



## The APL Education Center

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**I**n collaboration with the Johns Hopkins Whiting School of Engineering, the Laboratory offers graduate programs for professionals in engineering and applied science through the APL Education Center. These programs are designed to meet the needs of engineers and scientists who are employed full time. Class schedules are convenient, and course offerings are highly responsive to the needs of both students and their employers. Since the Center was established in 1964, more than 12,000 master's degrees have been awarded to students completing these programs.

### BACKGROUND

The need for comprehensive education programs is critical to maintaining and enhancing the skills required for carrying out the Laboratory's mission. With the rapid change in technology, staff members must continue their education to stay current in their fields and prepare for future assignments. All high-tech employers face the same challenge and, as part of a world-class university, APL contributes to meeting this challenge by providing graduate technical programs for the public. While education is not the Laboratory's primary role, we are committed to supporting the academic divisions of Johns Hopkins in fulfilling their education mission. The APL Education Center was established in 1964 as the vehicle for providing this support. The need for graduate technical education for its own staff was the Laboratory's primary motivation. However, it was recognized that creating a center that was open to the public would also allow the University to serve the employers of engineers and scientists in the region who shared the same need.

Initially, APL collaborated with the Evening College of JHU; then, after the formation of the Whiting

School of Engineering, the current partnership was created in 1983. The resulting programs are now offered through the Engineering and Applied Science Programs for Professionals (EPP) of the Whiting School. This unique model has proven to be highly successful since it was implemented 40 years ago. Today, EPP graduate enrollments constitute one of the largest such programs in the nation. For a detailed history of the Center and its programs, see Refs. 1–3.

The Center represents more than a location where courses are taught. It encompasses all aspects of APL's collaboration with an academic division for providing advanced education in engineering and applied science—degree programs, courses, faculty, students, facilities, partnerships, and staff support.

### ADVANCED EDUCATION FOR PROFESSIONALS

#### Degree Programs

The Center began by offering a master's degree program in one discipline, Electrical Engineering. Over the

years, additional master's programs were introduced in response to the needs of students and their employers.

- Electrical Engineering, 1964 (now named Electrical and Computer Engineering)
- Numerical Science, 1966 (now named Applied and Computational Mathematics)
- Applied Physics, 1967
- Space Technology, 1967 (discontinued in 1983 because of lack of demand)
- Computer Science, 1971
- Technical Management, 1981
- Engineering and Applied Physics of Biomedicine, 1993 (now named Applied Biomedical Engineering)
- Information Systems and Technology, 1997
- Systems Engineering, 1997 (spin-off from Technical Management)

There are now eight master's degree programs based at the Laboratory. An "APL-based" program is one where management of the program is the responsibility of APL staff members, who are appointed by the Dean of the Whiting School to serve as Program Chair, Vice Chair, and Program Committee members. This team performs the functions that are typically the responsibility of an academic department within the full-time programs of the Whiting School. Most of the APL-based programs were developed by Laboratory staff in recognition of a need for the program, and where APL staff possessed the necessary technical expertise to respond to that need. Articles providing full descriptions of each of these programs are included in this issue of the *Technical Digest*. The eight APL-based EPP master's degree programs for the 2004–2005 academic year were

- Applied Biomedical Engineering
- Applied and Computational Mathematics
- Applied Physics
- Computer Science
- Electrical and Computer Engineering
- Information Systems and Technology
- Systems Engineering
- Technical Management

### Courses

As the number of degree programs increased over the years, the number of course offerings also grew. In the first academic year (1964–1965), the Center offered 12 courses, all related to one degree program as noted above—Electrical Engineering. In academic year 2004–2005, 473 courses were taught in support of the eight APL-based master's degree programs. Most programs offer multiple concentration areas from which students can choose to support their professional growth.

### Faculty

The APL staff who serve as faculty members are the most important factor in the success of the Center. The

Laboratory has a large number of staff members who possess not only technical expertise but also the academic preparation to qualify them as full-time faculty members. Although they have chosen to work in the area of research and development, many have a strong interest in teaching and the talent to be successful at it. These faculty members are ideally suited to serve as instructors in the APL Center. Besides being experts in their fields, they understand the theory and can deliver courses that help students realize the application of the subject for the solution of real-world problems. And they perform this function as an additional responsibility to their regular APL assignments. Currently, about 150 APL staff members serve as instructors. While APL staff compose about 50% of the faculty in the APL-based programs, others are drawn from the Whiting School's full-time faculty, other universities, private industry, and government agencies (Fig. 1).

