

2012 GLOBEX SUMMER

College of Engineering, Peking University



工学院国际合作办公室
COE INTERNATIONAL RELATIONS



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The GLOBEX Program in Engineering @ Peking University

The Global Educational Exchange (Globex) program constitutes an initiative for educational exchange and research collaboration between The College of Engineering at Peking University, Beijing, China and a foreign College of Engineering. It is designed to deepen the growing partnership between the two institutions by providing a framework for exceptional students and faculty to attain a global educational, research and professional experience. Both parties subscribe to the policy of equal opportunity and non-discrimination on the basis of race, sex, age, ethnicity, religion or sexual orientation. The Globex agreement is governed by the principles of equality, reciprocity and mutual benefit.

Globex 项目是北京大学工学院和多所世界知名大学工学院之间达成的关于学生交换学习和合作研究的项目。此项目旨在加深北大工学院与其他多所世界著名大学工学院之间的合作关系，为优秀的工科学生和教师提供一个很好的全球教育交流和研究交流的实践平台。双方大学执行“机会平等”政策，不因种族、性别、年龄、民族、宗教或性取向而歧视申请者。另外，Globex协议遵守平等、互惠、互利原则。

The table below depicts the 4 Globex programs together with the 12 university participants.

Globex 项目有4种形式，共有12所高校参加，如下详情。

University	Participants	2012 Globex Summer	2012 Globex Fall	2013 Globex Spring	2012-2013 Globex Design
Peking University	Instructor & Students	●	●	●	●
University of Delaware	Instructors & 6 Students	●	●		
Stanford University	Instructors & 10 Students	●			
University of Maryland	Instructors & 15 Students	●	●		
University of Toronto	Up to 5 Students	●	●		●
Tsinghua University	Up to 15 Students	●			
Yokohama National University	Up to 5 Students	●			
Chinese University of Hong Kong	Up to 5 Students	●			
CONICYT (4 Chilean Universities)	Up to 15 Students	●			
National University of Singapore	TBD				●
University of Southern California	TBD			●	
Princeton University	TBD			●	

PKU Engineering



College of Engineering, Peking University

Peking University College of Engineering was established in 1910. However, in 1952 most engineering programs were re-located to Tsinghua University. Today, with the rapidly advancing economic and socio-technological developments in the Chinese economy and Chinese Society, coupled with the goal of Peking University to become a World class university, The College of Engineering was officially re-established in March 2005. The focus of PKU Engineering is on cutting-edge technologies, interdisciplinary research and the training of future engineering leaders and entrepreneurs. Since its rebirth, the College has made significant progress in faculty recruitment, scientific research and research collaborations, educational achievements, and global programs and relationships. The College currently has 6 departments and 18 research centers, 3 of which are state key research institutes. Many of them are recognized internationally for their research excellence. The College is rapidly evolving into one of the elite engineering schools recognized throughout the World. Since 2009 PKU Engineering has been consistently ranked in the top 50 worldwide and second in China by both US News and World Report and the UK Times Higher Education.

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The Program of 2012 GLOB EX Summer @ PKU, Beijing

July 2012										August 2012																																																				
Date ▼	Day ►	Week 0		Week 1		Week 2		Week 3		Week 4		Week 5		Week 6																																																
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S														
0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3	0
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Jul 12 - 14

Beijing Tours

Jul 16 Aug 10
Applied Numerical Methods
Shaoqiang Tang, Peking University

Jul 16 Aug 10
Nanomaterials and Nanotechnology
Bingqing Wei, University of Delaware

Jul 16 Aug 10
Orthopedic Biomechanics
Michael Santare, University of Delaware

Jul 16 Aug 13
Engineering System Analysis
Ali Haghani, University of Maryland

Aug 13 Aug 24
Random Phenomena
Babatunde Ogunnaike, University of Delaware

Jun 25 Aug 10
Cross Cultural Design for Service
Michael Barry, Julie Stanford & Pamela Hinds, Stanford University



PKU and YNU students showing off their lighter side after completing all their presentations



PKU welcoming University of Pittsburgh students



Top & Bottom: PKU and Stanford students taking a break on the last day of workshop

