

All Fields Report

Basic Course Information	
College	Cañada College
Discipline	PALT-Photonics and Laser Technology
Course Number	405
Full Course Title	Introduction to Laser Technology
Catalog Course Description	A hands-on introduction to the principles and technology of lasers including properties of different types of lasers. Topics include: safe use and operation of lasers; principle of producing laser light; techniques to control laser light; applications of laser in various medical, non-medical, defense and entertainment industries.
Class Schedule Course Description	A hands-on introduction to the principles and technology of lasers including properties of different types of lasers. Topics include: safe use and operation of lasers; principle of producing laser light; techniques to control laser light; applications of laser in various medical, non-medical, defense and entertainment industries.
Proposal Information	
Proposed Start	Year: 2021 Semester: Fall
Proposed Curriculum Committee Meeting Date:	01/22/2021
Deadline for submission to Dean's Queue:	12/17/2020
Deadline for submission of curriculum proposal to the Technical Review Committee:	12/29/2020
Proposal Origination Date:	10/13/2020
Justification For Board Report OR Curriculum Inventory update:	<p>1. For NEW Courses: Provide a brief justification statement describing the need for the course, its place in the curriculum, and pertinent information such as the role of advisory committees. New courses require approval of the SMCCCD Board of Trustees. The justification statement will be included on the annual Curricular Board report. Use complete sentences and present tense.</p> <p>2. For all types of Course MODIFICATIONS (modifications, banking, deletions and reactivations): Provide a brief justification statement describing the need for the change. The justification statement will be used for course updates in the State Curriculum Inventory as necessary. Use complete sentences and present tense.</p> <p>The course content is recommended by the Advisory Board. It provides students with necessary hands-on skills to safely, assemble, align and analyze lasers. This course is a core requirement for the Certificate of Achievements in Photonics and Laser Technology and in Advanced Photonics and Laser Technology.</p>
Honors Course	No
Open Entry/Open Exit	No 0

Equivalent Courses	
Will this course replace an existing course in the catalog, or an experimental course?	No
If yes, identify and explain.	

Similar Courses

Is there a similar or equivalent course in SMCCCD?	No
Added Similar Courses	

Units/Hours

Unit Types	Fixed			
Units	Min: 3.00			
Variable Range	Range (or)			
Hours				
Please enter hours as per term values				
Method	Min Hours	Max Hours	Min Faculty Load	Min Units
Lecture	32.00	36.00	2.00	2.00
Lab	48.00	54.00	2.40	1.00
TBA	0.00	0.00	0.00	0.00
Work Experience	0.00	0.00	0.00	0.00
Field Experience	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00
Homework	64.00	72.00	0.00	0.00
Other Hours				
Course Details				
Repeatable for Credit	No			
Grading Methods	Letter Grade Only			
Audit	Yes			

Materials Fee

Fee Required?	No
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Student Learning Outcomes

Upon successful completion of this course, a student will meet the following outcomes:
1. Demonstrate the safe use and operation of lasers.
2. Demonstrate the principles of lasers by solving analytical and numerical problems involving laser use and applications.
3. Demonstrate ability to make measurements of laser light properties.
4. Demonstrate ability to assemble, align, measure, and analyze a laser system.
5. Show the ability to work in teams to gather and analyze data and prepare technical reports describing experimental work.
6. Work independently to prepare and deliver presentations of their laboratory findings through use of presentation software (like libreoffice impress or powerpoint).

Course Objectives

Upon successful completion of this course, a student will be able to:
1. Safely use and operate lasers
2. Describe the basic properties of laser light

3. Describe the principle of laser operation
4. Identify the different types of lasers
5. Perform measurements of laser light
6. Modify/Improve the performance of a laser

Course Lecture Content

1. Overview of laser technology
 - a. Applications and uses of lasers
2. Laser Principles
 - a. Atomic energy levels
 - b. Spontaneous and stimulated emission
 - c. Population inversion
 - d. Pumping mechanisms
 - e. Gain, and Calculation of Output Power
3. Laser Resonators and Modes
 - a. Gain and loss
 - b. Oscillator-amplifiers
 - c. Unstable Resonators
 - d. Laser mirrors
 - e. Spatial energy distribution
 - f. Beam propagation
 - g. Stability criterion
 - h. Longitudinal Modes
4. Laser Types and their Performance
 - a. Semiconductor lasers
 - i. Diode lasers
 - ii. VCSELS
 - iii. Quantum Cascade Lasers
 - b. Gas lasers
 - i. HeNe, Ion lasers
 - ii. CO₂

c. Eximer lasers

- i. KrF, ArF, XeF

d. Solid state lasers

- i. Diode-pumped solid state
- ii. Lamp pumped lasers (Nd:YAG, ND:YVO4)

e. Fiber Lasers

- i. Yb:Er:Glass

f. Tunable, ultrafast, and Dye lasers

- i. Ti-Sapphire

5. Pulsed Laser Operation

a. Q-switching

b. Modelocking

6. Measurement of Ultrashort Pulses

a. Autocorrelation Techniques to measure Ultrashort Pulses

Course Lab Content

1. Measuring Laser Output Characteristics

- a. Use proper safety procedures related to lasers (e.g. Hene or Diode).
- b. Inspect a laser.
- c. Operate a power meter.
- d. Measure the beam power of a laser.
- e. Measure the focused beam power of a laser.
- f. Measure the beam profile of a laser.
- g. Measure the divergence of a laser beam.
- h. Measure the divergence of a laser beam at a focal point.

2. Operation and Characterization of a Q-switched YAG Laser

- a. Using proper laser-safety practices when operating Class 4 IR lasers
- b. Set up, run, and characterize an Nd:YAG or similar laser.
- c. Set up, run, and characterize a frequency doubled Nd:YAG laser

- d. Setup, run and characterize a Q-switched Nd:YAG laser.
3. Build and characterize end-pumped solid state laser
- a. Diode pumped solid state kit-on-rail system assembly
 - b. Harmonic generation
 - c. CW and Q-switching

TBA Hours Content

Frequently Recommended Preparation	
Frequently Recommended	
Justification for Frequently Recommended Preparation	
<p>Why is the knowledge of the recommended course(s), skill(s) or information necessary for students to succeed in the "target" course? Specify the relationship between the recommended knowledge and skills required of students and those taught in the "target course? (Please list the specific proficiencies students must possess in order to succeed in the "target" course.)</p>	
Other Recommended Preparation	
<i>You have no defined requisites.</i>	

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