
School of Physics and Technology at Wuhan University

WUHAN UNIVERSITY, CHINA



WUHAN UNIVERSITY

Wuhan University (WHU) is a comprehensive and key national university directly under the administration of the Ministry of Education. It is also one of the “211 Project” and “985 Project” universities with full support for construction and development from the central and local government of China.

The history of Wuhan University can be traced back to the Ziqiang Institute, which was founded in 1893 by Zhang Zhidong, the then governor of Hubei Province and Hunan Province in the late Qing Dynasty. In the process of development and evolution, the institute changed its name several times before it was finally named Wuhan National University in 1928. It is one of the earliest comprehensive national universities in modern China. By the end of 1946, the university had established 6 colleges, the colleges of liberal arts, law, sciences, engineering, agriculture and medicine. In 2000, an amalgamation of the former Wuhan University, Wuhan University of Hy-

draulic and Electric Engineering, Wuhan Technical University of Surveying and Mapping, and Hubei Medical University was announced, which ushered in a new era in its 100-odd years of development.

For the past century, Wuhan University has built an elegant palatial architectural complex of primitive simplicity which blends perfectly the eastern architectural style with that of the west. It is honored as the “Most Beautiful University in China.” Furthermore, Wuhan University’s centennial humanistic accumulation boils down to its succinct motto, that is, “Self-improvement, Perseverance, Truth-seeking & Innovation.”

Since its establishment, Wuhan University has cultivated more than 300 thousand professional talents in various occupations, among whom there are over 100 members of the Chinese Academy of Science and the Chinese Academy of Engineering. They have made great contri-



butions to national construction and social advancement. The remarkable achievements of Wuhan University have won it an extensive international reputation. In 1999, the world renowned journal *Science* listed Wuhan University as one of the most prominent institutions of higher education in China.

International exchanges and cooperation have burgeoned in recent years. Wuhan University has established cooperative relationship with more than 415 universities and research institutes in over 45 countries and regions. It is now endeavoring to shape itself into a world-class comprehensive research university domestically and internationally.

THE SCHOOL OF PHYSICS AND TECHNOLOGY

History

The School of Physics and Technology was officially named Department of Physics of National Wuhan University in 1928 and then began to recruit graduate students in 1942. Wuhan University initiated in China studies of the ionosphere, space physics and the plasticity of metals. In the 1940s, Wuhan University published papers in *Nature* and *Phys. Rev. (Letter to the Editor)* as the sole affiliation. Meanwhile, Wuhan University had the first doctoral degree granting school for physics in China. Currently, the Department of Physics can award PhD degrees and host postdoctoral researchers in physics. Condensed matter physics and radio physics are state key disciplines. Physics is also a key discipline of Hubei province and condensed matter physics is a dominant discipline of Hubei province. Physics at Wuhan has achieved a ESI physics discipline world ranking in the top 1% (568/732, 2017.3).

Faculty

Present faculty of the School of Physics and Technology mainly consists of 53 full professors (including research fellows) and 36 associate professors (including associate research fellows), together with 18 technicians. Among the faculty members, three were winners of “Chang Jiang Scholar Award Project” awards issued by the Ministry of Education, three were awarded National Funds for Distinguished Young, nine were included in the national “1000-Youth-Elite Program”, one was the chief scientist for a National Basic Research Program (973 Program) and one is a National Teaching Celebrity. Furthermore, many faculty members were and are the editors or committee members of international journals or conferences, and in charge of different international academic and domestic organizations.

Education

The School of Physics and Technology (SPT) at Wuhan University now consists of three departments, i.e., Department of Physics, Department of Materials Science and Department of Electronic Engineering. Its faculty and engineers are committed to education and research directly applicable to the betterment of human society. Unique interdisciplinary curricula are designed for both undergraduate and graduate students to enable them to combine their scientific studies with studies of many other disciplines, such as literature, arts and law, which are offered by several renowned graduate schools of our university. Special emphasis is laid upon the communication between faculty members and students. Faculty members assist each student to select the most suitable academic program. The following three programs are open to international students.



The Department of Physics is the predecessor of our school, with 38 full-time faculty members including 20 full professors, and a current enrollment of 550 undergraduate and 150 postgraduate students. The mission of the physics department is to promote strongly its education, research, and innovation. Physics is the science that deals at the most fundamental level with matter and energy, their interactions, and their transformation. It presents major challenges to the human mind and provides the foundation for other sciences. By pursuing creative research at the frontier of knowledge and innovation at the cutting edge of technology, it is the ultimate purpose of our faculty members to preserve and nurture a sense of wonder about the natural world, and to impart it to the students as a driving motivation for learning.

The Department has a wide variety of specialties and areas in physics, including Theoretical Physics, Condensed Matter Physics, Atomic and Molecular Physics, Particle and Nuclear Physics, Plasma Physics, Optics, and Acoustics etc. There is a strong offering of core subjects in the fundamental fields of physics. Undergraduates are encouraged to select areas of concentration in the traditional or applied subjects of physics. Faculty and postgraduate research focuses on condensed matter, optical and theoretical physics, and these include the physics of photonics and phononic crystals, soft matter, nano-structures, strongly correlated systems, nonperiodic solids, diffraction, lasers, quantum fields and elementary particles, materials, thin films, surfaces, interfaces, polymers and composites. A strong area of interdisciplinary collaboration that has emerged over the years is nanoscience and nanotechnology.



A number of key laboratories and interdisciplinary research centers provide support for the Department's research programs. Particularly relevant are the Center of Electron Microscopy, the Center of Nanoscience and Nanotechnology, the Key Laboratory of Artificial Micro- and Nano-structures of the Ministry of Education, the Laboratory of nuclear solid state physics, the Accelerator Laboratory, and the Positron Laboratory. State-of-the-art facilities for large scale and intensive scientific computation include various workstations, and a parallel processing platform of clustered PCs.

