

## 2018-2019 Tsinghua syllabus

Course title	Asia in the Modern World
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Department of Industrial Engineering
Course description	This course is a survey of Asian civilizations from the late eighteenth century to the present. Emphasis will be placed primarily on the distinctive aspects of the culture of Asian nations and their modern experiences in a rapidly transformed world. In particular, we will focus on China, Japan, and the so-called Four Mini-dragons (South Korea, Taiwan, Hong Kong, and Singapore) to examine the changes and continuities in Asia's political, economic, and social systems.
Course title	Global innovation strategy
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate

Department	Department of Industrial Engineering
Course description	As information technology has evolved for decades, we have already embraced an era when the recombination of industries, information, talents has become common. In collaboration with universities and institutes from around the globe via iPodia Alliance, this course will provide students with global vision on innovation opportunity identification, industry analysis, personal career planning, innovation strategy reporting etc. Key features of this course include: 1. Global innovation theories and practices. 2. Student prepared seminar and workshops. 3. iPodia enabled cross-cultural study.
Course title	Introduction to High Energy Physics
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Department of Engineering Physics
Course description	This course provides an up-to-date and comprehensive introduction to modern particle physics, including all the recent developments in elementary particle physics, as well as its connections with cosmology and astrophysics. The balance between experiment and theory is emphasised. The stress is on the phenomenological approach and basic theoretical concepts rather than rigorous mathematical detail. Short descriptions are

	<p>given of some of the key experiments in the field, and how they have influenced our thinking. Although most of the material is presented in the context of the Standard Model of quarks and leptons, the shortcomings of this model and new physics beyond its compass (such as supersymmetry, neutron mass and oscillations, GUTs and superstrings) are also discussed. This course is suitable for the 3rd and 4th-year undergraduate students.</p>
Course title	Intermediate Microeconomics
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	<p>This course focuses on the rational choice behavior of individual consumers and firms. The topics covered include: theory of consumer behavior; theory of firm behavior; pricing in different market structures, such as competitive and monopolistic markets; welfare and general equilibrium; and so on. Through this course, students will understand basic microeconomic analytical tools, be able to analyze rational individual decision making under well defined objectives and budget constraints, as well as to understand the role and function of markets. To build economic intuition of the students, many applications and examples from daily life will be introduced. Besides lecturing, student</p>

	participation, in-class discussion and problem solving will be strongly encouraged.
Course title	Principle of Finance
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	<p>This course is an introduction class to securities markets, financial instruments and basic portfolio theories and models. Topics cover: the structure of the capital markets and interest rates; valuation of risky assets and portfolio theory; the efficient market hypothesis and behavioral finance; main financial security pricing (bond, equity and option etc.); financial crisis; Chinese financial markets and international asset markets. Students will assess the strengths and limitations of different financial models and theories in understanding the features and mechanism of major financial markets. This course requires students to collect and use historical financial data, to do simple data analysis. Students learn to test theories and models by data and to discover the effectiveness and limitations of models and theories, and to understand the reasons why traditional theories cannot explain the empirical world well. So that students can know the development of finance theories, from traditional models to new ones; for example, behavioral models and frictions can</p>

	<p>contribute to the asset pricing anomalies. During this semester, students will become familiar with basic theories in financial economics and methods for asset valuation. They can analyze the development of Chinese and international financial markets in the recent 20 years, especially the US financial crisis in 2008 and European debt crisis in 2009.</p>
Course title	China Exploration
Credit	2
Class hours	64
Classification of the curriculum	Undergraduate
Department	Fundamental Industry Training Center
Course description	<p>This course helps students from different backgrounds to understand and know the basic knowledge of contemporary Chinese issues, and develops students' ability to use interdisciplinary knowledge and means to comprehensively analyze contemporary Chinese issues. This course also enhances students' ability of interdisciplinary inquiry and identification, comprehensive analysis capabilities and presentation skills, and cross-cultural communication and teamwork skills. The courses will be grouped in different directions to study and practice, such as education, economics, environment, cultural creativity, female issues, architecture, urbanization and other different modules. At the same time, we will provide opportunities for interested students to gain insight into relative disciplines of Tsinghua University, and</p>

	to feel the Chinese culture and Tsinghua spirit through cultural experience activities. Based on the advantages of the first-class disciplines of Tsinghua University, the summer curriculum is based on the interdisciplinary and intercultural integrated thinking mode to inspire international students to comprehensively understand Chinese issues through specific lectures, field research, round-table discussions and project practice. As a result, they will be able to express their own unique views on certain topics, and publish constructive proposals in the student-oriented forum and Expo.
Course title	Managerial accounting
Credit	3
Class hours	60
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	This course covers absorption costing system, variable costing system, master budget, flexible budget, etc. There all together 3 credits. We will use lectures, discussion, quiz, assignment to help students master the notions and skills.
Course title	Technical English Communication

Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Department of Automotive Engineering
Course description	<p>The course trains the technical English communication skills through a series of simulated academic meetings. Student practice will take up most of the time, with the instructors setting the stage, guiding and motivating the students. To alleviate the issue of large number of students and limited number of instructors, a combination of large/small classes and groups will be used: basic knowledge and common issues will be addressed in the large class, targeted instruction will be provided in the small classes, and students work in groups. A series of four simulated meetings will be conducted, each focused on new techniques and skills. The first meeting will be performed by the instructors and the teaching assistants, serving as the model case for the later student-led meetings. The following three meetings will be led by the students under the guidance of the instructors. The course trains the technical English communication skills through a series of simulated academic meetings. Student practice will take up most of the time, with the instructors setting the stage, guiding and motivating the students. To alleviate the issue of large number of students and limited number of instructors, a combination of large/small classes and groups will be used: basic knowledge and common issues will be addressed in the large class, targeted instruction will be provided in the small classes, and students work in groups.</p> <p style="text-align: right;">A</p>

	<p>series of four simulated meetings will be conducted, each focused on new techniques and skills. The first meeting will be performed by the instructors and the teaching assistants, serving as the model case for the later student-led meetings. The following three meetings will be led by the students under the guidance of the instructors. The course trains the technical English communication skills through a series of simulated academic meetings. Student practice will take up most of the time, with the instructors setting the stage, guiding and motivating the students. To alleviate the issue of large number of students and limited number of instructors, a combination of large/small classes and groups will be used: basic knowledge and common issues will be addressed in the large class, targeted instruction will be provided in the small classes, and students work in groups. A series of four simulated meetings will be conducted, each focused on new techniques and skills. The first meeting will be performed by the instructors and the teaching assistants, serving as the model case for the later student-led meetings. The following three meetings will be led by the students under the guidance of the instructors.</p>
Course title	Practical English in Nuclear Field
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Department of Engineering Physics



Course description	This is class emphasis on oral communication in english for engineering physics students. The class format is flexible, including lecture, discussion, and multimedia presentations on scientific topics. The final goal is to have each student be able to engage basic scientific english conversation with foreign scientists.
Course title	General Physics(1)
Credit	4
Class hours	64
Classification of the curriculum	Undergraduate
Department	Department of Physics
Course description	The course of “General Physics I ” consists of Mechanics and Thermodynamics. Mechanics: Motion of Point Particles, Non-Inertial System, Particle Mechanics, Law of Momentum Conservation, Law of Mechanical Energy, Law of Angular Momentum Conservation, Mechanics of Particle system and Extended object, Geostatics, Fluid Dynamics, Mechanical Oscillation, Mechanical Wave. Thermodynamics: Temperature, heat and First Law of Thermodynamics, Kinetic Theory of Gases, Entropy and Second Law of Thermodynamics.
Course title	General Physics(3)

