

New Cañada CA Programs

Photonics and Laser Technology (PALT)

Advanced Photonics and Laser Technology



Information for Curriculum Committee, Jan 2021

Dr. Ramki Kalyanaraman, Engineering

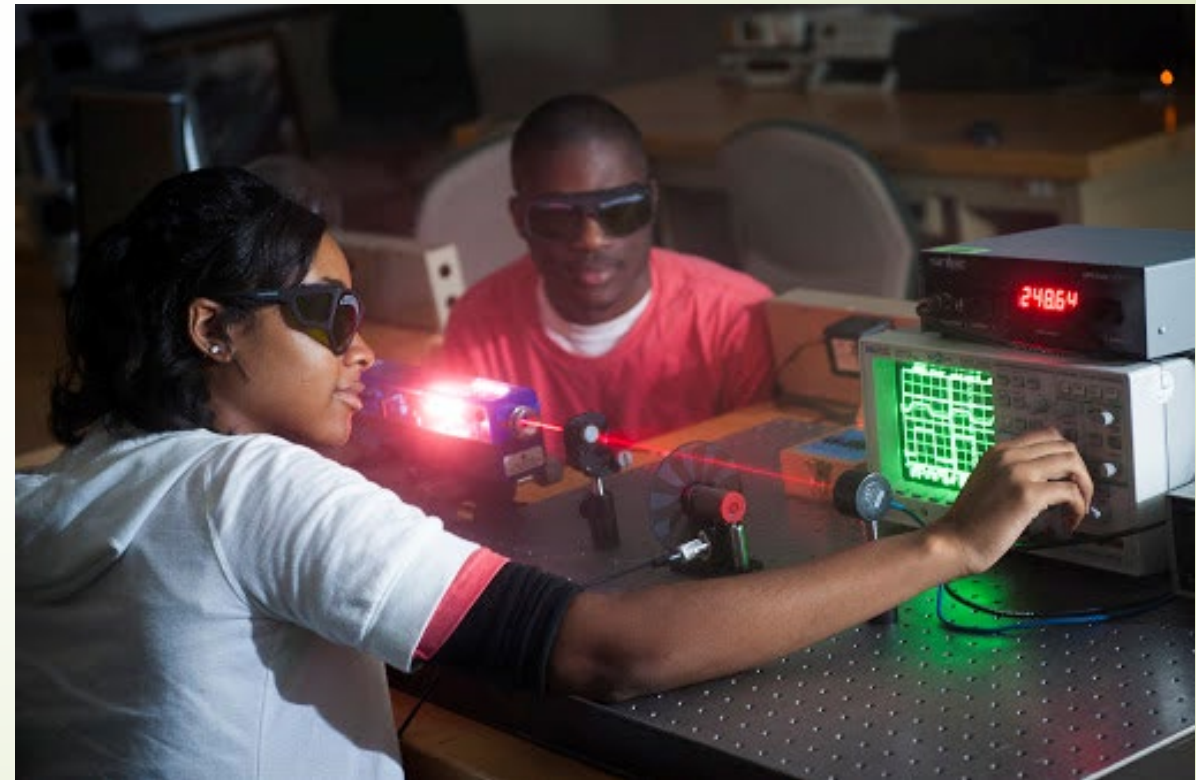


Content

- What is Photonics and Laser Technology (PALT)
- Why this New Program and Why Now?
- Why at Cañada College?
- LMI Data on Advertised Education for Photonics Positions
- LMI Data on Salary
- LMI Data on Outcomes
- Major Student Learning Outcomes and Skills
- Incoming Student Profile
- Program Overview – 2 CA's (Future AS) Top code: 0934.80
- Advisory Board and Program Creation Timeline
- Need for new Discipline Code (PALT)
- Minimum Qualifications for Instructor

What is Photonics and Laser Technology?

