#

# 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**

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| --- | --- |
| **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.

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| **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) | Teaching2-327(100) | JIANG Zhigang | May.7-Jun.18, 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) | Teaching2-221(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 |

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| **Code** | **Name** | **Type** | **Hours/Credits** | **Time** | **Classroom** | **Teachers** |
| 17DGB001-1 | Elementary Chinese-Reading and Writing | Public compulsory courses | 128/2.0 | Mon.(8:30-10:10) | Teaching2-213 | LIU Xiaomeng |
| Wed.(10:20-12:00) | Teaching2-213 |
| Thur.(8:30-10:10) | Teaching2-213 |
| Fri.(10:20-12:00) | Teaching2-213 |
| 17DGB002-1 | Elementary Chinese-Reading and Writing | Public compulsory courses | 128/2.0 | Mon.(10:20-12:00) | Teaching2-213 | HE Fei |
| Wed.(8:30-10:10) | Teaching2-213 |
| Thur.(10:20-12:00) | Teaching2-213 |
| Fri.(8:30-10:10) | Teaching2-213 |
| 17DGB003-1 | China Panorama | Public compulsory courses | 48/2.0 | Fri.(19:00-21:40) | Teaching2-118 | Cao Zhihong |





**Teaching Building 2**

**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.*

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| --- | --- | --- |
| 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**

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| 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 |  |  |

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**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**

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| 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: May-7th- Jun-18th, 7 times.*

*Classroom: Teaching2-327*

**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**

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| 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 |

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**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**

|  |  |  |
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| 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 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 biogenesisTransgenic technology | *Xiaoming Zhang* |
| 3 | RNA silencing-sRNA amplification and loadingVirus and VSR | *Xiaoming Zhang* |
| 4 | sRNA-action and degradationMolecular tools to study RNAi | *Xiaoming Zhang* |
| 5 | sRNA-Function: immunity and developmentAnimal virus and RNA silencing | *Xiaoming Zhang* |
| 6 | The movement of RNA silencing Cross-kingdom RNAi | *Xiaoming Zhang* |
| 7 | sRNA-applyRNA silencing and disease | *Xiaoming Zhang* |
| 8 | DNA methylation-establishment and maintenanceImprinting  | *Weiqiang Qian* |
| 9 | DNA demethylationMolecular tools to study DNA methylation | *Weiqiang Qian* |
| 10 | Transgenerational epigenetic inheritanceEpigenetics and flowering | *Xiaoming Zhang* |
| 11 | Histone modificationHoney bee epigenome | *Xianhui Wang* |
| 12 | Histone modificationX-inactivation | *Xianhui Wang* |
| 13 | Histone variants and Chromatin remodelingEpigenetics and disease | *Xiaoming Zhang* |
| 14 | RNA modificationEnvironment and epigenetics  | *Xiaoming Zhang* |
| 15 | Long non-coding RNACircular 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**

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| 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 |

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**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**

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| *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* |

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**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**

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| 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 |

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**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**