Credit	4
Class hours	64
Classification of the curriculum	Undergraduate
Department	Department of Physics
Course description	The course of “General Physics (3)” consists of Optics and Atomic Physics. Optics: principle of geometrical optics, imaging of thin lens, multiple slit interference, thin-film interference, single-slit, grating and single hole Fraunhofer diffractions, resolving powers of grating and lens imaging system, X-ray diffraction on crystals, Fresnel diffraction, polarization of light, Brewster’ s angle, birefringence, interference of polarized light, Fresnel equations, introduction to information optics. Atomic Physics: black-body radiation, photoelectric effect, Compton scattering, matter wave, Schrodinger equation, uncertainty principle, particle in potential well, quantum tunneling, hydrogen atom, angular momentum, spin and magnetic moment, Stern-Gerlach experiment, Pauli exclusion principle, nuclear magnetic resonance, X-ray, laser, introduction to solid-state physics, introduction to nuclear and particle physics.
Course title	Fundamental Physics-principles and Experiments(3)
Credit	6
Class hours	96

Classification of the curriculum	Undergraduate
Department	Department of Physics
Course description	<p>Studying the classical optics from the Maxwell equations in Classical electro-magnetic theory. Focusing on the wave properties of light, such as the propagation of light in vacuum and media, interference and diffraction of light, the concept of coherence, the polarization state of light. In the mean time, the presentation would make close connections to the quantum concept introduced later. In the part of modern physics, introducing the quanta from the experimental observations in the optics, such as spectroscopy of atom/molecule; black body radiation, etc. Discussing the basic postulations in quantum mechanics. 6-7 experiments are synchronized with the teaching in classroom, and these experiments are designed to help students better understanding the principles learned in the classroom and appreciating the physics as experimental science.</p>

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Course title	Real Analysis
Credit	4
Class hours	64
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	

Course title	China and the World: Legal Traditions
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	The course work provides an overview of the comparisons between the two legal traditions and seeks plausible answers to some the complex and contradictive questions which arise frequently in our discussions.
Course title	Probability and Mathematical Statistics
Credit	4
Class hours	64
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	This Course is designed to the second-year undergraduate students with some backgrounds in calculus and linear algebra. We shall introduce the basic principles and methods of probability and mathematical statistics, and illustrate the wide applications of probability and statistics in economics,

	<p>business and other fields. The course content consists of two parts, probability theory and mathematical statistics. In the probability part, we will introduce some key concepts such as random variables, random distribution and some typical random models such as Poisson distribution and normal distribution. Then we will proceed to talk about some summarizing numbers of a random distribution, e.g. the expectation and the variance, as well as the law of large numbers and the central limit theorem, which are the foundation of the large sample theory. In the statistics part, we talk both descriptive and inferential statistics. For the former, we highlight the data issues such as data collection and data types, as well as typical summarizing methods using graphical displays. In the inferential statistics part, we discuss point (interval) estimation, hypothesis testing, and the statistical inference in some popular statistical models, e.g., linear/logistic regression model and ANOVA model. The course presents the philosophical aspects of statistical thinking and the state-of-the-art statistical methods. We use R as our main computing vehicle and highlight both theories and methods.</p>
Course title	Structural Mechanics(1) (in English)
Credit	4
Class hours	64
Classification of the curriculum	Undergraduate
Department	Department of Civil Engineering

Course description	This course is intended to provide the student majoring in civil engineering skills of structural analysis at an elementary level. It mainly consists of structural geometric construction rules, computational methods for internal forces and deformation. The three major relations: equilibrium, deformation compatibility and stress-deformation conditions are used to study the behavior of structural components under various external loads. Emphasis is placed on the two major methods: the consistent displacement (force) method and the displacement method. The course serves as the basis for further exposure of structural theories to the student majoring in civil engineering.
Course title	Concrete Structure(1)
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	Department of Civil Engineering
Course description	
Course title	Basis of Engineering Materials
Credit	3

Class hours	48
Classification of the curriculum	Undergraduate
Department	Dept. of Mechanical Engineering
Course description	<p>The Fundamentals of Engineering Materials is taught in English and composed of three parts: (1) atomic-level structures, (2) microscopic-level structures, and (3) structure-property relationship of materials. The first part covers interatomic bondings, crystalline and noncrystalline structures, crystal defects, and atom diffusion. In the second part, the phase diagrams of binary alloys (including Fe-C alloys) and ceramics are described, and the phase transformations of materials as well as the principles of heat treatment for steels are introduced. The third part focuses on the stress-strain behaviors of materials and the mechanisms of plastic deformation and strengthening. The course aims to make students understand well about the relationship among the four components of materials science and engineering, e.g., composition, processing, structure, and property. This helps to establish a solid theoretical basis for their subsequent study in Engineering Materials.</p>
Course title	Stochastic Process
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate

Department	School of Economics and Management
Course description	Stochastic process is the mathematical subject which studies the statistical properties of the random phenomenon changing with time and/or other parameters, is also the theoretical foundation of stochastic model construction. Stochastic process has been widely applied to all areas in science and technology, and is one of the most important mathematical tools in economics and finance. The purpose of this course is supplying the mathematical foundation for undergraduate student to study the economic and financial issues.
Course title	Computer Programming Language
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	This course is a prerequisite for students who plan to have a career in areas like information systems, financial engineering, numerical methods, and other areas that require skills harnessing modern computation power. The skills learnt could be easily transferred to learning other computer languages. The goal of the course is to teach students how to program in C language to solve problems with computational methods. Therefore the goal is two-fold. First, students will learn the basic programming language concepts, such as data



types, control structures, memory addressing and modular programming, with C as an example. Second, students will be expected to develop a computational thinking to solve problems. General methods, such as bisection method, Monte Carlo simulation, divide and conquer, and dynamic programming will be introduced. Basic analysis of program complexity will also be discussed. Specific topic coverage includes:

- Concepts of Computation and Computers
- Data Types
- Interactive Input and Output
- Program Flow Control
- Functions
- Arrays, Addresses, and Pointers
- Character Strings
- Data Files
- Structures
- Bisection Method
- Newton's Method
- Monte Carlo Method
- Search and sort
- Dynamic Programming
- Computational Complexity

After the course, students are expected to

- Gain a general understanding of the concepts of programming languages
- Be able to independently develop solutions to simple computational tasks
- Gain proficiency in designing, implementing and testing solution
- Be able to transfer programming skills to learning other languages
- Be able to identify and comment programming quality and develop own programming styles.