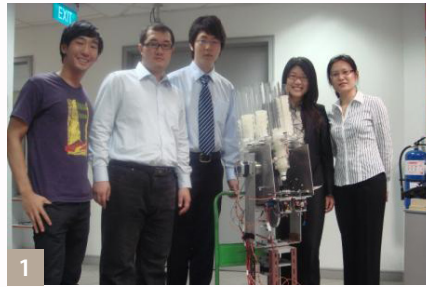
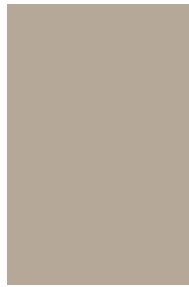


GLOBEX Design Program

Over the past several years, PKU-COE has initiated joint design programs with Stanford University, National University of Singapore and the University of Toronto. Adopting a cross-cultural approach, students work collaboratively in teams of four (2 PKU and 2 foreign students) on industry-sourced



projects. Some of the sponsoring companies included Schlumberger, Schneider Electric, Apple, Google, Panasonic, Wrigley Gums, Boeing, Siemens, Intel, Proctor & Gamble, American Heart Association, Hermann Miller, and several more.



- 1 PKU-NUS Team for the badminton shuttlecock launcher project
- 2 PKU girls by the Niagara
- 3 PKU-Stanford students deeply engrossed in their project discussions
- 4 PKU presentations at the University of Toronto, Canada, March 19, 2011
- 5 YNU's Araki demonstrates a working model of a fuel cell

The 2010 Cross-Cultural Design Project Teams (PKU, Stanford, CAFA Students)



- 1 Team Wrigley
- 2 Team Nokia Education
- 3 Team Nokia Family
- 4 Team Herman Miller Healthcare
- 5 Team Intel
- 6 Team American Heart Association

2012 GLOBEX Summer Instructors



Cross Cultural Design for Service

跨文化服务设计

Pamela Hinds

Associate Professor
Stanford University

No. of Credits
3

Duration
Jun 25 – Aug 10

Frequency
Varies

Further Info
See Page 11



Applied Numerical Methods

数值方法

Shaoqiang Tang

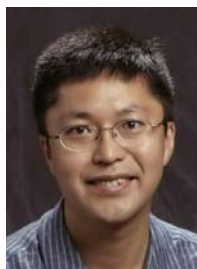
Professor and Associate Dean
Peking University

No. of Credits
3

Duration
Jul 16 – Aug 10

Frequency
8-10 AM, M-F

Further Info
See Page 12



Nanomaterials and Nanotechnology

纳米材料与纳米技术

Wei Bingqing

Professor
University of Delaware

No. of Credits
3

Duration
Jul 16 – Aug 10

Frequency
10 AM-12 PM, M-F

Further Info
See Page 13



Orthopaedic Biomechanics

骨科生物力学

Michael H. Santare

Professor
University of Delaware

No. of Credits
3

Duration
Jul 16 – Aug 10

Frequency
1-3 PM, M-F

Further Info
See Page 14



Engineering Systems Analysis

工程系统分析

Ali Haghani

Professor and CEE Dept Chair
University of Maryland

No. of Credits
3

Duration
Jul 16 – Aug 03

Frequency
3-6 PM, M-F

Further Info
See Page 15



Random Phenomena: Probability, Statistics and Statistical Design of Experiments

随机现象：概率、统计和统计实验设计

Babatunde A. Ogunnaiké

Professor and COE Dean
Member, National Academy of
Engineering
University of Delaware

No. of Credits
3

Duration
Aug 13 – Aug 24

Frequency
8AM-12PM, M-F

Further Info
See Page 16

Globex Courses:

Cross Cultural Cross Cultural Design for Service (3 Credits)

跨文化服务设计

Instructors:

Julie Stanford (julie@slicedbreaddesign.com), *Michael Barry* (mbarry@pointforward.com) & *Pamela Hinds* (phinds@stanford.edu),
The Design School, Stanford University

Description:

The Cross Cultural Design for Service (CCDS) course aims to teach design process and apply design thinking to service projects in rural China. This innovative class will be taught in a cross-culture environment. The class will be formed with 10 SU students, 5 PKU students, and 5 Tsinghua students. The course is consisted of a one-week design thinking workshop in PKU, 5-week design projects in a rural area of China, and a wrap-up session in Beijing.