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| Section | Content | hours |
| 1 | **Plate tectonics and its developing history** 1. Introduction to Plate Tectonics
2. The Structure of the Earth
3. Three Layers
4. Physical Properties
5. Chemical Compositions
6. Continental Drift
7. Principal Observations
8. The Implications
9. Seafloor Spreading
10. Seafloor Topography
11. Age of the Seafloor
12. Oceanic Ridge System
13. Accreting Plate Boundaries
14. [Divergent](http://www.so.com/link?url=http%3A%2F%2Fgeology.com%2Fnsta%2Fdivergent-plate-boundaries.shtml&q=teaching+plate+tectonics&ts=1479720858&t=f3cdf58048db6fe447bc8aeedf1e8ba&src=haosou)Plate Boundaries
15. [Convergent](http://www.so.com/link?url=http%3A%2F%2Fgeology.com%2Fnsta%2Fdivergent-plate-boundaries.shtml&q=teaching+plate+tectonics&ts=1479720858&t=f3cdf58048db6fe447bc8aeedf1e8ba&src=haosou)Plate Boundaries
16. Transform Plate Boundaries
17. Subduction
18. Distribution of Subduction zones
19. Deep Structure of the Subduction Zones
20. Continents
21. The Growth of Continents
22. Continental Margins
23. Hotspots and Mantle Plumes
24. Mantle Convection
25. Surface Volcanisms
26. Deep Origin of Mantle Plumes
27. The Wilson Cycle
28. Traditional Wilson Cycle Model
29. The Implications
30. Planetary Perspective
31. The Early History
32. Comparative Planetary
 | 12 |
| 2 | **Petrology and Plate Tectonics**1. Introduction to Petrology and Plate Tectonics1.1 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 rocks1.3 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 boundaries1.5 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 basin2. Igneous Petrology2.1 Fundamental concepts -magma/melts, fractional crystallization, eruption, emplacement, intrusive rocks, volcanic rocks, volcano, dike, country rocks2.2 Common rocks -granite, andesite, basalt 2.3 Magma Generation-composition, temperature, pressure and fluids-partial melting of mantle2.4 Magmatism and Plate Tectonics-Mid-Ocean Ridges-Intra-continental Rifts-Island Arcs-Active Continental Margins-Back-Arc Basins-Ocean Island-Miscellaneous-Intra-Continental Activity3. 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 facies4.2 Common rocks -mudstone, sandstone, limestone 4.3 “Bouma sequence” and “Galileo’s free fall” 4.4 “Facies” and Palaeoenvironments5. “Ophiolite” 5.1 What’s ophiolite? -a Special Suite of three types of rocks 5.2 Contribution to the Tibetan Plateau  | 12 |
| 3 | **Paleomagnetism and Plate Tectonics**1. Introduction to Geomagnetism
2. Earth Magnetic Field
3. History
4. Study Fields
5. Basic Rock Magnetism
6. Magnetic Properties
7. Magnetic Mineralogy
8. Magnetic Domains
9. Hysteresis
10. Natural Remanent Magnetism (NRM)
11. Sampling, Measurement, Analysis and Field Tests
12. Collection of Paleomagnetic Samples
13. Demagnetization Techniques
14. Display and Bedding-tilt Correction
15. Identification of Ferromagnetic Minerals
16. The Fold Test
17. Synfolding Magnetization
18. Conglomerate Test
19. Reversals Test
20. Baked Contact and Consistency Tests
21. Other Tests
22. Magnetic Reversals and Inclination Shallowing
23. Magnetic Reversals
24. Paleomagnetic Geochronlogy
25. Inclination Shallowing
26. Plate Tectonics and Sea Floor Spreading
27. Plate Tectonic Theory and Paleomagnetism
28. Sea Floor Spreading Hypothesis and Paleomagnetism
29. Paleomagnetic Poles and Paleogeographic Reconstruction
30. Procedure for Pole Determination
31. Types of Poles
32. Sampling of Geomagnetic Secular Variation
33. Paleogeographic Reconstruction
34. Regional Tectonics-Collision and Shortening
35. Evolution of the Tibetan Plateau and Tethys
36. India-Asia Collision Time and Shortening
37. Regional Tectonics-Regional Rotations
38. Rotations of the NE Tibetan Plateau
39. Rotations of the SE Tibetan Plateau
40. Rotations of the Tibetan Plateau
 | 12 |
| 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 strain3. 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 faulting6. 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 | 12 |
| 5 | **Plate Tectonic in Tibet Plateau**1. Introduction of the Tibet plateau
	1. Why is the Himalayan-Tibetan orogen so wide?
	2. Why is the Tibetan Plateau so flat?
	3. Why are the boundarys so steep?
	4. Why is the Tibetan plateau just so high and no higher?
2. The process of Gondwana split and the Asian continent aggregation
	1. The Gondwana super continent
	2. The split of the Gondwana
	3. The suture zones and aggregation in Tibet
3. India and Eurasia collision
	1. Methods to constrain the initial timing of collision