Course title	Design Theory and Methodology
Credit	1
Class hours	16
Classification of the curriculum	Undergraduate

Department	Department of Architecture
Course description	<p>Over the past several decades a good deal of research and theory has been published in the areas of design cognition, aesthetic theory, expertise, psychology, philosophy and neuroscience, that sought to describe how designers work. This research has resulted in multiple methods and critiques that have lead to a deeper understanding of how designers actually design. Though it is true that one design methodology or another is no guarantee of a successful design solution, there is value in observing how others design, learning about theories, reflecting upon and considering other methods, and understanding the role of aesthetic judgment. By doing so students are better equipped to develop their own methodologies, by becoming aware of how designers work so that they might be better, self-critical designers themselves. The course will include a mutli-disciplinary overview of design theory and methodology, focusing on the work of key persons, such as: Jones, Alexander, Cross, Broadbent, Sanoff, Kuff, Schouml;n, Arnheim, Rowe, Lynn and others; and by discussing and testing and critiquing several accepted frameworks. Topics to be discussed will include: design process/cognition, problem solving, analysis, programming, creativity, perception, systems, ideation, parametrics, materiality, tectonics, form generation, aesthetic theory, collaboration, decision-making and others. This course will be primarily a lecture/seminar course with a high expectation for student participation. Each class will include presentations of new material by the professor, a guided discussion of assigned reading (typically key 8 - 10 page article on the topic), in-class exercises and student reflection and observation. Students will be required to make in-class presentations on the</p>

	design methodology of architects of their choice. Several guests will be invited to describe their design methods throughout the course.
Course title	English in Construction Management
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Department of Civil Engineering
Course description	This course involves the state of art of construction, including the Owners' Perspective, Organizing in Project Management, the Design and Construction Process, Labor, Material and Equipment Utilization, Cost Estimation, Economic Evaluation of Facility Investments, Financing of Constructed Facilities, Construction Pricing and Contracting, Construction Planning, Fundamental Scheduling Procedures, Advanced Scheduling Techniques, Cost Control, Monitoring and Accounting, Quality Control and Safety During Construction, and Organization and Use of Project Information. It also includes presentation, discussion and translation in class.
Course title	English for Environmental Professionals
Credit	2

Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Environment
Course description	<p>Professional English for Environmental Science and Engineering mainly contains two parts, namely reading part and writing part. However, listening and speaking are also the lecture contents. The teaching material is the six edition of Environmental Science—A Study of Interrelationship written by Eager Smith. The students need to complete reading the majority part of whole book. The purposes lie on making the students knowing more the environmental vocabulary and terms as well as the expressing way. The reading contents are (1) science and scientific method, (2) environmental ethics, (3) ecological principles, (4) human population issues, (5) water, air and solid pollution and management, (6) environmental regulation. The scientific writing part aims at getting students understand completely how to write scientifically, master rules of scientific writing, including (1) summary and abstract writing, (2) review writing, (3) scientific paper writing, (4) thesis writing, (5) research proposal writing, etc.. Students also get practicing on aural presentation through answering questions and presenting their written proposal.</p>
Course title	Environmental Soil Science
Credit	2

Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Environment
Course description	In this course, basic characteristics of soil are learned by the students through field excursion and laboratory analysis. Moreover, the principles of important soil processes, such as cation exchange, pollutant adsorption, decomposition and mineralization of soil organic matters, nitrification and denitrification, mineral weathering, C/N circulation, oxidation/reduction reactions, speciation and transportation of metals, and soil hydrology, were taught.
Course title	World Environmental and Cultural Practice
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Environment
Course description	This course is completely taught in English, which is designed to enhance the English practical ability of undergraduates, improve the understanding of the world environment and culture, and improve the ability of self-learning, active communication and public speaking. This course also aims to help the students build their international vision and team spirit. The whole course consists of 3

	<p>programs, Global Environment, World Culture, and International Action. Programs will be conducted in various formats, which include: (1) lectures to introduce not only western cultural and historical knowledge but also state of the art technologies in environmental areas; (2) case studies to enable students to understand well and learn how to solve problems in English; (3) group discussions or activities to enhance the ability of utilizing English in professional fields and communications with people; (4) free-style group exhibitions to emphasize responsibilities in team work.</p>
Course title	International Organization and Environmental Convention
Credit	1
Class hours	16
Classification of the curriculum	Undergraduate
Department	School of Environment
Course description	<p>This is a five days intensive course on analysis of international organization and environmental conventions operation mechanism, basing on the work experience of the expert and the text of Basel, Rotterdam and Stockholm Conventions. The course covers the following major themes: overview of the international conventions; negotiation of the international conventions; function of international organizations and operation mechanism. Generally, more than four and half days courses are taken mainly with lectures, which highlight the most important points that the international conventions and</p>

	<p>organizations concern, with some discussion and case studies. The half-day classes are devoted to the application of the knowledge acquired in the last half-day courses onto concrete problems. Students are expected to participate in negotiation and discussion in the concluding classes. The examination is given in the form of writing a shorter paper on one of the themes indicated by the expert during the course by preparing the materials for applying a position in international organization.</p>
Course title	Physical Chemistry in Energy Utilization
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	Department of Energy And Power Engineering
Course description	<p>The course is mainly divided into three parts: chemical kinetics, introduction of quantum theory and spectroscopy, and several special topics, which are directly related to applications in the field of energy. These special topics include molecular interactions, molecular reaction dynamics, and processes at solid surfaces. In the part of chemical kinetics, the course will combine with its application in combustion, and introduce some relevant theoretical knowledge and experimental technique.</p>
Course title	Database Concepts

Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Department of Industrial Engineering
Course description	<p>This course mainly introduces how to design database schemas and manipulate database management systems. The contents includes:</p> <p>1. Knowledge about the database concepts and principles, data models, relational database, structural query language, database design, entity-relationship modeling, database connectivity, transaction management, database security, data warehouse, business intelligence, data mining and etc.</p> <p>2. Skills on database manipulation, including install, setup and use MySQL, query data with SQL, and program using C and Python to work with MySQL.</p> <p>3. Coursework which requires students to design a mini information system, design the database and program to implement the required functions based on a designated scenario.</p>
Course title	Introduction to High Performance Computing
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate



Department	Department of Computer Science and Technology
Course description	This course uses English in all the related activities. The instructions, textbook, homework and in-class discussions are all in English. In this course, the fundamentals of high performance computing, architecture of advanced computers, parallel program.
Course title	Bases and Application of Digital Video
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	Department of Automation
Course description	Systematically introduced the basic theory and technology of digital video signal processing, including the following contents: Overview of the basic methods of video technology and video signal analysis; The basic techniques for digital video signal processing include sampling, modeling and motion estimation; The basic principle of video compression and various video compression standards; Stereo video and multi-view video foundations, as well as the latest video research progress in the plenoptic/light field video foundation; The digital video technology frontiers.
Course title	Propulsion Principle and Technology

Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	School of Aerospace Engineering
Course description	a.Main relationships in space propulsion theory b.Basics of ballistic missile and rocket launcher design c.Rocket engines: Their design and operation principles d.Rocket Engine chamber, nozzle and performance e.Energy Conversion and rocket propellants f.Forces and Torques acting on the rocket in flight g.Ballistic Missile Trajectory h.Main means of control and stabilization of missile in flight i.Launch Pad
Course title	Biochemistry(2) (in English)
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	School of Life Sciences
Course description	Biochemistry II is the continuation of Biochemistry I. This course is divided into two parts. The first part (Chapter 14-23) is bioenergetics and metabolism, which includes principles of bioenergetics (Chapter 14), catabolism of carbohydrates, lipid acids and amino acids (Chapter 15-18), oxidative

	<p>phosphorylation and photophosphorylation (Chapter 19), biosynthesis of carbohydrates, lipids and amino acids (Chapter 20-22) and integration and hormonal regulation of mammalian metabolism (Chapter 23). The students are required to be familiar with the major catabolic and anabolic pathways of carbohydrates, lipids and amino acids, as well as the important enzymes and coenzymes involved in these pathways and the regulation of each pathway. The students are also required to know the interconnection and regulation between different catabolic and biosynthetic pathways. The second part (Chapter 24-28) of this course is information pathways. It includes genes and chromosomes (Chapter 24), DNA metabolism (Chapter 25), RNA metabolism (Chapter 26), protein metabolism (Chapter 27) and regulation of gene expression (Chapter 28). The students are required to know the structure of genes and chromosomes, the pathways of DNA, RNA and protein metabolism and the regulation of gene expression in prokaryotes and eukaryotes.</p>
Course title	Scientific Research Professional Skills
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Life Sciences
Course description	This course is intended to challenge highly motivated, gifted undergraduate life sciences majors to acquire the fundamental skills

