

2022 LOBEX

暑期项目 | Globex Julmester Program



College of Engineering
PEKING UNIVERSITY

2022 GLOBEX PROGRAM AT PEKING UNIVERSITY, CHINA

The Globex at the College of Engineering, Peking University is a professional mobility program with a worldwide exchange of students from all disciplines of study. To enhance students' global and professional experience, Globex offers courses that focus on: 1) engineering & science, 2) innovation & entrepreneurship, and 3) China & globalization. Engineering and science generate new knowledge and skills for society to advance and prosper. To convert into useful products, the acquired knowledge and skills need to be commercialized through innovation and entrepreneurship. Societies everywhere are being profoundly impacted by China, as it grows to become the world's largest economy. Globex offers students an opportunity to study China and its culture from engineering perspective. Globex students can select courses up to 6 credits from the various themes.

Important Dates

Deadline for online application	May 15, 2022
Deadline for tuition payment	May 31, 2022
Orientation and registration	July 3, 2022
First and last day of class	July 4, 2022 – July 22, 2022
Final exams	July 23, 2022

Fees and Payment

ITEM	COST	NOTE
Application fee	\$47 (RMB 300)	Compulsory application fee for all applicants
Tuition fee	\$0-1880 (RMB 0-12000)	1. Full tuition waiver (you may still need to pay tuition to your home school) 2. Partial tuition waiver 3. Full cost recovery 4. 20% off the original tuition fee applied for online courses

Miscellaneous Info

- Globex will provide course syllabi and PKU transcript to facilitate course credit transfer, it does not however guarantee that the credits will be acceptable by the student's home university.
- Official PKU transcript and certificate of completion will be offered in **September, 2022**.

Program Website & Contact Info

- Globex Website: <http://globex.coe.pku.edu.cn/>
- Email Inquiry: globex@pku.edu.cn

Notice: The format of Globex 2022 will depend on the national and school policy of pandemic prevention and control. Please visit <https://globex.coe.pku.edu.cn> and stay informed for the latest updates.

No.	Category	Course	Instructor	Organization	Class Time Mon-Fri
1	Engineering & Science	Intelligent Manufacturing and Service Systems 智能制造与服务系统	Andrew KUSIAK	University of Iowa, USA	AM
2		Compliant Robotics: from rigid links to soft bodies 柔性化机器人：从类人到软体	LIU Hongbin WANG Shuangyi HU Jian	Institute of Automation, Chinese Academy of Sciences King's College London	AM
3		Fundamentals of Control Theory 控制理论基础	HUANG Xun	Peking University, China	PM
4		Sustainability Theory and Practices 可持续性理论与实践	Tracy MORSE	Centre for Sustainable Development, The University of Strathclyde, UK	PM
5	Innovation & Entrepreneurship	Data Driven Techniques for e-Business 电子商务数据驱动技术	Wing Kuen SEE-TO	Lingnan University, Hong Kong China	AM
6		Financial Decisions in Engineering Project Management 工程项目管理中的金融决策	Daricha SUTIVONG	Chulalongkorn University, Thailand	PM
7	China & Globalization	China Economy: Growth and Global Connections 中国经济：增长与全球联系	Susan MAYS	University of Texas Austin, USA	AM

- All courses are **3 credits**
- Morning session: **9-12 AM**; Afternoon session: **3-6 PM (GMT+8:00 Beijing Time)**

Intelligent Manufacturing and Service Systems

智能制造与服务系统



Andrew KUSIAK

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Department of Industrial and
Systems Engineering

The University of Iowa, USA

Dr. Andrew Kusiak has chaired two departments, Industrial Engineering (1988-95) and Mechanical and Industrial Engineering (2010-15). His current research interests include applications of computational intelligence and big data in automation, manufacturing, product development, renewable energy, sustainability, and healthcare. He has published numerous books and hundreds of technical papers in journals sponsored by professional societies.