The Department of Materials Science is comprised of 20 faculty members (12 full professors), more than 120 full-time undergraduate students, and approximately 80 full-time graduate students of whom over 60% are Ph.D. candidates. The international reputation of its faculty and the impressive capabilities of its graduates have won respect from industrial leaders and academics world-wide.

Materials Science (MS) studies all classes of materials (metals, ceramics, electronic materials, and biomaterials) from a unified viewpoint and with an emphasis on the connections between the underlying structure and the processing, properties, and performance of the material. MS grew out of the disciplines of metallurgy and ceramics and now includes polymers, semiconductors, magnetic materials, photonic materials, and biological materials. A material scientist understands that all materials can be approached from a common set of principles and he studies how materials react under different conditions (such as temperature and pressure). Aeronautics and space, architects, civil engineers, toy companies, bio-medical research companies, and the data storage industry are all recent users of technologies that were de-

veloped from research in MS. Most fields in science and engineering are concerned in some way with materials, but only the field of materials science and engineering focuses directly on them.

The departmental faculty pursues a wide range of research and benefits from the synergy that our school provides which has combined materials, physics and electronics departments. Active research areas include: functional materials, artificial microstructure materials, low-dimension materials, ceramics and films, surface modification, ferroelectric polymers, composite materials, aerospace materials, metallurgy, and the synthesis and characterization of nanophase materials, etc.

The department is equipped with advanced research facilities worthy millions of US dollars, capable for optical, scanning, and transmission electron microscopy, x-ray diffraction, metallography, wet chemistry, mechanical testing of bulk and thin film materials, UHV sputter deposition, electrical and magnetic measurements, vacuum annealing treatments and metal forming, etc. They are open to all faculty, staff and students at Wuhan University as well as outside researchers.

Combining mathematical, chemical, and physical sciences, our curriculum is designed to prepare students for a professional career in materials science and engineering and lay a solid foundation for leaders in the science and technology of tomorrow.

The Department of Electronic Engineering has a history of more than 50 years, and its former specialties were semiconductors, radio waves and electronics. With the growing population of both undergraduate and post-graduate students, the department had a rapid development and now covers the disciplines of microelectronics, solid state electronics, optoelectronics, circuits & systems, sensors & actuators. The department looks forward to challenges ahead and to becoming more competitive in the university system.

The faculty and research staffs are experts in the fields of electronics, and they provide our students with the necessary knowledge and skills to meet the challenges of the rapidly changing information age. We make every effort to explore the potential of each student and develop his or her interests and aspirations. In parallel, our highly successful courses and continuing professional



research work meet the need to keep pace with the latest technology.

The teaching programs have been carefully designed with constant revision and enhancement. The syllabus is continually under development and review, in line with the requirements of the latest technological needs of industry. Required courses in the system integrate technological skills with theoretical disciplines, and are designed to help students keep up with technical progress and applications. As an extension, elective courses expose students to advanced ideas, while providing flexibility and interdisciplinary opportunities.

With a solid foundation and good training in the areas of electrical engineering, the graduates are eligible for the following fields: electronic materials, solid state electronics, devices, optoelectronics, integrated circuit design, and sensor applications.



Our research groups include Microelectronic and Solid State Electronics, Optoelectronics, Circuits & Systems, and Sensors & Applications. The group members engage in a wide range of research areas such as photonic materials, optoelectronic systems, nano-electronics, silicon processing & manufacturing technologies, electronic circuit simulation, IC design, and sensor applications, etc. Our team of faculty offers strong support for research postgraduates. The usual study period is 3 years for a MSc and 5 years for a PhD. Financial support is provided by the Ministry of Education, the National Science Foundation of China, and other research organizations. We also have close contact with industry which ensures that our research will meet current needs.

Research

Since the year 2011, the School of Physics and Technology has published over 1000 papers annually by first-time authors with about 200 articles indexed by SCI. Physics papers published in journals of high impact are showing a trend of increasing year by year. Overall, the School of Physics and Technology possesses the ability to keep pace with world leading research development. More importantly, in some basic research areas, especially in solar cells, semiconductor lighting, graphene, and medical physics, both equipment and achievement are at a world-leading level.

In addition, it has the following laboratories & institutes:

- Ministry Key Laboratory of Artificial Microstructures
- Hubei Province Key Laboratory of nuclear solid physics
- Center for Electron Microscopy
- Center for Nano-science & technology
- Center for Theoretical Physics
- Collaborative Innovation Center for Quantum Matter and Energy Conversion (under construction)

International Exchange

The School of Physics and Technology has established cooperative relationships with research institutes in more than 20 countries and holds annually 2-3 international conferences and workshops. Each year over 50 faculty members/students are invited to give talk at International Conferences. The Sino-French Master's class is taught jointly by Wuhan University and Université Claude Bernard Lyon 1. Each year, each of the two universities will select the same number of joint-training students. Both universities have 10 English study courses (a total of 20) for students to choose from, and each student must perform one-year scientific research and publish scientific papers in order to participate in the defense. The Sino-French undergraduate class is famous both in France and Europe. It has become a base for training high-quality students for the Ecole Polytechnique, the Swiss Federal Polytechnic, and the Swiss Federal Institute of Technology in Lausanne.



Hongxing Xu is the dean of School of Physics and Technology and associate dean of Institute for Advanced Study at Wuhan University in Hubei. He received his PhD in Chalmers University of Technology, Sweden in 2002. His research interest is on the investigation of surface-enhanced spectroscopy, nanophotonics, plasmonics and associated devices.