	<p>necessary to communicate research progress both orally and in written form. The students will have direct experience with poster presentations, oral presentations, scientific ethics, abstract writing, literature review and the writing of a standard scientific manuscript for publication. Upon completion of the course, students will have a high awareness of the typical responsibilities of international research scientists, with enhanced motivation and competence, after having participated in simulations of real world scientific communication. Each week will feature a progressive series of writing assignments as well as oral discussion of life sciences topics. Student presentations will be ongoing throughout the semester, with instructor guidance and critique. All papers will be hand graded to offer native speaker improvements to each student. The textbooks selected will be recent editions of standard academic communication textbooks.</p> <p>Students will be given a structured opportunity to design their own approaches to explaining research findings, emphasizing contemporary English usage. Desks will be placed in a round conformation in order to facilitate student-to-student interaction, during the discussion segment of each class meeting. Lectures will emphasize accuracy and precision of language, and will build student confidence by affording frequent opportunities to put class material into practice through oral presentations, discussion and formal written assignments.</p>
Course title	Foundations of Programming and Algorithm
Credit	4

Class hours	64
Classification of the curriculum	Undergraduate
Department	Institute For Interdisciplinary Information Sciences
Course description	This course assumes that the students have the basic knowledge of programming languages, e.g. functions, loops, and arrays, etc. Topics to be covered include an overview of fundamental programming concepts in C/C++ (e.g. procedural programming and object-oriented programming), data structures (e.g. linked lists, stacks, queues, and trees), common algorithms that related to those data structures, and an introduction of programming patterns (e.g. reference count, virtual constructor).
Course title	Fundamental Ideas in Theoretical Computer Science
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	Institute For Interdisciplinary Information Sciences
Course description	"This course aims to introduce students to fundamental mathematical techniques required to pursue computer science (and theoretical computer science in particular) at a research level. However, the course is not only focused on mathematical techniques and CS theory: examples will from a rich array of applications in different fields of computer

science. The mathematical material may include (but is not limited to) algebra, high-dimensional geometry, LP and SDP (semidefinite programming), information theoretic methods, stochastic processes, fourier analysis and boolean function analysis, discrete fourier transform and fast fourier transform, coding theory and expanders. Other topics may include Barrington's theorem, Newman's theorem, the INW pseudorandom generator and the Nisan-Wigderson PRG. This will be a fast-paced course. This course gives an introduction to the basics of computation theory, including: Finite Automata, Regular language, Pushdown Automata, Context-Free Grammars, Turing machine, undecidability, and computational intractable topics (NP complete, PSPACE, BPP etc)."

Course title	Speech Communication for Human and Machines
Credit	4
Class hours	64
Classification of the curriculum	Undergraduate
Department	Institute For Interdisciplinary Information Sciences
Course description	Speech communication refers to the process of transferring information from one person to another by speaking in a specific language. It is a highly inter-disciplinary subject, which is related to physiology, linguistics, phonetics, signal processing, and computer science. Many interesting and impactful computer applications have been developed to enable and improve human-computer and

	human-human speech communications. In this course, students will learn the scientific fundamentals underlying human speech communication, the basic techniques of computer speech and language processing, state-of-the-art spoken language technologies and their applications. Advanced research topics and future directions will also be discussed.
Course title	Modern Physics(1) (in English)
Credit	4
Class hours	64
Classification of the curriculum	Undergraduate
Department	Institute For Interdisciplinary Information Sciences
Course description	This course will cover the basic formalism and modern applications of optics and atomic physics. In the optics part, we will introduce geometric optics, wave optics, and their applications in the current research frontier such as quantum information science. For the atomic physics part, we will present many interesting experiments performed in early 20th century and explain how these results lead to the modern understanding of atomic structure. Modern applications of optics and atomic physics, such as laser and laser cooling of atoms, will also be discussed.
Course title	Modern Physics(2)

Credit	4
Class hours	64
Classification of the curriculum	Undergraduate
Department	Institute For Interdisciplinary Information Sciences
Course description	This course provides undergraduate students with background in science and engineering the foundation to understand many key aspects of quantum and statistical physics, which are essential for learning advanced topics such as condensed-matter physics, quantum field theory, and quantum information science. Conceptual understanding of the physical ideas and detailed mathematical derivations will be equally emphasized. Active class participation of students is expected.
Course title	The Physics of Information
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Institute For Interdisciplinary Information Sciences
Course description	The 21st Century has seen a string of profound discoveries that interface physics, information theory and computer science. This course will introduce undergraduate students this exciting frontier by connecting the various physics and



	computational ideas they learn in first year. After completion of the course, students will appreciate how information theoretical principles led to new understanding in physics, and how new physics facilitated new models of computation. Topics include physical consequences of the Church Turing thesis, unravelling Maxwell's Demon through information thermodynamics, and the information theoretic consequences of quantum mechanics.
Course title	Introduction to Data Science
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Institute For Interdisciplinary Information Sciences
Course description	The course intends to motivate students by fundamental (selected) aspects of Data Science. In this course, we discuss selected aspects of the concept of data, related techniques and aspects, and future achievements in the area of Data Science.
Course title	Investment
Credit	2
Class hours	32

Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	<p>This course aims to provide students with understanding of (i) the fundamental knowledge for those common and important investment strategies in financial market, (ii) the portfolio management techniques used to manage risk or make speculation, and (iii) the recent development of portfolio management tools and investment strategies in financial markets. On the theoretical side, this course introduces fundamental knowledge for investment strategies and portfolio management. On the practical side, this course covers recent topics that are related to the investment strategies and portfolio management. Some projects of portfolio management are specially designed to let you apply the theoretical knowledge to practice. This course is highly recommended for students who intend to pursue a career or further studies in investment strategies and portfolio management. Of course, the knowledge will also be very useful when you make your own personal investment decision</p>
Course title	Expert Systems and Decision Support Systems
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Economics and Management

Course description	This course is an introduction to expert systems and decision support systems, which is an integral part of the computer science curriculum. In this course, we learn how theory and applications complement each other. Both theory and application are presented. Students are provided with the Prolog, Lisp, CLIPS language that they can use to develop systems. By integrating theory with a fully functional means of applying that theory to real-world situations, students will gain an appreciation for the role played by expert systems and decision support systems in today's world. #The content of the course includes four parts with 12 chapters: 1) Overview of AI, ES and DSS;2)Knowledge expression and inference;3)Reasoning under uncertainty;4) Design and development of ES with Clips language.
Course title	The Principles of Area Studies
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Humanities &School of Social Sciences
Course description	This course will focus on area studies research with a particular emphasis on Latin America. In particular it will touch on the politics, economics and social problems both in historical and contemporary Latin America. The course will also pay special attention to Latin America's relations with China and the United States.

