PROGRAM APPROVAL APPLICATION

NEW or SUBSTANTIAL CHANGE or LOCALLY APPROVED

(This application may not exceed 3 pages)

Fill In Form

Photonics Technology Proposed Program Title	Corine Doughty Voting Member
Irvine Valley College College	Dean, Instruction, Economic & Workforce Development Title
South Orange County Community College District District	949-282-2730 Phone Number
Fall 2016 Projected Program Start Date	cdoughty@ivc.edu E-mail Address

Goal(s) of Program (Check all that apply):

- ☑ Career Technical Education (CTE)
- ☐ Transfer
- ☐ Other

Type of Program (Check all that apply):

- ☑ A.S. Degree
- ☐ A.A. Degree

Certificate of Achievement:

- ☑ 18+ semester (or 27+ quarter) units
- ☐ 12-18 semester (or 18-27 quarter) units

Reason for Approval Request: (Check One)

- ☑ New Program
- ☐ Substantial Change
- ☐ Locally Approved

Program Information

Recommended Taxonomy of Program (TOP) Code	0934.30
Units for Major-Degree	29
Total Units for Degree	60
Required Units-Certificate	18

Written Form

1. Insert the description of the program as it will appear in the catalog.

Program catalog descriptions:

1.A. Certificate of Achievement: Photonics Technology

The IVC Photonics Technology Certificate of Achievement will teach students the hands-on skills necessary to thrive in corporate labs that use or manufacture photonics systems. These courses have a strong emphasis on laboratory work, and hardware demonstrations. Students will gain the applied skills required to succeed in four-year engineering programs, graduate school, and industries, including medicine, remote sensing, manufacturing, telecommunications, and entertainment.

2.A Associate of Science degree: Laser & Photonics Technology

The IVC Lasers & Photonics Technology associate of science program will teach students the skills necessary to gain employment in fields of technology that use or manufacture devices that interact with light. Such devices are ubiquitous in modern society, and students will be taught how these

electronics are fabricated and how they function in hands-on courses with a strong emphasis on laboratories, demonstrations, and real-world examples. Students will gain the applied laboratory skills necessary in four-year engineering programs, graduate school, and industry. Opportunities to network with local industry will be provided as part of this curriculum via company tours and industrial-grade equipment demonstrations. Students enrolled in this program may seek employment as a photonics or electronics technician who designs, tests and services systems with applications in remote sensing, manufacturing, defense, telecommunications, aerospace, medicine, and entertainment.

2. Provide a brief rationale for the program.

The Los Angeles/Orange County Regional Consortia on January 16, 2014 endorsed the Photonics program as both an 18 unit Certificate of Achievement and a 28 unit Associate of Science degree. Due to changes in the CTE Transfer requirements as well as support from the Photonics and Op-Tec advisory members, Irvine Valley College is resubmitting the program as a 21 unit Certificate of Achievement and 29 unit CTE Associate of Science degree.

Irvine Valley College (IVC) was awarded its first National Science Foundation (NSF) grant, a three-year Advanced Technological Education (ATE) award of $190,000 to fund the IVC Photonics Initiative. The primary focus of the Initiative is on preparing students for employment in photonics, a rapidly growing field that covers the science and engineering of devices that interact with light. In addition, instructors are working with the local business and education community, providing on-site demonstrations to increase awareness of the diverse opportunities in the field of photonics.

The courses and program developed at IVC are based on the industry-guided photonics curricula written by OP- TEC, the National Center for Optics and Photonics Education. Prof. Roy McCord and Dr. Brian Monacelli, Co- Principal Investigators of the IVC grant are leading hands-on, laboratory-driven classes utilizing state-of-the-art industrial equipment. The IVC Photonics Initiative team is collaborating with regional companies that manufacture advanced photonics devices or use photonics in engineering applications that range from laser surgery to homeland security. The Initiative is designed to create a career path to employment via internships and industry-guided coursework. The first courses, Introduction to Light and Fundamentals of Photonics, are being taught at IVC's Advanced Technology Education Park in Tustin.

The Photonics program will continue to improve the course content based on industry recommendation. Next year's focus will consist of two additional courses in Optical Sources from Light Bulbs to Lasers and Cameras, Detectors, and Radiometry.

Irvine Valley College The science of light is ubiquitous in modern devices. The demand for technician-level employees is growing. A recent survey conducted by IVC of local optics and photonics companies indicated a need for nearly 600 optics technicians over the next five years.