Class Frequency & Dates: See Table Below, Jun 25 – Aug 10, 2012

Course Location: Peking University, Beijing and Mianyang, Sichuan

Office Hours: TBA

Class Location	Class Dates	Hotel Checkin / Checkout Dates
PKU, Beijing	Jun 25 – Jul 1	Jun 24 – Jul 2
Mianyang, Sichuan	Jul 4 – Aug 3	Jul 3 – Aug 4
PKU, Beijing	Aug 4 – Aug 10	Aug 4 – Aug 11

Objective:

To develop an understanding of the design process and applying design thinking to service projects.

Text/References: TBD

Syllabus:

Developing Empathy

Conducting Interviews
Learning from Observations

Prototyping

Reasons for Prototyping
What can be learned from Prototyping
Creating Rapid Prototypes

Developing Insights

Data Analysis
Tools for Revealing Insights

Testing and Iterating

Getting Input from Users

Ideation

Techniques for Generating Ideas
Brainstorming
Concept Generation

Project Deliverables:

The deliverables consist of project presentations and design. The schedule for presentations is as follows.

Week 3 Project presentation on developing empathy and insights

Week 4 Project presentation on concept generation

Week 5 Project presentation on prototyping

Week 7 Journal submission final presentation and design

Grading:

Interim Project Presentations	15%	Total 100%
Final Project Presentations	50%	
Design Journal	15%	
Teamwork and Citizenship	20%	

Globex Courses:

Applied Numerical Methods (3 Credits)

数值方法

Instructor: *Shaoqiang Tang, Dept of Mechanics, Peking University (maotang@pku.edu.cn)*

Description:

A course on the basic computational tools for generating numerical solutions. Included are methods for the solution of algebraic equations, linear equations, ordinary and partial differential equations and curve fitting techniques.

Prerequisite:

Calculus, Linear Algebra, Matlab or other computer languages

Class Frequency & Dates:

8-10 AM, M-F, Jul 16 – Aug 10, 2012

Course Location:

Room101, Classroom Building No.3, Peking University, Beijing, China

Office Hours: TBA

Objective:

To develop basic computational and modeling skills for solving mathematical problems arising from physical sciences and engineering; and to enhance the understanding of the relationship between continuous and discrete mathematics.

Topics:

- 1 Introduction to computing: numerical errors, recap of Matlab
- 2 Roots of equations: bracketing, Newton's method
- 3 Linear algebraic equation systems: Gauss elimination, LU decomposition, matrix inversion, iteration methods
- 4 Curve fitting: least square regression, interpolation
- 5 Numerical differentiation and integration
- 6 ODE: Euler's method, Runge-Kutta method, stiff systems, boundary value problems
- 7 PDE: IVP, BVP & IBVP, finite difference method

References:

- 1 Chapra, 2005. Applied Numerical Methods with MATLAB for Engineers and Scientists, McGraw Hill.
- 2 Gerald CF, and Wheatley PO 2004. Applied Numerical Analysis, 7th edition. Addison-Wesley. (There is a China-edition published by Higher Education Press, Beijing 2005).

Grading:

Homework	30%
Midterm	30%
Final	40%
Total	100%

Globex Courses:

Nanomaterials and Nanotechnology (3 Credits)

纳米材料与纳米技术

Instructors:

Bingqing Wei, Mech Eng Dept, University of Delaware (weib@udel.edu)

Description:

Advanced topics in nanoscience and nanotechnology including nanostructures, nanomaterial synthesis, properties, characterizations, and applications. The emphasis will be to introduce students to the science of the building blocks of nanostructured materials, material behavior when they are assembled, technology for building nanoscale structures and features, nanomaterials for energy conversion and storage, and the technological implications of these nanomaterials and nanotechnologies.

Class Frequency & Dates: 10 AM-12 PM, M-F, Jul 16 – Aug 10, 2012

Course Location: Room101, Classroom Building No.3, Peking University, Beijing, China

Office Hours: TBA

Objective:

To develop an understanding of the material and system characteristics and responses at the nanoscale level, in order to have a better grasp of the nanoscience and nanotechnology governing their novel and significantly improved physical, optical, chemical and biological properties.