Course title	Developmental Psychology
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	School of Humanities & School of Social Sciences
Course description	This course focuses on human behavior in the social environment by examining human bio-psychosocial development. The course examines several influences on life course development, including biological/physiological, environmental, relational, and cognitive influences on human behavior. Content includes major theoretical perspectives on human behavior, including attachment and other developmental theories. The underlying values of different theoretical perspectives, and the degree to which major theories of human development are based on empirical evidence will be examined.
Course title	Hot Issues of the Contemporary International Legal System
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate

Department	School of Law
Course description	By identifying and analyzing the hot issues of the contemporary international legal system, this seminar course is designed to broaden students' professional horizon and to promote their English proficiency for reading and communicating, in the field of international law. Ultimately, through their studies in this course, students are expected to familiarize themselves with the dynamic characteristics of the contemporary system of international law and make progress in building up their professional capacity of dealing with international legal transactions.
Course title	English for Journalism and Communication(5)-PR and Advertising
Credit	1
Class hours	16
Classification of the curriculum	Undergraduate
Department	School of Journalism and Communication
Course description	The course aims at teaching the students the basics of public relations and advertising, including the basic terms and theories, meanwhile, the course aims at improving students English proficiency, both in written and spoken. The classes is proceeded mainly by the instructor's lectures. The instructor will make full use of his own long experience in public relations field to introduce the basic elements of PR theories, PR planning and process. Case studies will be frequently used in the lectures. And students' participation is

	encouraged so that students can get a clearer sense of the public relations. The writing of press release will also be taught in the class, so as to make students more involved in public relations and improve their written English
Course title	English for Journalism and Communication(6)-Introduction to Media
Credit	1
Class hours	16
Classification of the curriculum	Undergraduate
Department	School of Journalism and Communication
Course description	By dint of analyzing topics of media studies and mass communication studies, this undergraduate course aims to provide journalism/communication majors with the theoretical framework and methodology of media/communication studies. Students are expected to attain a general overview of media studies and the historical evolution of mass communication studies in the US and the UK. Equipped with a critical perspective and media literacy, students will be able to develop potentiality in and familiarize themselves with the resources in academic research.
Course title	English News Writing
Credit	2
Class hours	32

Classification of the curriculum	Undergraduate
Department	School of Journalism and Communication
Course description	This course is planned to be given by proper foreign teachers. The foreign teacher will deliver the course in English, including (but not limited to) the media culture of UK and US, public relations and ads, speech and communication, etc.
Course title	The Principles of Area Studies
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Social Sciences
Course description	This course will focus on area studies research with a particular emphasis on Latin America. In particular it will touch on the politics, economics and social problems both in historical and contemporary Latin America. The course will also pay special attention to Latin America's relations with China and the United States.
Course title	Developmental Psychology
Credit	3

Class hours	48
Classification of the curriculum	Undergraduate
Department	School of Social Sciences
Course description	This course focuses on human behavior in the social environment by examining human bio-psychosocial development. The course examines several influences on life course development, including biological/physiological, environmental, relational, and cognitive influences on human behavior. Content includes major theoretical perspectives on human behavior, including attachment and other developmental theories. The underlying values of different theoretical perspectives, and the degree to which major theories of human development are based on empirical evidence will be examined.
Course title	Behavioral Economics
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Social Sciences
Course description	Behavioral Economics use social, cognitive and emotional factors to understand the economic decisions of individuals and institutions performing economic functions. These including consumers, borrowers and investors, and their effects on market prices, returns and



	<p>resource allocation. The field is primarily concerned with the bounds of rationality of economic agents. Behavioral models typically integrate insights from psychology with neo-classical economic theory. This course is of interests to anyone who is interested in improving his or her judgment and decision making. It does not assume advanced knowledge of statistics, psychology, economics, or decision making. For the psychology audience, it offers a systematic framework for using psychological findings to improve judgment. For the economics audience, it offers a critique of the classic economic model of decision making. Behavioral decision research has developed considerably over the past 30 years, and now provides considerable insights into managerial decision making. In the first half of this course, students will learn to examine their individual judgment, and the later part of this course will focus on a variety of interpersonal contexts that affect judgment.</p>
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Course title	Principles of Pharmacology
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	School of Pharmaceutical Sciences
Course description	Principles of Pharmacology This class includes an overview of the physiological, biochemical, and anatomical foundations for the interaction of drugs and chemicals with biological systems. The emphasis will put on mechanism

	of drug action and their related signal transduction and pathway. Topics will cover a broad field of pharmacology with focuses on:1, General principles of pharmacology; 2, Neuropharmacology; 3, Modulation of cardiovascular function; 4, Hormones and metabolic diseases ;5, Inflammation, immunomodulation, and hematopoiesis; 6, Chemotherapy of microbial disease; 7, Special systems pharmacology.
Course title	Computer Organization and Design(in English)
Credit	4
Class hours	64
Classification of the curriculum	Undergraduate
Department	School of Software
Course description	Computer organization is one of the most important foundation courses in computer science. It is a compulsory course in the undergraduate program of School of Software. The main goal of this course is to give students fundamental concepts on how a computer processor and its associated system work. The emphasis is on the working principles behind. Case studies on commercial processor will be used to illustrate how these principles work together in one single design. To deepen the student’ s understanding on processor design, advanced processor design concepts such as pipelining and superscalar processor will also be covered.

Course title	Theories and Application of Remote Sensing
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	Department of Hydraulic Engineering
Course description	<p>Remote sensing measurement of hydrological variables and processes represents one of the most challenging research problems in Earth science. This course will introduce the basic concepts on remote sensing ranging from visible, near infrared, thermal infrared, microwave, and LIDAR remote sensing, and various orbital satellite platforms/sensors as well. The lecturer will also overview advances in remote sensing hydrology from space-borne observations, state-of-the-art retrieval algorithms for hydrological variables, and ground validation strategies. Various applications of remote sensing to hydrology are treated as they are used to measure different hydrologic variables or processes related to the water and energy cycle (e.g., precipitation, soil moisture, evapotranspiration, runoff, groundwater, and land drainage basin). Each of these hydrologic variables or processes is discussed individually with an emphasis on the use of remote sensing data and its availability. Particular emphasis is also given to science and techniques used for space-borne estimation, validation, and its application in hydrometeorology.</p>

Course title	Study Abroad Program
Credit	12
Class hours	320
Classification of the curriculum	Undergraduate
Department	Department of Environment
Course description	The undergraduate students in Global Environment Program of School of Environment, Tsinghua University are required to attend the Study Abroad Program during their junior year and complete at least four core courses.
Course title	Introduction to International Environmental Law
Credit	2
Class hours	40
Classification of the curriculum	Undergraduate
Department	Department of Environment
Course description	This is a five days intensive course on international environmental law, using Beyerlin and Marauhn' s work (International Environmental Law) as a textbook. The course covers the following major themes: History of international environmental law; source of international environment law; major Principles of environmental law; topic Studies (Current international law on Ocean and

	Marine resources, and Climate Change); law-making and enforcement processes; relationship between international environment law and trade law.
Course title	Introduction to Micro Nano Manufacturing (teaching language to be decided)
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Dept of Mechanical Engineering
Course description	The curriculum content gives weight to the fundamental technologies of silicon process used in Micro Electro Mechanical Systems (MEMS). Also the fundamental technologies of non-silicon process are involved in. The silicon process includes photolithography technology, oxidation, doping and ion implantation, PVD and CVD, dry etching and wet etching, pattern transfer with etching and additive techniques. The non-silicon process includes LIGA process and micro molding, and non-traditional micro machining technologies without masks such as micro electro discharge machining, micro electrochemical machining, micro laser machining, micro mechanical machining etc. Also bonding and packaging of micro devices are dealt with. Some typical fabrication technologies of MEMS or miniaturized devices are given. And a brief introduction to nano manufacturing technology is added.