- Photonics (and lasers) is/(are) the technology of generating and harnessing light and other forms of radiant energy whose quantum unit is the photon” (The National Center for Optics and Photonics Education, 2019).
 - The applications of photonics and lasers in creating and enabling technologies are extremely broad.
- Aerospace Technology (Lidar..)
- Agriculture (Remote Sensing),
- Biomedicine and Health Care
 - (Laser for surgery..)
- Construction
 - (Scanning site topography)..
- Telecommunication (Fiber optics..)
- Environmental monitoring
- And many others..



Why this New Program and Why Now?

1. Si Valley is global leader in Manufacturing and technology related to Optics, Photonics, and Laser Products
 - ▶ Coherent Optics, Spectra Physics, Northrop Grumman, Cutera, Illumina, Lockheed Martin, SLAC, etc.
 - ▶ There is virtually no product manufactured without critical role of photonics and laser technologies involved in it
2. Significant shortage of Technicians and Engineers
 - ▶ Industry approached Cañada College to Create Program

Exhibit 1: Job ads that require photonics skills, May 2018 – Apr 2019

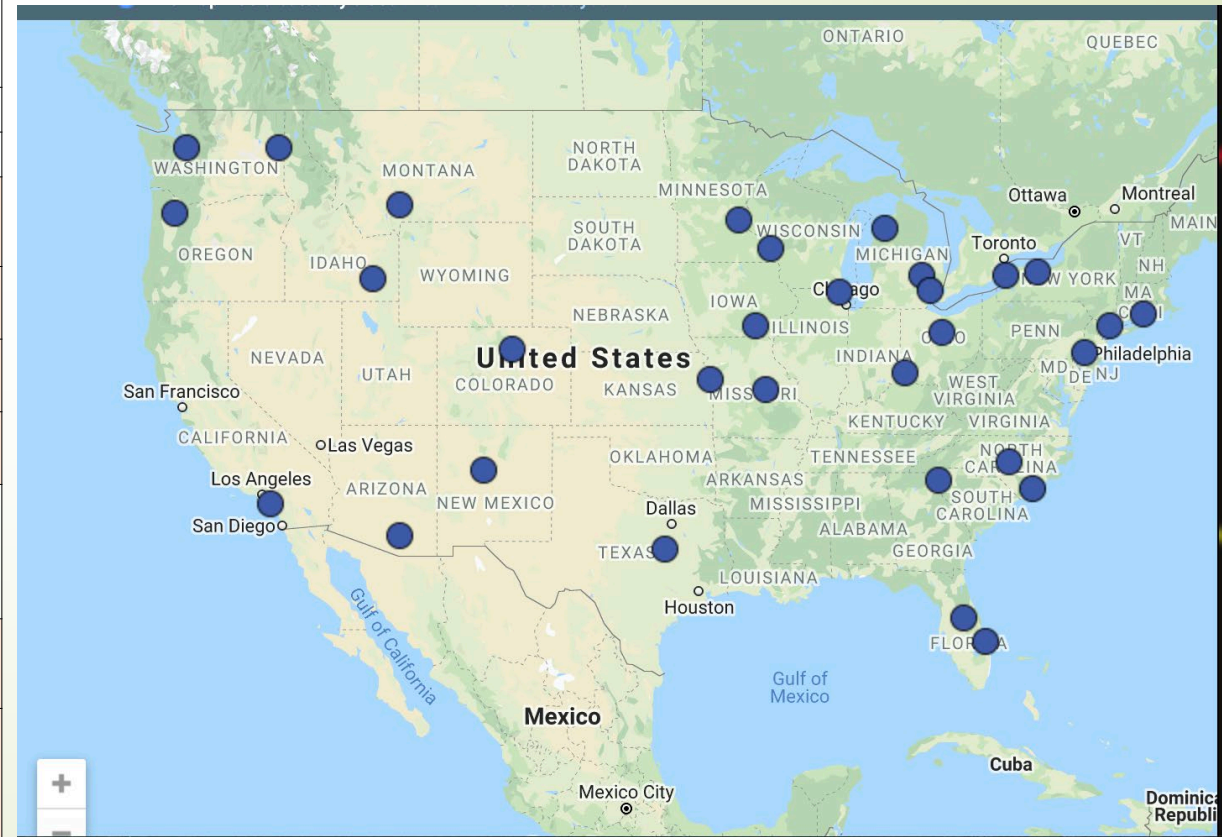
Occupation	Job Ads
Photonics Engineers	172
Photonics Technicians	34
<i>Mechanical Engineering Technicians</i>	5
<i>Manufacturing Production Technicians</i>	4
<i>Painting, Coating, and Decorating Workers</i>	2
<i>Medical and Clinical Laboratory Technicians</i>	1
<i>Electro-Mechanical Technicians</i>	1
Secondary Photonics Occupational Group Total	13