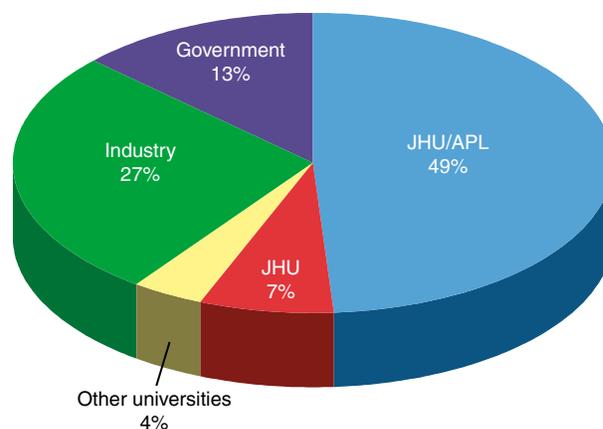
### Students

Students may enroll for a number of reasons, including

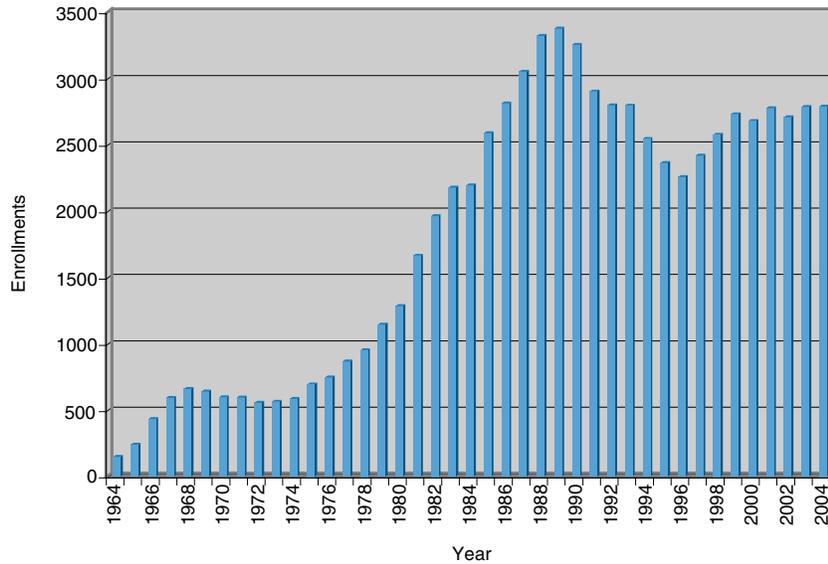
- Advancing their knowledge in their fields of expertise
- Advancing their careers
- Making a career change
- Staying current in their fields

Because these programs are taught at the Laboratory, they are particularly convenient for the APL staff.

Based on their goals, students may seek a master's degree, a graduate certificate, or an advanced certificate for post-master's study. It is not unusual for engineers to first obtain a master's degree in their chosen technical discipline and, as their careers advance, seek a second degree in the field of systems engineering or technical management. In addition, throughout their careers, staff members can enroll in individual courses pertinent to their immediate work assignments.



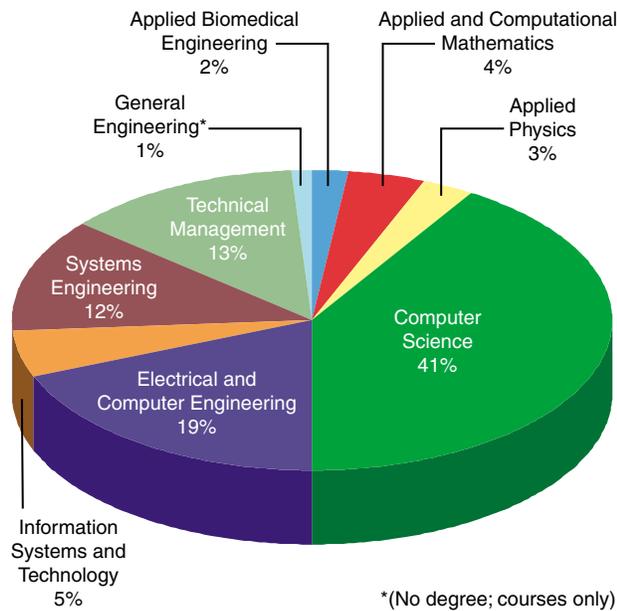
**Figure 1.** Faculty members of the APL-based programs are drawn from a number of sources.



**Figure 2.** Fall semester enrollments from 1964 to 2004.

In the fall of 1964, almost all of the students were APL staff members. However, by the third year, non-APL students outnumbered APL staff. Currently, APL staff constitute less than 10% of the student body at the APL campus. In academic year 2004–2005, for the APL-based programs at all locations, approximately 2000 part-time students made up total course enrollments of 7011 (Figs. 2 and 3).