High Pressure-Ultra High Pressure continental metamorphismOphiolite obductionCessation of marine sedimentationMolasse basinMid-ocean ridge spreading rateChange in direction of plate motionStrike slip faultsCrustal deformationApparent polar wander path (APWP)Peripheral foreland basinLeucograniteMagmatic transition from oceanic to continental subductionFaunal migrationNumerical and physical simulations* 1. History of research on the initial timing of Indian and Asian collision
	2. Deformation of the northern THS in the early collisional stage
	3. Foreland basin system
	4. Collision patterns and suturing processes between the Indian and Asian continents
1. The Raising of Tibet plateau
	1. Index of paleoelevation
	2. The raising of Himalaya
	3. The raising of Tibet
 | 8 |
| 5 | Exam of Oral Presentation: I EXPECT you to be creative and raise novel. | 4 |
| Total |  | 60 |

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**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**

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| Section | Content | hours |
| 1 | **Introduction of Physical Geography**1.1 Brief introduction1.2 The earth and its rotation1.3 Coordination system1.4 The earth in the solar system | 4 |
| 2 | **Global Energy Balance** 2.1 Insolation to the earth2.2 Global energy system2.3 Energy redistribution and climate change  | 4 |
| 3 | **Air Temperature, Moisture and Precipitation**3.1 Air temperature and vertical temperature structure3.2Temperature change3.3 Moisture and humidity3.4 Precipitation formation and types | 4 |
| 4 | **Global Climates and Climate Change**4.1 Climate and classification 4.2 Climate with latitude4.3 climate change and causes4.4 Mini-seminars: -student presentations and discussion | 4 |
| 5 | **Winds and Global Circulation**5.1 Air pressure, wind and cyclones-anticyclones5.2 Wind circulation5.3 Ocean circulation | 4 |
| 6 | **Weather Systems**6.1 Air masses and fronts6.2 Midlatitude anticyclones an cyclones6.3 Tropic and equatorial weather systems | 4 |
| 7 | **Earth materials**7.1 The structure of the earth7.2 Earth materials and rocks | 4 |
| 8 | **Tectonics and Landforms**8.1 Plate tectonics and global topography 8.2 Tectonic landforms8.2 Volcanic activity and landforms | 4 |
| 9 | **Weathering and Mass Wasting**9.1 Weathering 9.2 Mass Wasting**Freshwater of the Continents**10.1 Hydrologic Cycle10.2 Groundwater |  |
| 10 | 10.3 Streamflow10.4 Lakes10.5 Hydrological Model10.6 Water as a Natural Resource |  |
| 11 | **Landforms Made by Running Water**11.1 Erosion, Transportation, and Deposition11.2 Stream Gradation and Evolution11.3 Fluvial Landforms11.4 Fluvial Processes in an Arid Climate |  |
| 12 | **Global Biogeography and Biogeographic Process**12.1 Global Natural Vegetation and Climatic Belts12.2 Terrestrial Ecosystem-Components, structure and function12.3 Energy and Matter Flow in Ecosystem12.4 Biodiversity12.5 Human Disturbance to Natural Ecosystem12.6 Methods of Ecosystem Studies | 4 |
| 13 | **Global Soils**13.1 The Nature of the Soil13.2 Soil Chemistry13.3 Soil Moisture13.4 Soil Development13.5 The Global Scope of Soils | 4 |
| 14 | **Landforms Made by Wave and Wind**14.1 The Work of Waves and Tides14.2 Coastal Landforms14.3 Wind Action14.4 Eolian Landforms | 4 |
| 15 | **Glacial and Periglacial Landforms**15.1 Glaciers and Their Types15.2 Glacial Processes and Their Landforms15.3 Periglacial Processes and Landforms15.4 Glaciations and Climatic Changes | 4 |
| Total |  | 60 |

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**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**