Why at Cañada College?

Exhibit 7: Annual average community college credentials and enrollments for the laser and optical technology program in California
 Source: LaunchBoard, MIS Data Mart, COCI

0934.80 – Laser and Optical Technology	CCC Enrollments, Academic Year 2016-17	CCC Annual Average Credentials, Academic Years 2014-17
<i>Irvine – Photonics Technology</i>	59	
Certificate 18 to < 30 semester units		1
Certificate 6 to < 18 semester units		6
<i>San Jose City – Laser Technology</i>	90	
Associate Degree		1
Certificate 30 to < 60 semester units		1
Certificate 12 to < 18 semester units		7
<i>Victor Valley – Electronics and Computer Technology</i>	17	
Total CCC Enrollments, Academic Year 2016-17	166	
Total Annual Average CCC Credentials, Academic Years 2014-17		16

1. No competing programs in Photonics Technology in proximity
2. Engineering Faculty (Prof. Kalyanaraman) with background and expertise in this area
 - ▶ Also have several Physics Faculty
3. Industry keen on having a program here



LMI Data on Advertised Education for Photonics Positions

Exhibit 5: Minimum advertised education requirements for positions that require photonics skills, May 2018 – Apr 2019

Occupation	Minimum Advertised Education Requirement from Job Ads			
	Number of Job Ads (n=)	High school diploma or vocational training	Associate degree	Bachelor's degree or higher
Photonics Engineers	141	-	-	100%
Photonics Technicians	22	59%	23%	18%
Mechanical Engineering Technicians	5	100%	-	-
Manufacturing Production Technicians	4	100%	-	-

LMI Data on Salary

Exhibit 6: Advertised salary information for positions that require photonics skills, Apr 2018 – Mar 2019

Source: Burning Glass – Labor Insights

Occupation	Real-Time Salary Information				
	Number of job postings	Less than \$35,000	\$35,000 to \$49,999	\$50,000 to \$74,999	> \$75,000
Photonics Engineers	18	5%	11%	17%	67%
Photonics Technicians	14	43%	21%	22%	14%

LMI Data on Outcomes

Exhibit 8: Laser and optical technology program strong workforce outcomes

Source: LaunchBoard

*Data for these metrics is available in Community College Pipeline. All others are available in Strong Program Workforce Metrics.

Strong Workforce Program Metrics: 0934.80 – Laser and Optical Technology Academic Year 2015-16, unless noted otherwise	California Median
Course enrollments (2016-17)	59
Completed 12+ units in one year (2016-17)	20
Economically disadvantaged students* (2016-17)	56%
Employed in the fourth fiscal quarter after exit (completers)	81%
Median annual earnings* (completers)	\$47,213
Job closely related to the field of study (2014-15)	88%
Median change in earnings (all exiters)	51%
Attained a living wage (completers and skills-builders)	83%

Major Student Learning Outcomes and Skills

- ▶ Hands-on skills in safe use, care, and operation of various optical, photonic and laser components.
- ▶ Hands-on skills in building, aligning, and measuring optical systems like microscopes, telescopes, antireflective coatings, ...
- ▶ Application of basic and advanced knowledge of optics and photonics to troubleshooting problems in optical systems.
- ▶ Solving math, science and engineering problems involving optical, photonic, and laser systems
- ▶ Designing of optical components and systems using Industry-standard photonics design software (Zemax, Matlab)
- ▶ Engineering, Design, Technical Writing and Presentation Skills
- ▶ Collaboration and team work



Incoming Student Profile

- No prior Math or Science requirements for Students
- Target population
 1. A student (high-school or college) looking to make a career in a technical field (Certificates)
 2. High-School student looking to explore a technical field (Certificates and eventually AS degree)
 3. Existing labor force worker looking to change technical fields.
 4. Out-of-labor force worker looking to re-enter work force.
 5. Existing technician waiting to up-skill.

