	12

	-Plate move evidence -Plate boundaries 1.5 Rocks in plate boundaries -Diverging boundaries (e.g. mid-ocean ridges) -Convergent boundaries (e.g. subduction zone) 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	12

	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) 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	12

	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 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	8

	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 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

Course Schedule:

Tuesday afternoons, from 13:30-17:00.
Date: Mar-5th-Jun-11th, 15 times.
Classroom: Teaching2-227

Catalog Description:

Physical Geography 2019 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	hours
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	4
2	**Global Energy Balance** 2.1 Insolation to the earth 2.2 Global energy system 2.3 Energy redistribution and climate change	4
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
4	**Global Climates and Climate Change** 4.1 Climate and classification 4.2 Climate with latitude 4.3 climate change and causes 4.4 Mini-seminars: -student presentations and discussion	4
5	**Winds and Global Circulation** 5.1 Air pressure, wind and cyclones-anticyclones 5.2 Wind circulation 5.3 Ocean circulation	4
6	**Weather Systems** 6.1 Air masses and fronts 6.2 Midlatitude anticyclones an cyclones 6.3 Tropic and equatorial weather systems	4

7	**Earth materials** 7.1 The structure of the earth 7.2 Earth materials and rocks	4
8	**Tectonics and Landforms** 8.1 Plate tectonics and global topography 8.2 Tectonic landforms 8.2 Volcanic activity and landforms	4
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	4
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	4
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	4
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	4
Total		60

Course title

Global Change Ecology

Instructor(s)-in-charge:

Prof. PIAO Shilong

Course type:

Lecture

Course Schedule:

Wednesday afternoon, from 13:30-17:00.
Date: Mar-6th-Jun-19th, 15 times.
Classroom: Teaching2-206

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	24

	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 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:

Mondays from 8: 30 - 12:00 a.m.

Date: Mar-4th- Jun-10th, 15times.

Classroom: Teaching2-429

Catalog Description:

Climate Change 2019 spring semester is designed as an introductory course plus our research aspect in ITPCAS (Institute of Tibetan Plateau, 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 ITPCAS 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 and so on. All of these topics will enhance our theoretical questions about climate change, especially in the Tibetan Plateau.*

The course is structured as a series of lectures and mini-seminars in which individual research cases are discussed with faculty tutors. It will cover the following topics:

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 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	4

	3.9 Summary	
4	**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
5	**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
6	**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
7	**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
8	**Statistics, significance and cycles** 5.1 Time series, sampling and harmonic analysis 5.2 Noise 5.3 Measures of variability and significance 5.4 Smoothing 5.5 Wavelet analysis	4

	5.6 Multidimensional analysis 5.7 Summary	
9	**Modelling the climate** 10.1 Global circulation models 10.2 Simulation of climatic variability 10.3 The challenges facing modellers 10.4 Summary	4
10	**The measurement of climate change** 4.1 In situ instrumental observations 4.2 Satellite measurements 4.3 Re-analysis work 4.4 Historical records 4.5 Proxy measurements 4.6 Dating 4.7 Isotope age dating 4.8 Summary	4
11	**Predicting climate change** 11.1 Natural variability 11.2 Predicting global warming 11.3 The predicted consequences of global warming 11.4 Doubts about the scale of global warming 11.5 What can we do about global warming? 11.6 The Gaia hypothesis	4
12	**Land surface heat flux retrieve from in-situ data, remote sensing data and numerical model**	4
13	**Climate change over the Tibetan Plateau and its impact**	4
14	**Back carbon in the glacier area**	4
15	**Hydrological model, development and application**	4
Total		60

Course title

Chemical Reaction Engineering

Instructor(s)-in-charge:

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

Course type:

Lecture

Course Schedule:

Tuesday morning, from 08:30-12:00.

Date: Mar-5th-Jun-11th, 15 times.

Classroom: Teaching2-423

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 Schedule:

Mondays from 13: 30 - 17:00.

Date: Mar-4th- Jun-10th, 15times.

Classroom: Teaching2-338

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,
Dr. Yuan, Menglei

Course type:

Lecture

Course Schedule:

Wednesday morning, from 08:30-12:00.
Date: Mar-6th-Jun-19th, 15 times.
Classroom: Teaching2-225

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/electro-catalysis I	4
6	Photo/electro-catalysis II	4
7	Solid catalyst, Acid and Base	4
8	Ionic liquid and other non-organic solvents	4
9	Chemical separation	4
10	Alternate Energy sources	4
11	New synthetic route	4
12	Functional materials	4
13	Design of safe and harmless chemicals	4
14	Industrial Examples	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 Schedule:

Tuesday afternoons, from 13:30-17:00.

Date: Mar-5th-Jun-11th, 15 times.

Classroom: Teaching2-319

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, Transport Phenomena, College Mathematics.

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,	4
2	particle characterization, Single particle motion,	4
3	flow regime diagram, criteria of transition, particulate and aggregative fluidization, stability analysis	4
4	Bubbling fluidization, bubble dynamics,	4
5	distributor design criteria, entrainment and elutriation	4
6	Circulating fluidized bed, generalized fluidization, choking phenomena	4
7	cyclone and separation, downer, mixing, mass and heat transfer	4
8	Introduction to multiphase fluid dynamics, two-fluid model,	4
9	Introduction to kinetic theory, drag force, multiscale models	4
10	Introduction to simplified solution, bubbling simulation, clustering simulation, reactive simulation, perspective	4
11	Final test	2
total		42

Textbook and any related course material:

No textbook, and electronic course reading materials will be provided before each class. The following references are recommended, including

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

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

Course Schedule:

Thursday afternoon, from 13:30-17:00.
Date: Mar-7th-May-9th, 10 times.
Classroom: Teaching2-421

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*