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| 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 record2.3 Responses to elevated CO2 and nitrogen availability2.4 Responses to warming and drought2.5 Impacts of multiple factors and their interaction | 8 |
| 3 | **Responses of terrestrial ecosystems**3.1 Forests3.1.1 Cambial activity and wood structure of trees3.1.2 Elevational and latitudinal distribution of forests3.1.3 Global change and forest growth3.2 Grasslands3.2.1 Plant phenology3.2.2 Plant composition and diversity3.2.3 Plant production and decomposition3.2.4 Greenhouse gas fluxes3.2.5 Carbon sequestration3.3 micro-organisms3.3.1 The origin and evolution of microorganims3.3.2 Classification of microorganims3.3.3 The role of microorganims in the response of terrestrial ecosystems to climate change3.3.4 Methods: controlled microcosms experiments and field investigation3.3.5 Methods to study the microbial ecology3.3.6 Responses to warming, precipitation and drought3.3.7 Responses to eCO2 and N availability (GeoChip or high throughput seq) | 24 |
| 4 | **Regional and global responses**4.1 Approaches: Satellite observations4.2 Approaches: Land surface modeling4.3 Terrestrial vegetation dynamics4.4 Carbon cycle4.5 Nitrogen cycle | 20 |
| 5 | **Mitigation and adaption**5.1 Concepts 5.2 Land use and reduce of GHG emissions5.3 Accounting methodology of GHG reduction and monitoring5.4 Carbon trade | 4 |
| Total |  | 60 |

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**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**

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| Section | Content | hours |
| 1  | **Overview of Climate Change**1.1 Weather and climate1.2 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 radiation2.2 Solar variability2.3 Summary | 4 |
| 3  | **The elements of the climate**3.1 The atmosphere and oceans in motion3.2 Atmospheric circulation patterns3.3 Radiation balance3.4 The hydrological cycle3.5 The biosphere3.6 Sustained abnormal weather patterns3.7 Atmosphere–ocean interactions3.8 The Great Ocean Conveyor3.9 Summary | 4 |
| 4  | **The natural causes of climate change**6.1 Auto-variance and non-linearity6.2 Atmosphere–ocean interactions6.3 Ocean currents6.4 Volcanoes6.5 Sunspots and solar activity6.6 Tidal forces6.7 Orbital variations6.8 Continental drift6.9 Changes in atmospheric composition6.10 A belch from the deep6.11 Catastrophes and the ‘nuclear winter’6.12 Summary | 4 |
| 5  | **Human activities**7.1 Greenhouse gas emissions7.2 Dust and aerosols7.3 Desertification and deforestation7.4 The ozone hole7.5 Summary | 4 |
| 6  | **Evidence of climate change**8.1 Peering into the abyss of time8.2 From greenhouse to icehouse8.3 Sea-level fluctuations8.4 The ice ages8.5 The end of the last ice age8.6 The Holocene climatic optimum8.7 Changes during times of recorded history8.8 The medieval climatic optimum8.9 The Little Ice Age8.10 The twentieth-century warming8.11 Concluding observations | 4 |
| 7  | **Consequences of climate change**9.1 Geological consequences9.2 Flora and fauna9.3 Mass extinctions9.4 Sea levels, ice sheets and glaciers9.5 Agriculture9.6 The historical implications of climatic variability9.7 Spread of diseases9.8 The economic impact of extreme weather events9.9 Summary | 4 |
| 8  | **Statistics, significance and cycles**5.1 Time series, sampling and harmonic analysis5.2 Noise5.3 Measures of variability and significance5.4 Smoothing5.5 Wavelet analysis5.6 Multidimensional analysis5.7 Summary  | 4 |
| 9 | **Modelling the climate**10.1 Global circulation models10.2 Simulation of climatic variability10.3 The challenges facing modellers10.4 Summary | 4 |
| 10 | **The measurement of climate change**4.1 In situ instrumental observations4.2 Satellite measurements4.3 Re-analysis work4.4 Historical records4.5 Proxy measurements4.6 Dating4.7 Isotope age dating4.8 Summary | 4 |
| 11  | **Predicting climate change**11.1 Natural variability11.2 Predicting global warming11.3 The predicted consequences of global warming11.4 Doubts about the scale of global warming11.5 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 |

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**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**

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| 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 |

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**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**

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| 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** |

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**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**

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| 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** |

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**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**

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| 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 |

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**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*