Course title	Measurement and Test Technology (teaching language to be decided)
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	Department of Precision Instrument
Course description	The course is intended to provide the students with adequate knowledges on principles and methods of measurement technology, including signal theories and signal processing, characteristic analysis of a measurement system, principles for various sensors and transducers and their applications, signal conversion and conditioning, principles and applications of common instruments for data presentation and storage, and the measuring techniques for various physical quantities and their applications.
Course title	Introduction to Micro Nano Manufacturing
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Department of Precision Instrument
Course description	The curriculum content gives weight to the fundamental technologies of silicon process used in Micro Electro Mechanical Systems

	<p>(MEMS). Also the fundamental technologies of non-silicon process are involved in. The silicon process includes photolithography technology, oxidation, doping and ion implantation, PVD and CVD, dry etching and wet etching, pattern transfer with etching and additive techniques. The non-silicon process includes LIGA process and micro molding, and non-traditional micro machining technologies without masks such as micro electro discharge machining, micro electrochemical machining, micro laser machining, micro mechanical machining etc. Also bonding and packaging of micro devices, micro manipulation and assembly, are dealt with. Some typical fabrication technologies of MEMS or miniaturized devices are given. And a brief introduction to nano manufacturing technology is added.</p>
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Course title	Metrology for Micro and Nanotechnology
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Department of Precision Instrument
Course description	The course is intended to provide the students with knowledges on theories and methods of measuring techniques for micro- and nanotechnology, including the features of the metrology for micro- and nanotechnology, signal sensing and microsensors (resistive, capacitive, inductive, thermoelectrical, piezoelectric, piezoresistive, and fiber optic,

	etc.), optical methods such as the interferometry, microscopy, SEM, autofocusing, structured light encoding, fringe projection, and confocal microscopy, as well as the techniques for measuring typical physical quantities such as the displacement, velocity, acceleration, surface roughness, flow, temperature, force and pressure.
Course title	Financial Engineering (Economics Decision Analysis)
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Department of Industrial Engineering
Course description	Students learn core concepts and techniques for economic decision analysis of complex problems that involve dimensions of time, uncertainty, economics, strategy, and constraints. Students also learn some basic terminology, concepts and issues relevant to financial engineering and management.
Course title	Manufacturing and Warehouse Management
Credit	2
Class hours	32



Classification of the curriculum	Undergraduate
Department	Department of Industrial Engineering
Course description	Design and operation of manufacturing, service and warehousing facilities.
Course title	Management Information Systems
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Department of Industrial Engineering
Course description	<p>1. Understanding the effects of information systems on business and their relationship to globalization. 2. Explain why information systems are so essential in business today. 3. Define an information system and describe its management, organization, and technology components. 4. Define complementary assets and explain how they ensure that information systems provide genuine value to an organization. 5. Describe the different academic disciplines used to study information systems and explain how each contributes to our understanding of them. 6. Explain what is meant by a sociotechnical systems perspective. 7. Practicing on developing a MIS based on database management (Access)</p>

Course title	Computer Science Training Summer School
Credit	5
Class hours	100
Classification of the curriculum	Undergraduate
Department	Department of Computer Science and Technology
Course description	Theory, programming and applications of deep learning. Applications include voice, image, social network, knowledge graph, natural language processing and robotics. In addition, deep generative models and deep reinforcement learning are introduced.
Course title	Discrete-Time Signal Processing
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Department of Automation
Course description	

Course title	Communication Systems and Circuits
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Department of Microelectronics and Nanoelectronics
Course description	This course gives insights into analog/digital communication systems with practical circuit design examples. Students are expected to learn both system and circuit design perspectives in modern communication IC design.
Course title	Combustion
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	School of Aerospace Engineering
Course description	Introduction to combustions processes and chemical kinetics. Mechanisms of formation of pollutants such as nitrogen oxides, carbon monoxide, soot and unburned hydrocarbons in stationary and vehicular power plants. Premixed and diffusion flame structure and burning rates, spray combustion, single droplet vaporization and combustion, combustion of solid fuels and pollution clean-up devices, gas

	turbine combustion.
Course title	Chemical Biology (teaching language to be decided)
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	Department of Chemistry
Course description	Chemical biology is an emerging scientific discipline that spans the fields of chemistry and biology. Chemical biology involves the use of chemical methods, tools, and molecules that are designed and made through synthetic organic chemistry, to study, understand, and manipulate biological systems. It attempts to use chemical principles to perturb or control biological systems to either investigate the mechanisms or create new functions. In the class we will review the chemical biology of small molecules, biomacromolecules, and concepts and techniques.
Course title	Chemistry for Sustainable Society
Credit	1
Class hours	16

Classification of the curriculum	Undergraduate
Department	Department of Chemistry
Course description	<p>This short course is designed specifically for the chemistry students of Tsinghua Elite Program. It is aimed to guide students to scrutinize the importance and contribution of chemistry to humankind and the development of society. It is hoped that the students, after studying the course, will strengthen their interest in chemistry, improve their innovative capacity, and choose chemistry research as their life-time career. This course will discuss a few key issues of chemistry and sustainability of the economic and social development. The topics include: what challenges we are facing in terms of sustainable development, what chemistry can deliver to ensure enough foods and guarantee food safety; chemistry is the devil causing problems of our living environment, or chemistry is the angel to protect our ecosystem and environment; where we can find enough energy to drive our planet; what are the replacement of the fossil resources for chemical industry and manufacture; what chemistry can contribute to improve the quality of life; and the philosophy and the contents of sustainable chemistry.</p>
Course title	Introduction to Computational Chemistry
Credit	1
Class hours	16

Classification of the curriculum	Undergraduate
Department	Department of Chemistry
Course description	In a time of computer revolution, chemistry has become a science with both experiment and theory due to the rapid developments of applying quantum mechanics and relativity mechanics to fundamental chemistry problems. In this course, we will introduce recent developments in theoretical and computational chemistry and the applications in experimental chemistry research.
Course title	Advanced Algorithms
Credit	4
Class hours	64
Classification of the curriculum	Undergraduate
Department	Institute for Interdisciplinary Information Sciences
Course description	The course is meant for an elite group of undergraduate (juniors) computer science students who are more mathematically oriented. They have had a first course in algorithms, and a first course in theory of computation. So this course is meant to be a 2nd course in Algorithms
Course title	Hot Topics in Computer Science

Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Institute for Interdisciplinary Information Sciences
Course description	This course provides an overview to the state of the art of computer science research. The goal is to introduce students to the frontier of computer science research and help them plan their career in the computer industry. The course will devote one or a few lectures to each field. Examples of topics include computer systems, computer networking, information security, computer graphics, computer vision, web search and mining, multimedia, speech technology, and natural language processing.
Course title	Information Theory and Network Coding
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	Institute for Interdisciplinary Information Sciences
Course description	This course is an introduction of the information theory developed by Claude Shannon and network coding. Information theory is a branch of applied mathematics and electrical engineering involving the

	quantification of information. Network coding is one of the most active research frontiers in information theory.
Course title	Software Engineering for Saas and Cloud Computing
Credit	4
Class hours	80
Classification of the curriculum	Undergraduate
Department	Institute for Interdisciplinary Information Sciences
Course description	The course teaches software engineering techniques using SaaS+Agile+cloud as the vehicle and Rails as the framework. A partial list of what we cover includes test-driven development, behavior-driven / user-centric design, design patterns, legacy code and refactoring, deployment (including “SaaS Performance Security 101” ), and working effectively as part of a small team (using version control with branches, estimating progress toward customer-driven goals, work planning, etc.) In addition to telling students the best practices and methodologies, we introduce students to useful software engineering tools with which they can put the principles learned into practice. There are 3 hours of lectures and 1 discussion sessions per week. Students are expected to complete weekly programming assignments, bi-weekly short-answer quizzes, and a 6 to 8 week course project featuring a real world SaaS development project in 4-6 people teams.



