

Optics education at Nankai University of China

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ABSTRACT

Nankai University is one of the 30 Chinese key universities that directly under the National Education Committee of China. In this paper, the policy and programs, the curriculums and research opportunities, and the international cooperations of the optics education at Nankai University on both optical science and engineering are briefly introduced.

1. INTRODUCTION

Higher education on optics in China has been carried out since 1951 essentially at two different kinds of universities (colleges): universities of engineering and universities of sciences and arts. Generally speaking, Nankai University belongs to the latter.

Nankai University started its Optics education with special emphasis in 1954 when the optics division at Department of Physics was founded which is one of the eldest of its kind in China. Famous Chinese physicist Prof. Ancai Jiang (deceased) and Prof. Shouchun Shen (retired) had made great contributions. Most of the students at that time were undergraduates and no academic degrees were offered in China from 1949 to 1978.

The effort of optics education at Nankai University has been considerably enhanced after the foundation of the Institute of Modern Optics (IMO) in 1984.

IMO is a graduate center for both research and teaching on optical sciences and engineering. Up to now, 627 undergraduates and 87 postgraduates have completed their studies here. 90 undergraduates and 37 postgraduates (among them 9 are Ph.D candidates) are studying at IMO.

About 30 full time and concurrent researchers and educators led by Prof. Guoguang Mu, the president of Nankai university and the Director of IMO, are engaged in Modern Optics Sciences and Engineering at IMO. Among them there are 6 professors, 18 associate professors, research associates and senior engineers. More than 300 research papers have been published both at home and abroad since 1985. 42 research projects have been accomplished, of which 26 are appraised achievements including 5 patents and 14 have been awarded by the State, the Ministries and Committees under the State Council or the Municipal Government of Tianjin City.

In this paper, we will briefly introduce the policy and programs, the curriculums and research opportunities, and the international cooperations of the optics education at IMO on both optical science and engineering.

2. THE POLICY AND PROGRAMS OF OPTICS EDUCATION AT IMO

The policy of optics education at IMO is to be geared to the needs of the four modernizations (of agriculture, industry, national defenses, and science and technology) in China, the needs of future, and the needs of the world.

According to the policy, optics education should train qualified scientists and engineers with different levels. In addition to the BS and MS programs, Ph.D programs have also been set up at IMO since 1986 (for optical engineering) and 1991 (for optics science).

It is worthy of notice that education in both optics science and optical engineering is undertaken jointly at IMO. This newly emerging aspect probably enable our optics training programs to meet the demands of this rapidly developing technology better.

In order to implement our education policy, we must foster the students not only to learn necessary rudimentary and specialized knowledge but also to gain up their abilities of solving problems and studying on their own. Therefore, besides curriculums and class works of different levels, practice or research projects ending in a thesis are also required regardless of BS, MS, or Ph.D programs.

Since China is still a developing country, the opportunity of higher education has been very limited by now. Admission for undergraduates is vitally dependent on the National Unified Entrance Examinations of Chinese Universities and Colleges held every summer. For postgraduates, admission is mainly based on the results of written and oral entrance examinations organized by the institutions themselves early every year. A small percentage of outstanding students can be admitted upon either recommendations of the authorities of the colleges or high schools from which they graduated, or upon their academic achievements.

The typical lengths of schooling are 4 years for BS, 3 years for MS, and another 3 years for Ph.D programs.

3. CURRICULUMS AND RESEARCH OPPORTUNITIES.

Table 1 shows the required and elective specialized curriculums for BS, MS and Ph.D programs. Foreign language is commonly required and is an extremely important course at IMO. The first foreign language for most of the students is English, while the second which is required for Ph.D program only can be selected from German, Japanese, France and Russian.

Research opportunities for both undergraduates and postgraduates exist in the areas of optical information processing, optical computing, optical pattern recognition, optical neural networks, laser spectroscopy, ultra-short laser pulse techniques and applications, optical fiber sensors and fiber devices, lasers and their applications, etc.