3. List all courses required for program completion, including core requirements, restricted electives and prerequisites. (Push Enter after each entry to begin a new line)

Certificate of Achievement Photonics Technology

Course No.	Course Title	Units
LET 205	Fundamentals of Light	3 Units
LET 215	Fundamentals of Photonics	3 Units
ET 102	Basic Electricity, DC Circuits	4 Units
LET 225	Quality Assurance for Precision Optics	4 Units
ET 105	Solid-State Circuits I	4 Units
LET 235	Optical System Metrology	3 Units
		21 Units

Associate of Science Degree Lasers & Photonics Technology

Course No.	Course Title	Units
LET 205	Fundamentals of Light	3 Units
LET 215	Fundamentals of Photonics	3 Units
ET 102	Basic Electricity, DC Circuits	4 Units
LET 225	Quality Assurance for Precision Optics	4 Units
ET 105	Solid-State Circuits I	4 Units
LET 235	Optical System Metrology	3 Units
	Complete two of the following courses	
Course No.	**Course Title**	**Units**

ET 99 ET 107 ET 116	Digital Electronics Solid-State Circuits II Industrial Electronics	4 Units 4 Units 4 Units
		29 units

4. Summarize the Labor Market Information and employment outlook (including citation of the source of the data) for students exiting the program.

IVC has established a working relationship with over 50 companies that employ technicians with photonics skills. We estimate that there are over 500 such companies in the Southern California area, 200 of which are commutable to IVC. Local industrial leaders in photonics include Newport Corporation, Northrup Grumman, Raytheon, and LightWorks Optics, as well as established vendors of unique optical elements, such as Precision Optical and Reynard Corporation. There are over 1200 businesses that develop products that use optics in what OP-TEC considers the Western US Region, California, Arizona, Nevada, Oregon, and Washington.

Sources

• Industry Demand for Two-Year College Graduates in Optics and Photonics Technology, An Industry Survey of Current and Future Demand for Two-Year Degreed Photonics Technicians: Summary Report for the National Center for Optics and Photonics Education (OP-TEC)," by Paul Illich, McLennan Community College, and Darrell Hull, University of North Texas, July 2012.

• "Photonics Industry Survey of Southern California and the Western US," unpublished study conducted by IVC staff, summer 2012.

• Career Pathways for STEM Technicians, Dan Hull, OP-TEC, Published by OP-TEC under NSF/DUE Grant 1203500, July 2012.

5. List similar programs at other colleges in the Los Angeles and Orange County Region which may be adversely impacted. (Push Enter after each entry to begin a new line)

College	Program	Who you Contacted	Outcome of Contact
There are no available colleges in CA offering Photonics courses	NA	NA	NA

6. Include any other information you would like to share.

Below is the additional LMI data requested by the Voting Members at the December 2013 Program Approval Meeting:

In 2012, Irvine Valley College (IVC) conducted a web-based survey of the local and Western Regional optics industry to gauge their interest in graduates who were trained to have applied laboratory skills in optical and photonics systems. From a member of each company's technical staff, this survey requested each company's current employment of technicians with photonics-based skills, as well as their projection for hiring photonics technicians in each year from 2012 through 2016. We also requested the range of salaries and the major applications required for this type of work. The LA/OC-area companies who replied to our survey included Newport Corporation, Precision Optical, DRS Technologies, Reynard Corporation, LightWorks Optical Systems, Del Mar Photonics, Nuphoton Technologies, PI (Physik Instrumente), Inrad Optics, Coastline Optics, and Miyachi Unitek Corporation, to highlight a few of the more than 400 companies that work on photonics systems in the area. Major aerospace companies, such as the Raytheon, Boeing, Northrop Grumman, and the Aerospace Corporation, were partially queried, but their feedback was incomplete because their programs span many divisions, and an appropriate member of each divisions' technical staff was not available to take the survey. About 50 of these 400 companies provided a reply to our survey.

At these 50 companies, the current number of employed technicians with photonics skills is 142. In 2013 alone, their projected hiring totaled 20 future employees; in 2014 alone, 29 future technicians were projected, followed by 32 in 2015 and 64 in 2016. The salaries for these positions were typically in the low $40k range, with some advanced technicians earning up to $70k. Manufacturing, imaging and remote sensing, and medical equipment were among the most common applications of their work. Companies often paid or supplemented their current employees' continued education tuition and time. Nearly all survey participants indicated that they were interested to hire skilled photonics technicians, rather than perform as much on-the-job training as they have had to do historically.

The labor market data gathered from our employer survey is consistent with the national data measured by OP-TEC, which indicates that 1,592 additional photonics technicians are needed in the next year, and 4,115 will be needed over the next five years. Their national survey also agreed with our local findings in that employer demand for photonics technicians continues to increase. Furthermore, our findings are consistent with the national data in that the average entry level salary for photonics technicians with two-year degrees is above $40,000--the average entry level salary reported in the national data was $41,137.

IVC Photonics program has partnered with the NSF, OP-TEC, and some of the aforementioned industrial partners to create and review curricula and skill set standards for photonics technicians in an effort to exceed the job skill requirements needed by our local employers