Course title	Algorithms and Models for Bid Data
Credit	4
Class hours	64
Classification of the curriculum	Undergraduate
Department	Institute for Interdisciplinary Information Sciences
Course description	Analysis, computation, and privacy issues over environments involving a huge amount of data. Formal approaches: (i) datastream computation, (ii) property testing of large objects, (iii) big data statistics and machine learning techniques (Bootstrapping, Bagging and their variants), and if time permits (iv) introduction to differential privacy (anonymizing databases). For these settings we study models and algorithms.

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Course title	Network Science
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	Institute for Interdisciplinary Information Sciences
Course description	Network science is a new and emerging scientific discipline that examines the interconnections among diverse physical or engineered networks, information networks,

	<p>biological networks, cognitive and semantic networks, and social networks. In this course, we examine the many facets of internet from the algorithmic perspective, including for instance the mathematical modeling of large-scale networks, information retrieval algorithms for massive data sets, algorithmic game theory and electronic commerce. Specific topics include small world phenomena, power law distributions, rank aggregation, web crawling, hubs and authorities, clustering large data sets, streaming algorithms, network routing, Nash equilibrium, market clearing, mechanism design, auction theory, social networks, etc.</p>
Course title	Physics of Financial Markets
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	Institute for Interdisciplinary Information Sciences
Course description	<p>This is a course describing financial markets from the Physics point of view. Statistical physics describes the behaviour of complex systems emerging from simple rules and the cooperation of many agents. Financial markets feature this kind of complexity. The course is self contained, provides a thorough introduction to statistical physics, and to the important tools to understand financial markets and become a quantitative analyst. The course will go through the most important models of physics for financial markets.</p>

Course title	Advanced Applications of Machine Learning( teaching language to be decided)
Credit	4
Class hours	64
Classification of the curriculum	Undergraduate
Department	Institute for Interdisciplinary Information Sciences
Course description	<p>“Advanced Applications of Machine Learning” is a pioneering undergraduate course offered jointly by IIS at Tsinghua University and Innovation Works on artificial intelligence. The course is intended for sophomore and junior students at IIS and other IT-related majors. The course aims to introduce to students Machine Learning algorithms and tools, as well as their applications in various important emerging fields. In particular, the foundation part includes machine learning algorithms and systems, and deep learning, and the application part includes FinTech, face recognition, speech processing, self-driving, and Internet big data. Students will be given projects in various fields, and learning about applying machine learning knowledge to solving real-world problems.</p>
Course title	Production and Operation Management( teaching language to be decided)
Credit	3

Class hours	48
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	<p>From an organizational perspective, operations management may be defined as the management of the direct resources that are required to produce and deliver an organization's goods and services. The day-to-day activities within the operations management function focus on adding value for the organization through its transformation process. The main contents of operations management can be divided into four parts: 1) Operations strategy and the firm's competitiveness, including the competitive priorities, the relationship between operations strategy and the firm's competitiveness, operations processes selection, etc. 2) Design of the operations system, such as new product and service development, capacity decision, facility location and layout, job design, etc. 3) Operations planning, organizing and control, including forecasting, operations planning, inventory control, MRP and JIT, supply chain management, etc. 4) The improvements of operations system, including quality control and improvements.</p>
Course title	Introduction to Financial Engineering( teaching language to be decided)
Credit	3
Class hours	48

Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	This course covers derivatives such as options, forward contracts, futures contracts, and swaps. By the end of the course you will have a good knowledge of how these contracts work, how they are used, and how they are priced. Derivatives have become an integral part of finance. Whether you end up working for a financial or a non-financial institution you will find the material you learn on this course important
Course title	Principles of Insurance:Life,Health and Annuities (teaching language to be decided)
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	School of EconomSchool of Economics and Managementics and Management
Course description	The course will cover various aspects of life and health insurance, including economic considerations, product types, and underwriting issues. Although pricing and reserving methods will not be addressed directly, the course will include an overview of the concepts and techniques of probability and statistics necessary for a basic understanding of actuarial issues. Students will be assessed through both (take-home) written essays and (in-class) examinations. In addition to specific assigned readings, students will be expected to use the Internet

	to conduct independent research of current issues of importance in the health-insurance sectors of both China and the United States. They also will be expected to participate in class discussions.
Course title	Organizational Design and Human Resource Management Economics
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	This course focuses on economic principles of internal labor market and organizational design. The topics it covers include the boundary of the firm, the allocation of ownership in the organization, wage determination, screening of job candidates, principal agent relationship, human capital investment and its impact on employment stability, job design, hierarchy, bargaining theory, etc. International comparative context is considered in the study of the theoretic topics.
Course title	Foundation of Actuarial Science
Credit	3
Class hours	48

Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	This course covers individual future lifetime and its related functions, and pricing for individual life insurance and annuities. I will include some SOA past exam M problems as examples.
Course title	International Economics-Theory and Policy
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	This course introduces to students basic concepts and theories in international economics. Topics covered in the course include: Ricardian trade model, Neo classical trade theory, The Heckscher-Ohlin, new trade theory-competitive advantage, International capital and labor movement, tariff and non-tariff barriers and protectionism, balance of payment and exchange rate, economic policy under fixed and floating exchange rate.
Course title	Object-oriented analysis and design methods

Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	
Course title	Large Financial Data Analysis (teaching language to be decided)
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	
Course title	Senior Seminar on Major Issues in Finance
Credit	2
Class hours	32



Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	This course is designed as a seminar series and will be joint-developed by all the professors and the senior undergraduate students in Department of Finance. The presentations are required in English. After seven-semester learning, a comprehensive course is necessary to help the students improve their ability to do research and develop their professional skills in presentation. This course will provide such a platform that we hope every student can benefit from it.#This course covers almost all the subfields in finance, including financial economics, corporate finance, asset pricing, financial engineering, international finance, financial institutions, fixed income securities, insurance and risk management, real estate finance, and etc.
Course title	Career Development Planning
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	

Course title	Labor Economics
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	This course studies the mechanism of labor markets. It covers the traditional topics in labor economics, which include the theories of labor demand and supply (both static and dynamic), labor market equilibrium, compensating differentials, human capital investments and returns, wage determination and structure, migration, gender and race discrimination, inequality, unionization, efficiency wages and work incentive scheme, and unemployment. It deals with the impacts of wages, prices, profits, working conditions, government policies and the like on the decision makings of firms and workers.
Course title	Global business Analysis Team Project (teaching language to be decided)
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Economics and Management

Course description	The main contents of this course include: 1., the internationalization of the start of the law, anatomy, through the internationalization of wealth creation, competition, business factors. 2., the competition model in international market competition, as well as the source of competitive advantage. 3., enterprises in the international market competition often taken commercial means. 4., grasp international business opportunities. 5., tap international resources. 6., enter the overseas market model. 7. risk analysis and risk management models. 8., to deal with local competition. 9.. Grasp international business practices. 10. dealing with cultural conflicts. 11., warning political risks.
Course title	Financial Risk Management
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	
Course title	Finance Seminar
Credit	3