Topics:

- 1 Introduction
- 2 Science of Building Blocks: Nanoparticles and Quantum Dots
- 3 Nanotubes, Nanorods and Nanowires
- 4 Nanocomposites
- 5 Processing-Structure-Property Correlations in Nanostructured Materials: bottom-up and top-down processing techniques, micro structural features and mechanical, physical and chemical properties
- 6 Advanced Characterization Techniques for Nanostructured Materials
- 7 Energy Conversion and Storage in Nanostructured Materials
- 8 Nano to Molecular Electronics
- 9 Bio-inspired and Bio-applications of Nanostructures and Nanomaterials
- 10 Applications of Nanostructured Materials

References:

- 1 Massimiliano Di Ventra, Stephane Evoy and James R. Heflin, Jr., Introduction to Nanoscale Science and Technology, Springer
- 2 Gregory Timp, Nanotechnology, Springer-Verlag
- 3 Charles P. Poole, Jr., and Frank J. Owens, Introduction to Nanotechnology, John Wiley & Sons
- 4 Pulickel M. Ajayan, Linda S. Schadler, and Paul V. Braun, Nanocomposites Science and Technology, John Wiley & Sons
- 5 M. S. Dresselhaus, G. Dresselhaus, P. Avouris, Carbon Nanotubes : Synthesis, Structure, Properties, and Applications, Springer-Verlag
- 6 Journal Papers

Grading:

Midterm Project Assessment	
Class Presentation	25%
Term Paper	20%
Final Project Assessment	
Class Presentation	25%
Term Paper	20%
Attendance & Discussion	10%
Total	100%

Globex Courses:

Orthopaedic Biomechanics (3 Credits)

骨科生物力学

Instructor: Michael H. Santare, Mech Eng Dept, University of Delaware (santare@udel.edu)

Description:

Anatomy and physiology including microanatomy and mechanics of bone, cartilage, tendon and muscle. Mechanical modeling of the body including; joint loads, motion analysis, muscle forces and interactions with orthopaedic devices.

Class Frequency & Dates: 1-3 PM, M-F, Jul 16 – Aug 10, 2012

Course Location: Room101, Classroom Building No.3, Peking University, Beijing, China

Office Hours: TBA

Objective:

To develop an understanding of the mechanics of the human musculoskeletal system and to establish facility with techniques for modeling this system.

Text: Bartel, Davy, Keaveny, Pearson, Orthopaedic Biomechanics, Prentice Hall, 2006.

Syllabus:

Gross Anatomy

Terminology
Bones
Muscles
Joints

Mechanical Joint Analysis

Kinematics of Joints
Kinetics of Joints
Muscle Redundancy

Tissues and Structures

Bones
Connective Tissues
Muscles

Applied Biomechanics

Implants and Devices
Motion Analysis

Project Overview:

The project consists of a research paper and analysis on a mechanism of soft tissue injury. Students are to work in teams of two. The work should be evenly divided and team members will receive the same project grade. All papers should provide a review of the current literature and results of a force or motion analysis of the particular injury mechanism under review. Topics must be approved by the instructor. Each team will submit a written report (less than 10 pages).

	Injury Mechanism Analysis of	
Sample	Cervical disc rupture	Rotator cuff tear
Project	Lumbar disc herniation	Shoulder separation
Topics	Anterior cruciate ligament rupture Knee meniscus tear Chondromalacia	Shoulder dislocation Supraspinatus impingement Tendinosis in the
Project	Topic Selection	First week
Deadlines	Bibliography	Second Week
	Draft paper and Preliminary Model	Fourth Week
	Completed Paper and Analysis	Fifth Week

Grading:		
	Midterm	25%
	Final	30%
	Project	25%
	Homework	20%
	Total	100%

Globex Courses:

Engineering System Analysis (3 Credits)

工程系统分析

Instructor: *Ali Haghani, Civil & Environ Eng Dept, University of Maryland (haghani@umd.edu)*

Description: This course introduces advanced undergraduate engineering students to systems analysis, modeling, optimization, and the quantitative techniques that are used in problem solving and decision making. The following major topics are covered in this course: deterministic modeling and optimization, linear programming, integer programming and dynamic programming.

