



Learning at NPU  
Global Summer Open Courses

# Learning at NPU Global Summer Open Courses

International College  
Northwestern Polytechnical University



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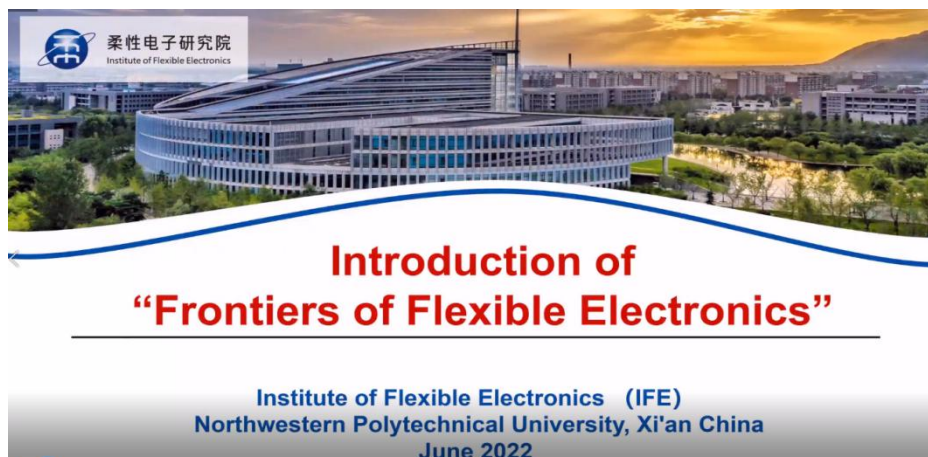
**For obtaining more details, please visit:**

**<https://npuinternationalcollege.nwpu.edu.cn/>**



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### 1. Frontiers of Flexible Electronics Research



**Brief Intros:** "Frontiers of Flexible Electronics Research" is led by the member of the Chinese Academy of Sciences, **Prof. HUANG Wei**, the founder and pioneer of Chinese organic electronics and flexible electronics, and jointly taught by 8 brilliant professors in the field of flexible electronics. It is a general interest guidance course, which aims to cultivate students' interest in one of the new interdisciplinary forefront research focuses- “Flexible Electronics” . The course will introduce basic concept, development history, latest research progress and application prospect of flexible electronics. In this course, students will have a good command of the basic knowledge of physics, chemistry, biology, electronics, mechanics and other relative fields for frontier of flexible electronics research, and lay a certain foundation for in-depth frontier research in this field.



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### Leading Scholars



Prof. HUANG Wei



Prof. LI Peng



Prof. YU Haidong



Prof. LIU Xiwang



Prof. GUAN Cao



Prof. WU Zhongbin



Prof. XU Weidong



Prof. JI Lei

a. **Academician Professor HUANG Wei** is an Academician of Chinese Academy of Sciences (CAS), Russian Academy of Sciences (RAS), Asia Pacific Academy of Materials (PAM), ASEAN Academy of Engineering and Technology (AAET) and Pakistan Academy of Sciences. Currently, he is director of the Academic Commission of Northwestern Polytechnical University (NPU), China. He also holds the position of Chief Scientist of the Frontiers Science Center for Flexible Electronics, NPU. Being a



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founder and pioneer of organic electronics, plastic electronics and flexible electronics in China, Academician Prof. Huang is regarded as “the father of electronics.”

**b. Prof. LI Peng**'s research interests are the development of bioelectronic materials/devices for the treatment of diseases, especially infectious diseases caused by pathogenic microbes. His research achievements in this field have been widely reported by many media in the United States, Germany and Singapore. At the same time, his research patents have also attracted the attention of the industry, and he has cooperative relations with many industrial enterprises.

**c. Prof. YU Haidong**'s research focus is primarily on green flexible electronics for healthcare applications.

**d. Prof. LIU Xiaowang**, mainly engaged in the research of rare earth doped nanocrystalline materials, flexible electronic materials and devices.

**e. Prof. GUAN Cao** focuses on flexible energy storage devices, including self-assembling of 3D electrode, surface/structure engineering and the application for flexible energy storage devices. He also serves as Advisory Panel for Nanotechnology, Young Advisory Board Members for InfoMat and SmartMat.