Synopsis

Manufacturing and service industry is undergoing a transformation towards greater service orientation and autonomy. The use of sensors and wireless technologies capturing data is growing across industries. Emerging configurations of systems are analyzed, optimized, and designed. Models, methodologies, and algorithms in support of design and analysis of intelligent manufacturing and business systems are discussed. Data science, computational intelligence, cloud computing, and diverse x-as-a-service systems are introduced.

Audience

Year 3 & 4 Undergraduate and Graduate Students

Schedule

Class: 9 – 12 AM (Beijing Time), M – F, July 4 – July 22, 2022

Total Contact Hours: 45

Topics

1. Introduction to intelligent manufacturing and service applications
2. Digitization in manufacturing and service industry
3. Systems modeling
4. System analysis
5. Process optimization
6. System decomposition
7. Reliability and quality analysis
8. Resiliency and sustainability analysis
9. Data science
10. Computational intelligence in x-as-a-service systems
11. Emerging developments in intelligent manufacturing and business applications
12. Innovation science and the industry of the future

Note

Students will use their own laptops in this course

Grading

- 25% Homework assignments
- 20% Quizzes
- 30% Classroom exercises
- 25% Project
- 100% Total

Compliant Robotics: from rigid links to soft bodies

柔性化机器人：从类人到软体



LIU Hongbin

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Institute of Automation
Chinese Academy of Sciences
King's College London, UK

Dr. Liu's research group has been focusing on research and development of medical robotic systems with advanced haptic perception and interaction capabilities, to enable safer and more effective minimally invasive diagnosis and treatment for patients. Dr Liu's research has led to the clinical translation of a series of flexible robotic endoscopic systems for applications such as colonoscopy, bronchoscopy as well as vascular surgeries.



WANG Shuangyi

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Institute of Automation
Chinese Academy of Sciences

Dr. Wang's research interests include medical robotics, intelligent mechatronics systems, and robot-assisted surgery. He is the lead instructor of the postgraduate module 'Robotics Mechanism' and the undergraduate module 'Practical and Experimental Robotics' at the University of Chinese Academy of Sciences.



HU Jian

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Institute of Automation
Chinese Academy of Sciences

Dr. Hu's research focuses on haptic sensing and perception for medical robotic systems. Dr. Hu has developed novel optical tactile sensing technologies in collaboration with industry partners, making it possible to realize multi-dimensional force sensing for 3D surfaces. He is an inventor of three PCT patents.



Synopsis

Traditional industrial robots have been designed to be as rigid as possible to ensure good motion precision; however, because of the massive rigidity, it can make them dangerous when operating in close proximity with humans. Further, as robots expand their domain into healthcare and home service, the issues of safety, adaptability and energy efficiency become a primary concern. To address these challenges, scientists are developing a new generation of compliant robots, evolving from rigid-link robots to flexible and soft robots. This course aims to provide students with an essential knowledge for rigid-link to compliant robotic modeling, perception, interactive control and path planning. This course involves a hands-on coding exercise to facilitate the implementation of algorithms for solving real-world problems.

Audience

Year 3 & 4 Undergraduate and Graduate Students

Schedule

Class: 9-12 AM (Beijing Time), M-F, July 4–22, 2022

Total Contact Hours: 45

Objective

- Introduction of the state of the art robotic technologies
- Basics of link-based mechanism and modeling and applications of link-based robot
- Basics of kinematic and mechanical models for compliant robotic systems
- Understand and implement different methods for estimating and control the robot position and the interaction force

Topics

Basics of link-based mechanism

- Basics of rigid-link and flexible-link mechanism (with DAS 2D/3D toolbox)
- Design and modeling of serial and parallel robot (with Matlab Robotics Toolbox/CoppeliaSim)
- Advances in link-based robot

Basics of compliant mechanism

- Continuum/flexible robot model
- Mechanics for continuum mechanism
- Advances in compliant/soft robots

Control of Different Robot Systems

- Forward/Inverse Kinematics
- Redundancy control
- Force / Impedance control
- Real-time path planning with Potential field

Text & References

Course Notes – will be provided by the instructor

Bruno Siciliano, Lorenzo Sciacivco, Luigi Villani, Giuseppe Oriolo, Robotics: Modelling, Planning and Control, Springer-Verlag London, 2009.