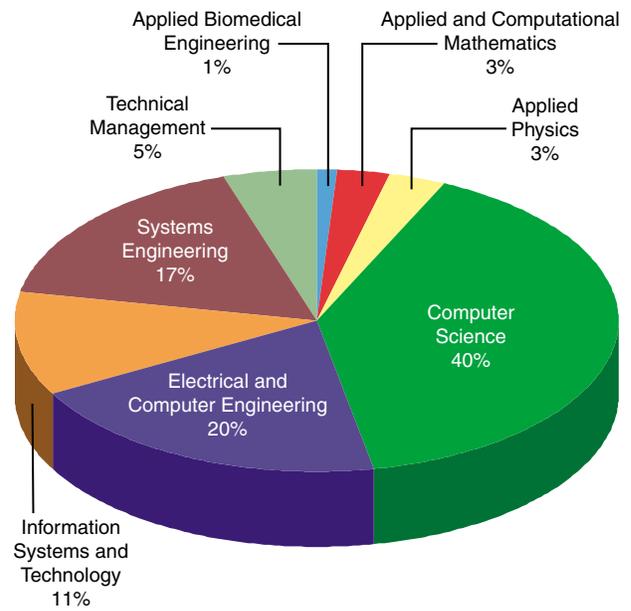
Since the Center opened, 12,223 master’s degrees have been awarded to graduates of the APL-based programs. In addition, 126 graduate certificates and 142 advanced certificates for post-master’s study have been awarded (Fig. 4).



**Figure 3.** Master’s degree program enrollments for the 2004–2005 academic year (total = 7011).

early 1980s increasing enrollments necessitated scheduling classes in conference rooms, as well as in the Barton Room and the cafeteria of Building 1. In 1983 the Kossiakoff Conference and Education Center opened, providing much needed additional classroom space. This facility, which includes a 500-seat auditorium, dining area, and classroom wing, quickly became the hub for the APL Education Center’s programs. The Kossiakoff Center has eight classrooms on the first floor and one additional classroom, an instructional television facility, and several computer laboratories on the second floor.

All of the classrooms on the APL campus have comfortable seating for adult students, chalk or white boards,



**Figure 4.** Master’s degrees awarded for the 2004–2005 academic year (total = 548).

## Facilities

The APL-based EPP programs are offered at several locations in Maryland, although not all programs are available at every location. Programs are selected based on the needs of students and employers at each location. Sites where APL-based programs are available are described below (Fig. 5).

As noted previously, all eight of the Laboratory-based programs are taught at the APL campus. Initially, courses were also offered at the Homewood campus. At APL, classes were originally taught in four classrooms in the lower level of the R. E. Gibson Library. As demand grew, two additional classrooms were added under the Library. By the



**Figure 5.** For the convenience of students and employers, classes are held in a number of locations.

overhead projectors, ceiling-mounted LCD projectors, VCRs, personal computers, and Internet access. Other audiovisual equipment is provided as needed.

The University and the EPP are committed to meeting the needs of practicing engineers and scientists throughout the Baltimore/Washington region. In response to the increasing number of technical companies and government agencies along the I-270 corridor, a JHU Montgomery County Campus (MCC) was established in Rockville in 1986. Five of the APL-based programs are offered at this site: Computer Science,

Electrical and Computer Engineering, Information Systems and Technology, Systems Engineering, and Technical Management. After further growth, the Dorsey Center was opened in 1988 to provide overflow classroom space for the crowded APL campus. It is located near the BWI airport and provides classrooms and a microwave engineering laboratory. In 2002, EPP also established its Student Services operation at this location, which now includes most of the EPP staff.

As a result of the Base Realignment and Closure Act, there was a significant expansion of the Patuxent

Naval Air Station in St. Mary's County. This expansion created a demand for higher education opportunities for employees being relocated to this area. In response, Maryland created the Southern Maryland Higher Education Center (SMHEC) to give colleges and universities the opportunity to offer needed programs. EPP and APL responded to this need by offering programs in 1997. Currently, the Systems Engineering and Technical Management programs are offered at this location.

While EPP also offers programs at the Higher Education and Advanced Technology Center in Harford County and the JHU campus in Washington, DC, no APL-based programs are taught at those locations.

Computer facilities to support students are maintained at each site as needed. Some of these are general-purpose laboratories, whereas others are designed to meet the needs of specific courses. An EPP multi-user facility, located in the Kossiakoff Center, is available to all students and faculty via the JHU network, modem, or Internet. The Kossiakoff Center serves as the hub, with remote facilities at the MCC and SMHEC. EPP maintains instructional television facilities at three sites, which allows courses to be shared, thus expanding the course selection available at locations where enrollments are not as large. All EPP students have access to the University's libraries, including remote access via the Internet. The Gibson Library supports the centers at APL and Dorsey.