**f. Prof. WU Zhongbin**'s research direction is semiconductor optoelectronic devices and integration. His main research interests are flexible light-emitting diodes, thin-film transistors and light-emitting transistors and their applications in flexible integrated logic circuits, flexible wearable devices, and flexible displays. Mainly engaged in the research of semiconductor optoelectronic devices and integration, in the past five years. He has won the



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National Outstanding Youth Fund (Overseas), German Humboldt Scholars, Northwestern Polytechnical University Soaring Overseas Scholars, Chinese Academy of Sciences President Excellence Award, etc.

**g.Prof. XU Weidong** is an active researcher in organic and perovskite optoelectronics, pioneering in the research of material design, device physics, and novel device structures for perovskite optoelectronic devices.

**h.Prof. JI Lei**, his research interest is the design and synthesis of photoelectric functional air-stable organic free radicals: research on the methods of stabilizing organic free radicals, design and preparation of air-stable new organic small molecules and polymer free-radical materials with specific opto-electromagnetic functions; air-stable Organic radicals are used in optoelectronic devices such as flexible organic solar cells (OPVs), organic field effect transistors (OFETs), organic electroluminescent diodes (OLEDs), as well as in energy storage and bioluminescence imaging.

## 2. Introduction to Formal Logic and Formal Semantics

**Brief Intros:** Mathematical Logic is the natural foundation of computer science, software engineering and systems. University students in computer science and software engineering are required to study mathematical logic as part of their theoretical foundation. This course on “Introduction to Mathematical Logic and Formal Semantics” aims to improve the education on software theory and method and to help the students to develop their ability in logical thinking and using formal proofs and verification.

Through this course, the students are expected to develop good understanding of basic principles and methods in computer program



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language design and implementation, to improve their cognition of program correctness and the basic theory of program correctness analysis and verification. It is our hope that students are to develop an interest and ability software theory and formal methods and their application in building trustworthy software systems.

### Leading Scholar



**Prof. LIU Zhiming**, a national high-level talent, director of the Research Center for Intelligent Embedded Systems (CiES). He has been engaged in the field of software theory and method for a long time, especially the research of formal method and model-driven software engineering method. His formalized method of rCOS won the second prize of the 2nd Macao Special Administrative Region Natural Science Award. His academic positions include: Member of the China Computer Federation, Fellow of the British Computer Society, Senior Member of ACM; he is also the initiator of international academic conferences ICTAC, SEFM, FACS and SETTA.

### 3. Frontiers of AI and its Applications

**Brief Intros:** The theory and technology of artificial intelligence is



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getting increasingly mature with its expanding application since the birth of AI. The school of computer science specially offers the course Frontiers of AI and its Applications. Led by national young talents such as Zhang Ying, Yang Bo and Zhang Shu, this course is jointly taught by five outstanding young teachers (all with rich overseas studying background) of the SCS. It is a characteristic course of interdisciplinary integration, aiming to cultivate students' interest in artificial intelligence. The course includes introduction to the background of the birth of artificial intelligence, cutting-edge technologies, application prospects, etc. After learning this course, students will not only master the elementary theories, knowledge and skills in the field of artificial intelligence and experience the high-quality education, but also enjoy the teaching of top teachers in the field, deeply appreciating the cutting-edge scientific and creative knowledge of artificial intelligence and the learning mode with creativity, imagination, innovation and interaction. It will lay a foundation for in-depth frontier research in this field and provide a new channel for students to understand NPU and SCS.

### Leading Scholars



Prof. ZHANG Ying



Prof. YANG Bo



Prof. ZHANG Shu



Prof. ZHANG Lei



Assoc. Prof. LIU Le





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- a. **Professor ZHANG Ying:** She has been chosen to the National Science Fund for Outstanding Young Scholars (Overseas) program. In 2009 and 2014. She is mainly specialized in the research of group intelligence perception, media intelligent computing, machine learning and other fields.
- b. **Professor YANG Bo:** He has been chosen to the National Science Fund for Outstanding Young Scholars (Overseas) program. mainly engaging in 5G/6G research, cloud edge computing, deep learning, intelligent reflective surface, etc
- c. **Professor ZHANG Shu:** He has been chosen to the Aoxiang overseas scholar Introduction Program" of Northwestern Polytechnic University. He is mainly engaged in the research of brain inspired artificial intelligence, brain image analysis, computer-aided detection and diagnosis and multimodal image fusion analysis.
- d. **Professor ZHANG Lei:** He has been selected to Aoxiang overseas scholars program of Northwestern Polytechnic University. In february2019, he joined the UAE origin Artificial Intelligence Research Institute as a research scientist, mainly engaging in research on image processing, machine learning, etc
- e. **Associate professor LIU Le:** He is committed to the research of interdisciplinary disciplines linked by visualization technology, including information and scientific visualization, artificial intelligence, computer graphics, 3D stereovision and cognitive science.