Class Frequency & Dates:

3-6 PM, M-F, Jul 16 – Aug 03, 2012

Course Location:

Room101, Classroom Building No.3, Peking University, Beijing, China

Office Hours: TBA

Objective:

To teach students the concepts of systems analysis and mathematical modeling. The students will learn to develop and solve engineering optimization models using linear and integer Programming. They also learn to work with their peers in teams.

Topics:

- 1 Systems and Systems Analysis
- 2 Modeling and Optimization
- 3 Linear Programming, Graphical Solution, Simplex Algorithm
- 4 Network Problems
- 5 Integer Programming, Formulation and Solution
- 6 Dynamic Programming

References:

- 1 ReVelle, C.S., E.E. Whitlatch, and J.R. Wright, 2004, "Civil and Environmental Systems Engineering," 2nd Edition, Pearson Prentice Hall.

Grading:

Homework	20%
Midterm Exam	40%
Final Exam	40%
Total	100%

Globex Courses:

Random Phenomena: Probability, Statistics and Statistical Design of Experiments (3 Credits)

随机现象：概率、统计和统计实验设计

Instructor: Babatunde A. Ogunnaike, Chem Eng Dept, University of Delaware (ogunnaik@udel.edu)

Description: Fundamental approach to modeling, characterization and analysis of random phenomena with the aim of providing students with the basic principles, methods and tools for solving engineering problems involving randomly varying phenomena. Application areas explored include experimental design, manufacturing, system reliability, and cellular biology.

Class Frequency & Dates: 8AM-12PM, M-F, Aug 13–24, 2012

Course Location: Room101, Classroom Building No.3, Peking University, Beijing, China

Office Hours: TBA

Course Objective: To develop an understanding of the basic principles, methods and tools for solving engineering problems involving randomly varying phenomena.

Textbook /Reference:

Babatunde A. Ogunnaike, Random Phenomena: Fundamentals of Probability & Statistics for Engineers, CRC Press, (2009)
(Indicated chapter references are from this book).

Course Content:

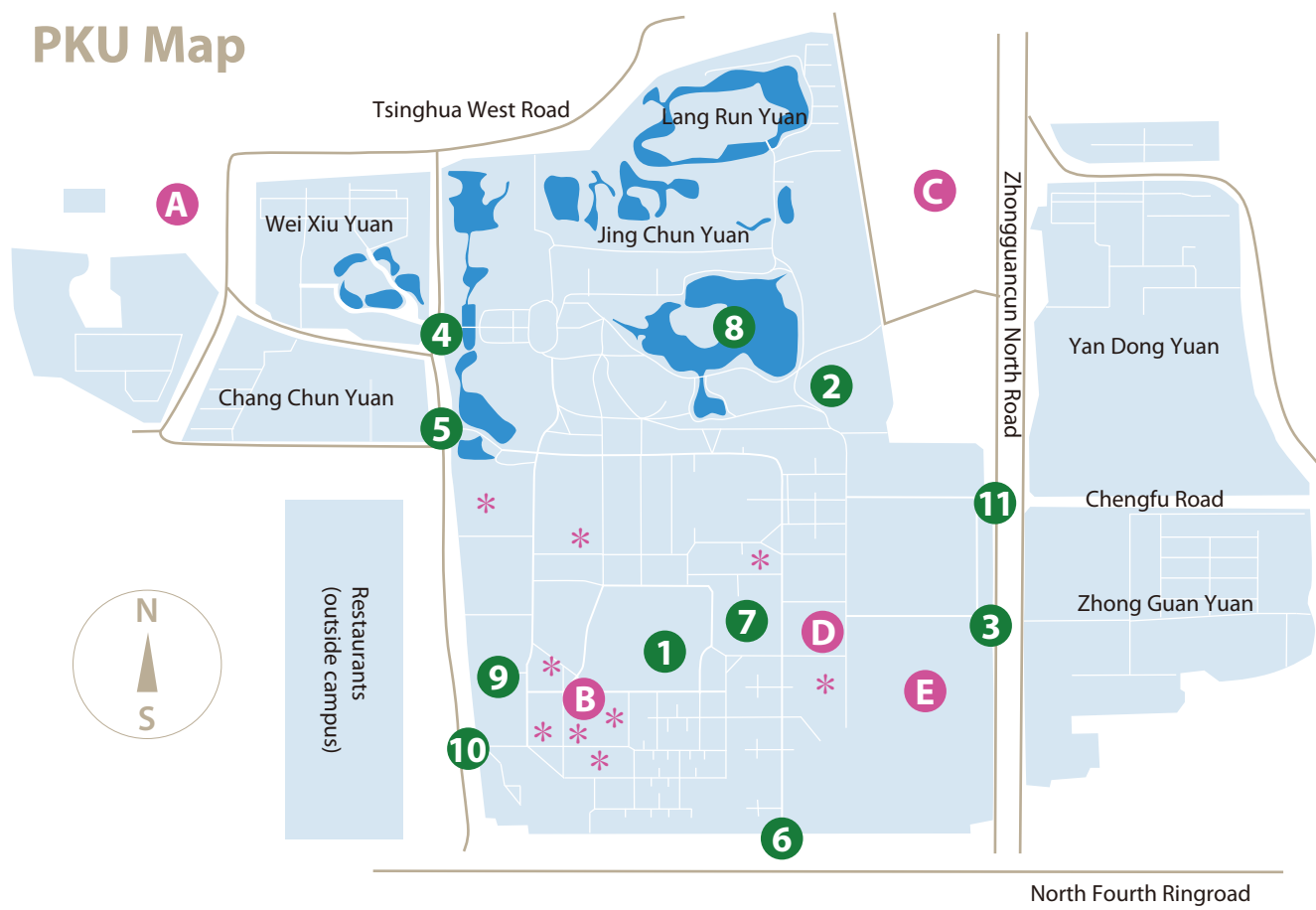
Lecture 1	Introduction and Motivation	Chapter 1
Lecture 2	Basic Principles of Random Phenomena Analysis	Chapter 2
Lecture 3	Introductory Concepts of Probability	Chapters 3, 4
Lecture 4	Random Variables and Distributions	Chapters 4
Lecture 5	Multidimensional Random Variables and Distributions	Chapters 5
Lecture 6	Probability Models (Discrete Random Variables)	Chapters 8
Lecture 7	Probability Models (Continuous Random Variables)	Chapters 9
Lecture 8	Case Studies (Mendel, Naval Tactics & IVF)	Chapters 7, 11
Lecture 9	Tutorial and Practical Demonstration ("Lab") Session I	
Lecture 10	Introduction to Statistics & Data Analysis	Chapters 12
Lecture 11	Overview of Sampling Theory and Estimation	Chapters 13, 14
Lecture 12	Overview of Sampling Theory and Estimation	Chapters 13, 14
Lecture 13	Hypothesis Testing	Chapters 15
Lecture 14	Hypothesis Testing & Practical Demonstration ("Lab") Session II	Chapters 15
Lecture 15	Midterm Exam	Chapters 15
Lecture 16	Introduction to ANOVA & Design of Experiment Concepts	Chapters 19
Lecture 17	Single Factor Experiments	Chapters 19
Lecture 18	Multi-Factor Experiments	Chapters 19
Lecture 19	2^k Factorial Experiments	Chapters 19
Lecture 20	Screening Designs I	Chapters 19
Lecture 21	Screening Designs II	Chapters 19
Lecture 22	Response Surface Methodology	Chapters 19
Lecture 23	Response Surface Methodology	Chapters 19
Lecture 24	Presentation of Capstone Project	
Lecture 25-27	Capstone Project Design, Implementation, Execution and Confirmation	
Lecture 28-29	Capstone Project Evaluation	
Lecture 30	Course Summary and Wrap Up	

Grading:

Homework: 3@10 pts	30%
Midterm Exam	30%
Final Project	40%
Total	100%



PKU Map



Places of Direct Interest

- A. Beijing Post and Telecom Conference Center
- B. Student Center
- C. PKU Hospital
- D. Room 247, COE Office of International Relations, Dian Jiao Building
- E. Room 101, Teaching Building No. 3

* Cafeterias

Places of Optional Interest

- 1. Yannan Yuan, College of Engineering
- 2. Boya Tower
- 3. Southeast Gate
- 4. West Gate
- 5. Side West Gate
- 6. South Gate
- 7. PKU Centennial Lecture Hall
- 8. Weiming Lake
- 9. Wu Mart
- 10. Southwest Gate
- 11. East Gate

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