**New Ventures**

Over the past 6 years, the EPP has pursued initiatives to expand its reach to working professionals through corporate partnerships and distance education. Corporate partnerships are intended to respond to the specific educational needs of a company or government agency. Since the needs vary, the nature of each partnership is unique. Today, there are 12 partnerships that involve APL-based programs, and they fall into the three categories listed in Table 1.

Most courses taught at the partner's location are delivered in the traditional "live" mode, with EPP faculty traveling to the site. In some cases, video teleconferencing may be used to supplement instruction.

Five years ago, EPP embarked on an experiment to assess the viability of delivering courses in a fully online format. Since then, about 20

online courses have been developed in the APL-based programs of Computer Science, Electrical and Computer Engineering, and Information Systems and Technology. More information about these new ventures appears in other articles in this issue.

**Staff Support**

In addition to the APL staff who serve as Program Chairs, Program Vice Chairs, Program Committee members, faculty, and advisors, there are other roles performed by staff in support of these programs. The first Director of the Center was Dr. Paul Edwards, who was responsible for getting the programs started with the Evening College and nurturing the Center's growth from 1964 to 1981. Dr. Theodore Poehler led the program during the period of transition from the Evening College to the Whiting School of Engineering from 1981 to 1983. Then, from 1983 to 1993, Dr. Samuel Koslov served as Director as the programs thrived under the Whiting School partnership. Since 1993, the author has been the Director. Also, APL staff assigned to the Center provide the administrative talents needed to conduct the operations required to support this educational

**Table 1. Programs available through corporate partnerships.**

Partnerships	Programs
All courses delivered at Hopkins campuses	
Booz-Allen & Hamilton	All programs
Lockheed Martin (Fairfax, VA): Engineering Leadership Development Program (ELDP)	Computer Science Systems Engineering Technical Management
Northrop Grumman	
U.S. Naval Academy: Voluntary Graduate Education Program (VGEP)	All programs
U.S. Naval Test Pilot School	Systems Engineering Technical Management
Some courses delivered at Hopkins campuses and some onsite at partner location	
Lockheed Martin (Rockville/Gaithersburg, MD): ELDP	Computer Science Information Systems and Technology Systems Engineering
All courses delivered onsite at partner location	
BAE Systems (Nashua, NH)	Systems Engineering
Federal government agency (Vienna, VA)	Information Systems and Technology
MITRE Corp. (Bedford, MA)	Systems Engineering
MITRE Corp. (McLean, VA)	Systems Engineering
Naval Air Systems Command (Patuxent River, MD)	Systems Engineering <sup>a</sup>
Naval Sea Systems Command (Crystal City, VA)	Systems Engineering

<sup>a</sup>Noncredit course.

endeavor. Additional staff members serve in a variety of other roles, including guest lecturers, graders, computer system managers, and laboratory assistants.

## CONCLUSION

Two divisions of JHU working in partnership—the Whiting School of Engineering and APL—created a unique model to respond to the educational needs of practicing engineers and scientists. The viability of the model has withstood the test of time and continues to flourish after 40 years. With the advent of the Internet and online education, it has become evident that for this

partnership to continue to fulfill its mission, alternative approaches must be explored and implemented. This process is already under way, and there is every reason to believe that this collaboration will meet the challenge.

## REFERENCES

- <sup>1</sup>Edwards, P. B., "The JHU/APL Evening College Center," *Johns Hopkins APL Tech. Dig.* 1, 297–302 (1980).
- <sup>2</sup>*APL's Role in Education*, special edition, *Johns Hopkins APL Tech. Dig.* 10(2) (1989).
- <sup>3</sup>Farrell, R. A., Pisacane, V. L., Bankman, I. N., Shoukas, A. A., and Sachs, M. B., "Master's Degree Program in Engineering and Applied Physics of Biomedicine," *Johns Hopkins APL Tech. Dig.* 16(4), 397–401 (1995).

## THE AUTHOR

**James L. Teesdale**, a member of the Principal Professional Staff, is the Director of the APL Education Center. He is a graduate of MacMurray College and joined the Laboratory in 1969. He has contributed to APL's internal training and development programs as well as the graduate education programs offered in partnership with the JHU Whiting School of Engineering. He serves on the APL Science and Technology Council and the JHU Committee on Part-Time Education. His e-mail address is jim.teesdale@jhuapl.edu.



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