### 4. Computing Technology for Engineering

**Brief Intros: This course is an EMI course for international**



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**students.** Through more than 10 cases, it introduces how to use MATLAB to solve calculation problems in engineering applications. This course is a compulsory basic computer course for non-computer science, engineering and management majors in engineering universities. MATLAB, as an advanced scientific computing software, is an interactive application development environment for algorithm development, data visualization, data analysis and numerical calculation. This course pays special attention to the cultivation of practical ability, so that students can master the basic technology of MATLAB, and skillfully use MATLAB to carry out general engineering calculation.

### Leading Scholar



**Assoc. Prof. SUN Peng's** research interests include data analysis and visualization, Cracks Images Detection and Quantification. She has been taught EMI course for the international class of Northwestern Polytechnical University for 11 years. She is now the director of two EMI courses "Software Technology" and "Computing Technology In Engineering Application". She is the chief editor of the university planning English textbook Software Technology, Northwestern Polytechnical University Press, in



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preparation, Chief editor of the Chinese textbook MATLAB Foundation, published in 2011, Tsinghua University Press. She have attended the English-only teaching ability training and improvement classes offered by international famous universities such as University of Oxford, University of Cambridge so on. In 2021, she was appointed as teaching observer of EMI training course by the Teaching Development Research Institute of Teachers in Colleges and Universities in northwest China.

### 5. Joint Human Machine Learning (JHML)

**Brief Intros:** This course covers the fundamentals of machine learning using R and Python, a user-friendly and well-known programming language. We'll go over two major components in this course: First, you'll learn about Machine Learning's objective and how it applies in the actual world. Second, you'll learn about supervised vs unsupervised learning, model evaluation, and Machine Learning algorithms. In this course, you'll get hands-on experience with real-world Machine Learning applications and learn how it influences society in unexpected ways.

#### Leading Scholar





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**Assoc. Prof. FARHAN ULLAH** is the special issue Lead Guest Editor for Security and Communication Networks Journal, and the Computers, Materials, and Continua Journal. He is an editorial board member of KSII Transactions on Internet and Information Systems Journal. He also served as a Guest Editor for a special issue of Future Internet Journal. He received Research Productivity Award (RPA) from COMSATS Institute of Information Technology (CIIT), Sahiwal, Pakistan in 2016.

### 6. Secure Coding in C/C++

**Brief Intros:** Build more secure and reliable software systems: The most effective way to improve software security and reliability is to eliminate vulnerabilities during its development — before the software is released. The course assumes basic C and C++ programming skills but does not assume an in-depth knowledge of software security. Producing secure programs requires secure designs. However, even the best designs can lead to insecure programs if developers are unaware of the many security pitfalls inherent in C and C++ programming.

This course helps software developers increase security and reduce vulnerabilities in the C and C++ programs they develop. This course helps developers to eliminate vulnerabilities during development, which can result in reducing the total cost of repairing code compared to making repairs after development. This course provides developers with practical instruction based on the CERT Secure Coding Standards, which have been curated from the contribution of more than 1,900 experts in the C and C++ programming languages.



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### Leading Scholar



**Dr. Arnatovich Yauhen's** interests span various areas in Programming Languages, Algorithms and Data Structures, Software Development and Design, Software Security and Quality, Artificial Intelligence and Machine Learning, Internet of Things, and Quantum Computing. He has completed two Professional Certification Programs for Database Developers and Administrators from IBM. He has (co-)authored various research papers published in reputable international journals and conferences and have been invited as a Reviewer for various international software engineering journals.