Class hours	48
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	<p>This course is a seminar style class. Each class (except the first one) focuses on one specific topic. Each class contains three sections: lecture on brief introduction to the literature of the topic covered by the class; paper discussion; and student presentations of journal articles.</p> <ul style="list-style-type: none"> <li>• Lecture: Each class begins with brief introduction to the body of literature on the topic covered by the class.</li> <li>• Paper discussion: Each class discusses one article on the covered topic. Every student should contribute to the discussion of every paper. Students are expected to have thoroughly read the articles and be ready to answer any questions related to them. The following main areas of each paper will be discussed: its key findings, its methods and research design, its contribution to the topic, its strengths and its weaknesses. Class participation will not rely only on volunteers and cold-call will also be employed.</li> <li>• Student presentations of journal articles: Each student is required to give a presentation of a recommended journal article (or working paper) over the semester. The detailed requirement can be seen in course evaluation section. The class also includes several talks by outside speakers from industries and other academic institutions.</li> </ul>
Course title	Behavioral Economics

Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	Do people really behave according to the standard neoclassical models of economics? Or do we sometimes have self-control problems? Do we care about other people as well as ourselves? Do we suffer from overconfidence? This course will examine the common deviations from neoclassical economic models in real world decision-making. We will then study how economics incorporates insights from psychology in order to more fully account for human economic behavior.
Course title	Case analysis for Corporate Finance
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	Case analysis for Corporate Finance course covers the content of both basic theory of corporate finance and the knowledge and skills of financial decision making analysis. It

	<p>mainly includes the financial statement analysis, risk and return and cost of capital; valuation; capital budgeting, financing alternative approaches; dividend policy and Merger Acquisition..In order to put context between theory and the practical situation in China, the review and discussion of the financial situation in China is arranged associated with the relevant topics of each class. The teaching methodology of the course is mainly case study combined with practical project and mini lecturing. After taking this course, the students should: 1) learn the basic principle of Corporate Finance, 2) build the basic skill of financial analysis and decision-making, and understand more about relevant situation in China.</p>
Course title	Marketing Principles
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Economics and Management
Course description	<p>Marketing is the core of an operating business, and also the management process through which goods and services move from concept to the customer. Marketing is based on thinking about the business in terms of customer needs and their satisfaction. Marketing differs from selling because it has less to do with getting customers to pay for your product as it does developing a demand for that product and fulfilling the customer's needs. Marketing entails planning and</p>

	<p>executing the conception, pricing, promotion, and distribution of ideas, goods, and services. It starts with identifying and measuring consumers' needs and wants, assessing the competitive environment, selecting the most appropriate customer targets and developing marketing strategy and implementation program for an offering that satisfies consumers' needs better than the competition. Marketing is the art and science of creating customer value and market place exchanges that benefit the organization and its stakeholders. The objective of this course is to introduce students to the concepts, analyses, and activities that comprise marketing management, and to provide practice in assessing and solving marketing problems. The course is also a foundation for advanced electives in marketing as well as other business/social science disciplines. We will explore the theory and applications of marketing concepts through a mix of cases, discussions, lectures, guest speakers, individual assignments, and group projects. We will draw materials from a variety of sources and settings including services, consumer and business-to-business products.</p>
Course title	Mathematics of Risk 2
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Economics and Management

Course description	<p>The course addresses a number of fundamental topics from intermediate professional actuarial examinations, as well as more advanced topics of current interest. Specifically, students will study, evaluate, and apply mathematical techniques relating to:</p> <ul style="list-style-type: none"> <li>• Utility theory</li> <li>• Probability distributions for insurance loss frequencies and loss severities</li> <li>• The effects of insurance policy restrictions (deductibles, limits, copayments)</li> <li>• The individual and collective risk models for total insurance losses</li> <li>• Insurer net worth processes and ruin theory</li> <li>• The frequentist and Bayesian statistical paradigms</li> <li>• Point- and interval-estimation methods</li> <li>• Model-selection methods</li> <li>• Credibility methods for combining estimates and forecasts</li> <li>• Catastrophe risks</li> <li>• Reinsurance markets</li> </ul>
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Course title	The World and China: by Historical Perspectives
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Credit	2
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Class hours	32
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Classification of the curriculum	Undergraduate
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Department	School of Economics and Management
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Course description	This course is one of the China and the World Series. It analyses the development of China and the world from a historical perspectives.
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Course title	Reading Shakespeare (teaching language to be decided)
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Credit	3
Class hours	96
Classification of the curriculum	Undergraduate
Department	Department of Foreign Languages and Literatures
Course description	<p>This course introduces students to seven Shakespearean plays, and acquaints students with the stage conventions and cultural trends in Shakespeare's time. Students read the plays closely and discuss the themes, characters, key passages and dramatic skills in class. The reading focuses on the flavor of Shakespeare in the original, and will be aided by major criticism of the plays and multimedia resources. Students are encouraged to find their own links with the Bard by discussing, showing, acting and writing. Teaching goals:</p> <ol style="list-style-type: none"> <li>1. Students will be able to read Shakespeare's plays, discuss the major themes and feel the beauty of his language.</li> <li>2. Students will be able to appreciate the plays as literary texts and analyze Shakespeare's poetic and dramatic techniques.</li> <li>3. Students become aware of the relation between Shakespeare's plays and the social background of the Elizabethan and Jacobean eras. Students learn to find their own ways of approaching and being attracted to Shakespeare, and create links between their reality and the dramatic world of Shakespeare.</li> </ol>
Course title	Moot Court Training
Credit	2

Class hours	
Classification of the curriculum	Undergraduate
Department	School of Law
Course description	The Summer Intensive Legal English Course aims to introduce first-year law students to the world of American advocacy. Both the lecturer and tutors will closely work together to help students learn about the American legal system, legal research, case reading and analysis, statutory interpretation, legal synthesis as well as basics to trial advocacy and legal ethics. If time permits, students will also learn some legal translation and legal interpreting skills. Overall, students taking this course will experience enhancement in self-confidence, legal logic, and legal English.
Course title	Legal Writing Workshop
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Law
Course description	School of Social Sciences

Course title	Statistics for Psychology
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	School of Social Sciences
Course description	
Course title	Academic English Writing
Credit	2
Class hours	32
Classification of the curriculum	Undergraduate
Department	School of Social Sciences
Course description	This course will help you learn how to write a scientific paper in English. You will study examples of well-written papers and determine the underlying structure of the paper -- what the different parts (introduction, etc.) are made of and how the pieces within them fit together.
Course title	Indoor Air and Health:Past,present and future

Credit	1
Class hours	16
Classification of the curriculum	Undergraduate
Department	Department of Architectural Technology
Course description	The history, presence and future of indoor air quality and health are introduced. This course can provide students a general knowledge on indoor air quality and health. In addition, students' abilities of written and oral English can be improved.
Course title	Software System Design
Credit	3
Class hours	48
Classification of the curriculum	Undergraduate
Department	School of Software
Course description	This course aims to provide students with the followings: Fundamentals on software systems architecture design: Defining software system design principle, Envisioning software system architecture, Creating software system architecture, Analyzing software system architecture; Broad understanding of software service-oriented system engineering (in particular on Web Service Architecture WSA and Service Oriented Architecture SOA)

	related technologies and business process design; Case study on existing information services (e.g. Web, peer-to-peer, google search, ..., etc.)