Program Overview – 2 CA's (Future AS)

Top code: 0934.80

Stackable
Certificates in
Photonics and Laser
Technology (PALT)

TERM 1

PALT 401- Intro to Photonics and Laser Technology (2 units)
PALT 402 - Geometrical Optics (4 Units)
PALT 403 - Optics and Photonics Modeling and Design (ZEMAX) (3 units)

TERM 2

PALT 404 - Wave Optics (4 Units)
PALT 405 - Introduction to Laser Technology (3 Units)
PALT 406 - Components and Devices in Optics & Photonics (2 Units)

TERM 3

PALT 407 - Optical Coating Technology (3 Units)
PALT 408- Optical Fibers (3 Units)
PALT 409 - Advanced OAPT (3 Units)

CA in PALT **(18 UNITS)**

CA in Advanced PALT **(27 UNITS)**

- Two Certificate of Achievement's
 - PALT (18 units)
 - Advanced PALT (27 units)
- Hands-on training + foundational
- AS Degree in long-term
 - Work with UC/CSU for articulations

Advisory Board and Program Creation Timeline

Spring 2020

Jan 22, 2021

Feb 12, 2021

March 18, 2021

Fall 2021

- ▶ Late Fall/Early Spring 2019 Formation of Advisory Board
 - ▶ Questionnaire conducted
- ▶ Advisory Board Meeting – May/22/2020
 - ▶ Meeting Notes collected and Recorded
- ▶ Program and Curriculum Creation
 - ▶ Jan 2021
- ▶ State Deadline , Feb 12, 2010
- ▶ Regional Approval, March 18, 2021
- ▶ **Tentative Program Launch**
 - ▶ **Fall 2021**

- ▶ External Advisory Board Members
 1. Dr. Norman Hodgson
 - ▶ Coherent Inc.
 - ▶ VP for Technology and Advanced Research
 2. Joann Dean
 - ▶ Ametex
 - ▶ Manager of HR
 3. Dr. Lukas Hunziker
 - ▶ Cutera
 - ▶ Senior VP of R&D
 4. Dr. Marco Krumbuegel
 - ▶ Illumina
 5. Eric Cunningham,
 - ▶ Stanford SLAC

Why Create a new Discipline Code (PALT)

- Proposed discipline code: Photonics and Laser Technology of PALT
- 1. Reflects the Program Accurately
 - Name clearly reflects the technology and subject matter covered in the CA
- 2. Unique but Recognizable
 - Program Name will be unique with respect to existing programs around region, CA, and Country
- 3. Future AS Degree
 - Program name will help with articulations to science and engineering programs
- 4. Marketing Purposes
 - Proposed name will be easier to market

Minimum Qualifications for Instructor

- ▶ There are very few Bachelor's or graduate degrees offered in Optics, Photonics and Laser Technology in US
 - ▶ Currently no directly relevant Discipline and area listed in the CCR (Calif. code of Regulations. and CEC (Cali. edu code)
- ▶ This is an interdisciplinary field: Physics, Engineering
 - ▶ Laser Technology – SJCC – Taught by Physics Ph.D.
- ▶ Eventually we plan to also offer an Associates Degree in PALT
- ▶ Minimum qualification will be similar to Physics
 - ▶ Master's in physics, astronomy or astrophysics
 - ▶ OR
 - ▶ Bachelor's in physics or astronomy {AND} Master's in engineering, mathematics, meteorology or geophysics OR the equivalent.