## 7. Digital Signal Processing

**Brief Intros: This course is a Brand Course for Study in China awarded by Ministry of Education.** Digital Signal Processing is a basic and core course in the major of electronics and information, as an essential professional knowledge, which has been widely implemented in the field of electronics and information, e.g., communications, instruments, radar, image processing, biology engineering, consumer electronics, industrial control. This course is primarily designed for undergraduates who have already completed classes in calculus and linear algebra.



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Through this course, the students should be able to master the basic theories and methods of digital signal processing, including digital signals and systems, time and frequency analysis of linear time-invariant system, Fourier transform, z-transform, structures of discrete-time systems, and design of digital filters, with a good understanding of related applications. Programming examples are designed in labs and projects, from which the students should learn and grasp the practical skills of digital signal processing.

### Leading Scholar



**Prof. WAN Shuai**, nearly 10 technologies have been adopted by international and domestic standards. She have won the ICME 2020 Outstanding Service Award as the Lead TPC Chair.

### 8. Digital Signal Processing Method and Simulation

**Brief Intros:** As a professional course, it mainly teaches the basic theory and method of digital signal processing. The course content includes analysis method of discrete-time signal and discrete-time system, FFT, digital filter and matlab simulation etc.



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### Leading Scholars



**Assoc. Prof. YANG Changsheng**, his interests span various areas in underwater signal and information processing, bionic intelligent perception. He is currently a member of the International Institute of Electrical and Electronics Engineers (IEEE), the Chinese Acoustic Society, and the Chinese Simulation Society. He won the second prize of the national teaching competition, won the most satisfactory teacher of the undergraduate and postgraduate students of Northwestern Polytechnical University and won the outstanding master's thesis guidance teacher of Northwestern Polytechnical University.

### 9. Theoretical and Applied Mechanics

**Brief Intros:** The course of theoretical and applied mechanics enables students to understand the mechanics principle of engineering problems and the analysis of engineering problems by learning the basic principles of mechanics and its application in engineering, cultivates students' ability to analyze and solve complex engineering problems, stimulates the spirit of exploration, and cultivates students' learning ability at the same time.



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### Leading Scholar



**Prof. ZHANG Juan**, researches on Dynamics of Spacecraft: orbit transfer and orbit keeping, formation flight of small satellites, Dynamics of rigid-flexible coupling, Vibration theory and application, Optimization design of mechanics, etc. The first batch of the national excellent Massive Online Open Course "Theoretical Mechanics" course leader. She was awarded Baogang Excellent Teacher Award, the National Xu Zhilun Excellent Teacher award in Mechanics, the first prize of the fourth Teaching Innovation Competition of Shaanxi Province, the first prize of teacher teaching Innovation Competition of the universities of Excellence Alliance, etc.

### 10. Airplane Stability and Control

**Brief Intros:** This course mainly discusses the airplane design requirements and evaluation methods from the perspective of stability and control. Through the study of this course, students will master the concept and evaluation methods of aircraft stability, the influence of individual components on static stability, mechanism



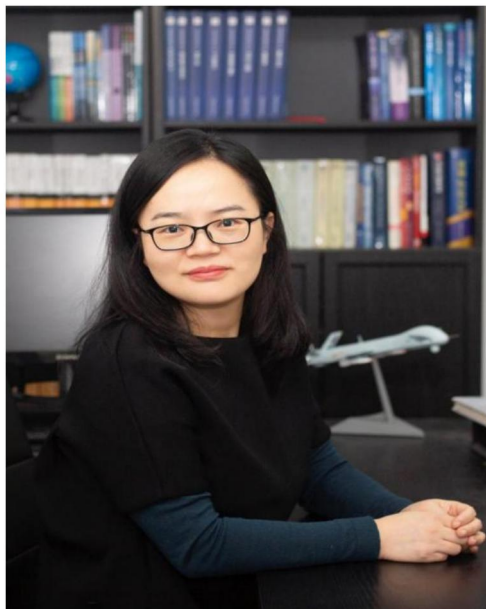


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and design requirements of airplane control surface, modelling, simplification, and solution of airplane equation of motion, typical modes, and flying quality requirements.

Through the study of this course, students will understand the concept of airplane stability, the stability contribution of airplane components, how to control an airplane, how to build the airplane mathematical model, and how to evaluate the stability and control characteristics of an airplane.