Grading

- 30% 2 Individual Projects @ 15% each
- 30% 1 Final Teamwork Project (Team Presentation)
- 40% Final Exam
- 100% Total

Fundamentals of Control Theory

控制理论基础



HUANG Xun

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College of Engineering,
Peking University

Dr. HUANG Xun is a professor in Department of Aeronautics and Astronautics and Department of Mechanics and Engineering Science in College of Engineering, Peking University. He earned his Ph.D. from Aeronautics and Astronautics, University of Southampton, United Kingdom. His Research Areas are Aeroacoustics, flow control, flight control, array signal processing. He served as Associate Editor for Journal of the Acoustical Society of America, Editorial Board Member at Acta Mechanica Sinica and Journal of Aeroacoustics.

Synopsis

Introduce the fundamentals of classical and modern control theories to undergraduates in Engineering. The graduate students in dynamics and control are also welcomed if their undergraduate trainings were not in control.

The pre-requisite course is calculus and linear algebra. Knowledge in electronic circuits and signal and processing will be helpful too, but will be summarized in this tutorial when it is necessary. In addition, the emerging machine learning-based control methods will be introduced, mainly through the successful completion of the designed software tasks. Hence, students are expected to have experience with Python or other similar programming language.

Audience

Year 2 to 4 Undergraduate and Graduate Students

Schedule

Class: 3-6 PM (Beijing time) M-F, July 4 – 22, 2022
Total Contact Hours: 45

Objective

Students learn how to model and analyze real-life problems from the perspective of control and the fundamental modeling and control methods. The knowledge can be demonstrated by completing an inverted pendulum example and, later, could be further extended to more practical design examples.

Topics

1. Introduction
2. Mathematical model of system
3. Time domain analysis
4. Frequency domain analysis
5. Loop shaping
6. Fundamentals of nonlinear system control
7. State space representation
8. Observability and Controllability
9. Regulator
10. Examples

Reference

Dorf R.C., Bishop R.H. Modern Control Systems, 12th edition.
Lecture notes will be provided.

Grading

- 0% Homework problems (Only for self evaluation)
- 30% Mid exam
- 30% Experiential learning report
- 40% Final exam
- 100% Total

Sustainability Theory and Practices

可持续性理论与实践



Tracy MORSE

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Centre for Sustainable
Development

The University of Strathclyde, UK

Dr. Tracy Morse is Senior Lecturer and Head of Strathclyde Centre for Sustainable Development. Having previously been based in Malawi for 20 years, she leads an interdisciplinary research team with a focus on addressing the determinants of health in low and middle income countries. Working with a number of partners globally, she is focused on promoting the importance of transdisciplinary research in addressing sustainable development for all, and supporting the transformational change needed to support attainment of UN SDGs.

Synopsis

This course will introduce students to sustainability in the context of energy supply and demand both now and in the future. Using case studies and practical examples, the course will examine current and future energy demands in terms of CO₂ emissions and climate change, future challenges and opportunities in the energy sector for high and low income countries, trans/interdisciplinary and cross sectoral engagement in the development of energy solutions, and how these solutions may affect society, economies and the environment. This course will be led by Dr. Tracy Morse and will feature lectures from a range of experts from across the University of Strathclyde.