The annual average funds of IMO have been around 800 thousands Yuan (RMB) since 1985. Some of the on going research projects, as examples, are:

Color Image Encoding and Decoding System and Instruments, Optical / Digital Hybrid Image Processing and Recognition Techniques for Robot Vision. Optical Neural Networks

for Pattern Recognition, Real Time Holography and Optical Associative Memories;

Liquid Crystal Light Modulators and Threshold Devices, Fiber Modulators, Amplifiers and Sensors, Mode-locking and Light Pulse Compression, Studies on Laser Medical Instruments;

Table 1. Specialized Curriculums for BS, MS, and Ph.D Programs.

PROGRAM	CREDITS & LENGTHS	REQUIRED AND ELECTIVE SPECIALIZED CURRICULUMS
BS	160 credits & 4 years	Higher Mathematics, Mathematical Physics Methods, General Physics, Physics Experiments, Electronics and Experiments, Theretical Physics, Laser Physics, Spectroscopy, Optical Information Processing(I), Optoelectronics, Modern Optics Experiments, Microcomputer and Its Applications, and 3 month thesis works, etc.
MS	35 credits & 3 years	Advanced Quantum Mechanics, Advanced Optics, Optical Information Processing(II), Statistical Optics, Advanced Modern Optical Experiments, Measurements of Optical Radiations, Advanced Laser Physics, Laser Spectroscopy, Light Wave Electronics, Photonics, and one and a half year thesis works, etc.
Ph.D	10 credits & 3 years	Modern Optical Engineering, Quantum Optics, Nonlinear Laser Spectroscopy, Lectures on Progress in Modern Optics, and 2 year thesis works, etc.

Studies on Highly Excited States and Rydberg States of Atoms and Molecules, Resonant Multiphoton Ionization Spectroscopy of Aromatic Molecules, Spectroscopy of Rare-earth Ions in Crystals, Spectroscopy Study of Intermolecular Energy Transfer; etc.

4. INTERNATIONAL COOPERATIONS

As a part of the China's open policy, IMO has paid great attention to international cooperations of education in optics. The institute has an extensive academic exchanges and cooperations with universities and research institutions all over the world. All these have benefited a great deal to and given profound and lasting impact on the education in optics here.

From our experience in last decade, there can be many practicable ways that contribute to the international cooperations of education in optics:

- (1). Sending our faculty members abroad. Up to now, more than 45% of the faculties

here at IMO have been abroad as visiting scholars, scientists, and professors for a certain period of time from several months to 2 years. The countries in which they have been include USA, German, Japan and other countries. Besides learning some thing new, they did their own bit in the research projects and/or in the teaching tasks there.

(2). Inviting foreign professors and scientists coming for a visit. Up to now, more than 50 physicists and specialists in optics have visited us. Among them there are, for example, Nobel Prize Winners Prof. C.N.Yang, Prof. T.D.Lee, and Prof. Y.T.Lee, well known specialists of optics Prof. F.T.S.Yu, Prof. H.K.Liu, Prof. L.Huff, Prof. C.Warde, Prof. E.Garmire, Prof. R.A.Lesard, Prof. S.L.Chen, Prof. Tsujiuchi, Prof.T.Minemoto, and many others. From these visitors we have had interesting lectures and short courses, valuable comments and suggestions, and even common ideas on cooperations.

(3). Joint program in advising Ph.D students. This is a more straight way of cooperation in education. Up to now 3 students have been involved in this program. Two students are with Department of Electrical Engineering, Pennsylvania State University, USA, and one is with Department of Physics, Laval University, Canada. They have completed their credits of curriculums and passed for the qualification examination of Ph.D candidate in IMO. According to an agreement, they are then working on their thesis abroad at the cooperative universities and will finally be conferred Ph.D degree jointly afterwards. The students involved in this program are well selected. Therefore, we expect that this joint program will be able to score great successes under the efforts of the two sides involved.

We would like to extend international cooperations of education in optics with more universities and colleagues around the world.

5. CONCLUSION

There has been a proverb that says: " it takes ten years to grow trees, but a hundred years to rear peoples ". Education is a project of vital and lasting importance. Since modern optics is developing so rapidly that there has been an urgent need to improve education in optics. We did a little in this undertakings, but it is far from enough and there is still a long way to go.

To present this paper, we really mean to exchange ideas on all aspects of education in optics with colleagues from around the world at the conference.