### Leading Scholar



**Assoc. Prof. LIU Yan**, who has been engaged in all English Teaching for 10 years and has taught over 180 class hours in all English every year. The number of learners of all English MOOC "Airplane stability and control" she is responsible for producing has exceeded 5000, which is also the first online course of the "iCourse" International Platform. The teaching assistant of this course is Assoc. Prof. Mi Baigang, who has taught an all-English course "Dynamics of Atmospheric Flight".



## 11. Fiber Reinforced Polymer Composite: Mechanics and Manufacturing

**Brief Intros:** This course introduces theories and engineering technologies in manufacturing and machining of fiber reinforced polymer composite (FRP), focusing on the material properties and production, the experimental study of conventional drilling and milling process, quality control and process optimization, with relation to the mechanism of FRP machining, cutting force and damage modeling, mechanics of composite materials (such as stiffness, strength, and fracture mechanics), as well as finite element modeling, etc.

Through this subject, students are expected to master the mechanics and engineering knowledge in manufacturing and machining of FRP components, master the methods for conducting experimentation and theoretical modeling for the machining process, and help to solve process problems in industry.

### Leading Scholar



**Assoc. Prof. HE Yanli**, mainly engaged in modern integrated manufacturing system, manufacturing system simulation and optimization, fiber composite material cutting and cutting process intelligent clamping research.



## 12. Mechanics of Composites in Advanced Space Carrier

**Brief Intros:** As Polymer reinforced composites are the key lightweight, high-strength and corrosion-resistant basic raw materials for modern aerospace, aviation, automobile and marine industries. They usually consist of fiber reinforcements such as glass fiber, carbon fiber, basalt fiber or aramid fiber and various resins. However, due to the viscoelastic properties of the resin, the viscoelastic properties of the polymer reinforced composites are very obvious in the working environment. Therefore, their mechanical properties strongly depend on the loading time and temperature. How to accurately analyze the mechanical properties of composites under the conditions is of great value to the design of advanced aircraft in extreme environments.

### Leading Scholar



**Assistant Prof. LEI Ming**, his research interest spans structural mechanics of polymer composites.



### 13. Polymer Characterization

**Brief Intros:** Polymer characterization is a fundamental course which introduces powerful analytical instruments and approaches to reveal the mysterious structure of polymers. It's not just to know how to use the instruments, but also, I hope by the end of this course you will be able to identify the structures and properties of polymers based on the basic principles of analytical methods. Moreover, in this course we are going to broaden our horizons to include analytical chemistry and instrumental analysis.

#### Leading Scholars



**Prof. CHEN Yanhui**, researches on Morphology and structure regulation and properties of semi-crystalline polymers during processing, Design and synthesis of functional, intelligent, high-performance polymer Study on structure, properties and mechanism of nanocomposites etc. In 2018, she was selected into the second batch of "Young Outstanding Talents Support Plan" for Universities in Shaanxi Province. She serves as the editorial board member of Current Applied Materials journal, deputy secretary general of Xi'an Association of Adhesion Science and Technology, the sixth director of China Creation Association, the fourth director



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of Shaanxi Creation Association.

### 14. Physiology

**Brief Intros:** Physiology aims to investigate various phenomenon of human life. Physiology is a science to explore the basic activities of various components of human body as well as the potential mechanisms to ensure their functions. This course emphasizes the illustrations of human physiology, including the normal activities, functions and inner mechanisms of the cell, organ and systems.

This course mainly discusses the human biology and its major content include the normal activities, functions and intrinsic mechanisms of individual systems, organs and cells of human body. During the teaching process, materialistic perspectives are involved to help students realize the principles of life activities. Besides, scientific thinking is embodied in each sections of teaching and the students are equipped with the abilities to analyze and solve problems, independent learning, the spirit of exploration as well as the consciousness of innovation.

#### Leading Scholar





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**Assoc. Prof. LI Chenrui**, Mainly engaged in the research of the pharmacology of traditional Chinese Medicine. The current research direction includes the mechanism of metabolic diseases and their prevention and treatment by natural products as well as the repair of bone defects. The reviewer of Chinese Pharmacological Bulletin and AAPS Journal. The council member of Shaanxi Experimental Animal Society, executive council member of Shaanxi Natural Medicine Society and member of American Association of Pharmaceutical Scientists.