Audience

Year 3 & 4 Undergraduate and Graduate Students

Schedule

Class: 3-6 PM (Beijing Time), M-F, July 4 -22, 2022

Total Contact Hours: 45

Objective

To develop an understanding of the principles of sustainability, and how the many facets of sustainability relate to the current and future demand for energy

Topics

1. Understanding the principles of sustainability
2. Sustainability and systems thinking
3. Introduction to key sustainability issues around energy
4. Current and future energy demands
5. Energy system transitions and sustainability
6. Energy justice through the system transition

References

Material will be provided during the course

Additional recommended reading:

Cohen, M.J. (2021) Sustainability. Cambridge: Polity Press.

https://politybooks.com/subjectlanding/index.php/bookdetail/?isbn=9781509540310&subject_id=9&tag_id=77

Grading

90% 3 x weekly assessments

10% Attendance and discussion

100% Total

Data Driven Techniques for e-Business

电子商务数据驱动技术



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Department of Computing and
Decision Sciences

Lingnan University,
Hong Kong China

Dr. Eric W.K. See-To's research specializes in information systems and (big) data science applications. His scholarly activities use data science techniques for the extraction of managerial insights in the areas of healthcare, finance, and electronic business, leveraging on the now available online big data streams such as social media. His work appeared in top-tier journals such as Journal of Management Information Systems, Research Policy, Information and Management, and Technological Forecasting and Social Change. Before joining the academia, he had extensive consulting experiences for international firms in the banking and finance industry.

Synopsis

This course introduces the fundamentals of data driven techniques for e-business. Students will learn from this course the essential techniques for e-business organizations to make use of the now available big data streams about their customers. Big data has emerged as critical source of competitive advantage for e-business, and as a system of knowledge that is already changing the objects of knowledge and promises to bring new insights to our understanding of human networks and communities. Data driven techniques provide the ability to gain insight from such large scale, and fast changing data streams derived from phenomena where the underlying objects of interest are related in a complex manner. In the digital world, our every browse, every click, every review we read and write, every purchase we make, and so much more are all stored in the databases of relevant organizations. Leveraging from this digital archive, organizations use data driven techniques to learn about us, and to provide us with ever smarter and better experience. This course aims at familiarizing students with the latest developments and innovations in this fast growing area of data driven techniques in e-business, and equipping them with relevant knowledge and skills for the corresponding real life applications.

Audience

Suitable for engineering students, and those from other backgrounds with an interest in the e-business domain

Schedule

Class: 9 – 12 AM (Beijing Time), M – F, July 4 – July 22, 2022

Total Contact Hours: 45

Topics

1. Analytics for Recommendation Systems
2. Customer Lifetime Value Modelling
3. Customer Retention-Churn Model
4. Fraud Detection
5. Natural Language Processing (NLP) Models for User Generated Content (UGC) analysis
6. Storytelling with Data: Visualization of Large and Complex Datasets

Note

Students will use their own laptops in this course

Grading

75% [Weekly Hands-on Exercises and Multiple-choice Quizzes](#)

25% [Final Group Project Presentation](#)

100% Total

Financial Decisions in Engineering Project Management

工程项目管理中的金融决策



Daricha SUTIVONG

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Department of Industrial
Engineering
Chulalongkorn University,
Thailand

Dr. Daricha Sutivong earned her PhD from Management Science and Engineering, Stanford University and Masters in Engineering from Stanford University and MIT. Her research interests mainly focus on Engineering economic analysis and modeling, information technology investment, information markets, economics of electricity and energy, decision analysis and risk

Synopsis

The course introduces widely-used financial techniques for project evaluation. Based on the time value of money concept, the course examines how to analyze and value various cash flow patterns and provides popular economic measures for project assessment and selection, including the net present value and the rate of return, along with the application criteria for single and multiple project decisions. The course also addresses decision under uncertainties using techniques such as breakeven analysis, sensitivity analysis, decision tree, etc. Students will have an opportunity to perform a financial analysis of their interested problem in a group project and create management report and presentation.

Audience

Undergraduate and Graduate Students (all majors and all levels) with no prerequisites

Schedule

Class: 3-6 PM (Beijing time), M-F, July 4 -22, 2022

Total Contact Hours: 45

Objective

To develop an understanding of financial techniques used for project evaluation, project selection and decision under risk and uncertainties. Students will apply their knowledge to a real-world problem in a team environment.

Topics

1. Time Value of Money, Interest Rate, Economic Equivalence, Simple and Compound Interests
2. Cash Flow Analysis and Valuation: Single Cash Flows, Cash Flow Series
3. Nominal and Effective Interest Rates: Discrete Time Period, Continuous Compounding
4. Present Value Analysis: Equal-life Alternatives, Different-life Alternatives, Capitalized Cost, Payback Period
5. Annual Value Analysis: Capital Recovery, Equivalent Annual Value
6. Rate of Return Analysis: Single Alternative
7. Rate of Return Analysis: Multiple Alternatives
8. Breakeven Analysis: Single and Multiple Alternatives
9. Decision under Uncertainties: Sensitivity Analysis, Three Estimates, Expected Value Decision, Decision Tree
10. Financial Analysis Modeling
11. Creating Report and Presentation for Management

Grading

- 25% Quiz 1 (Topic 1-3)
- 35% Quiz 2 (Topic 4-7)
- 30% Group Project Presentation and Report
- 10% Attendance and Participation
- 100% Total

China Economy: Growth and Global Connections

中国经济：增长与全球联系



Susan MAYS

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Center for Asian American
Studies

The University of Texas at
Austin, USA

Dr. Susan Mays holds a PhD from Columbia University in Global Economic History (Asia/China focus), an MA from Harvard University in East Asian Studies (China focus), an MS from Stanford University in Engineering-Economic Systems, and a BS from Purdue University in Engineering. Prior to academia, Dr. Mays worked in business and technology with Fortune 500 companies initially as an engineer and later as a management consultant with Kearney. Susan Mays' primary focus is economic and technological development in Asia, particularly China. Her interdisciplinary projects have addressed high technology sectors in China/East Asia including how global trade, investment, and supply chains influence organizations and human capital. She focuses on macro-economic trends and trends in business, technology, and human resources.

Synopsis

This course addresses economic development in China, in global context. The course examines trends in trade, foreign investment, ownership (i.e., public vs. private), finance, the workforce, and consumption. The class also considers challenges and opportunities in China in the areas of environment, energy, education, and healthcare. Taught by an economic historian, the course considers China's unique history, culture, and business context, as well as global partnerships and influences. The reading and course materials are by scholars, leaders in business, economics and policy, as well as journalists.

Audience

Undergraduate and Graduate Students (all majors and all levels) with no prerequisites

Schedule

Class: 9-12 AM (Beijing time), M-F, July 4 -22, 2022

Total Contact Hours: 45

Topics

1. China's Reform and Opening from 1978 and Chinese Governance
2. Rural-to-Urban Labor Migration, Export-led Development, and Foreign Trade
3. Business Ownership (private, state-owned, Sino-foreign joint ventures, foreign owned)
4. Financial Services and the Legal System
5. High Tech Sectors and Entrepreneurship
6. The Education System and China's Talent Pool
7. Energy and Environmental Challenges
8. Family Economics and the Healthcare Industry
9. The Foreign Sector in China and Chinese Investments Abroad
10. Infrastructure Initiatives

Grading

Undergraduate Students:

- 50% 2 Noncumulative Quizzes (multiple choice)
- 25% 8 Written Reactions (short reactions to daily reading)
- 25% Individual Paper or Group Project (chose one)
- 100% Total

Graduate Students: Same grading as above, except requires an Individual Paper of 6000+ words.





Intelligent Manufacturing

49:52 Take control Leave

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Evolution of Manufacturing

Time	Manufacturing Type	Key Technologies
~1950	Classical manufacturing	
~1980	Automated manufacturing	Machine cell control
~1990	Computer integrated manufacturing	Enterprise resource planning
~2010	Intelligent manufacturing	Edge computing, Fog computing, Cloud computing
~2030		

Meeting chat

hhh,got it

AE Ang Kai En (Guest) 9:15
is it possible to upload your slides beforehand?
thank you!

ZW WANG, zilai [Student] (External) 9:15
and upload the recording of the lecture after class please
thank you

Li Yuhan has joined



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