

All Fields Report

Basic Course Information	
College	Cañada College
Discipline	PALT-Photonics and Laser Technology
Course Number	402
Full Course Title	Geometrical Optics
Catalog Course Description	A hands-on introduction to geometrical optics that deals with image formation by considering light as rays. Topics Include: concepts of reflection, refraction, transmission, and dispersion; the interaction of light rays with optical elements like mirrors, lenses, prisms, and stops; image formation characteristics, aberration, and optical design using ray tracing and matrix methods; description of common optical systems like cameras and telescopes.
Class Schedule Course Description	A hands-on introduction to geometrical optics that deals with image formation by considering light as rays. Topics Include: concepts of reflection, refraction, transmission, and dispersion; the interaction of light rays with optical elements like mirrors, lenses, prisms, and stops; image formation characteristics, aberration, and optical design using ray tracing and matrix methods; description of common optical systems like cameras and telescopes.
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 assemble, align and analyze optical systems based on principles of light rays. PALT 402 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 No

existing course in the catalog, or an experimental course?	
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: 4.00			
Variable Range	Range (or)			
Hours				
Please enter hours as per term values				
Method	Min Hours	Max Hours	Min Faculty Load	Min Units
Lecture	48.00	54.00	3.00	3.00
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	96.00	108.00	0.00	0.00
Other Hours				
Course Details				
Repeatable for Credit	No			
Grading Methods	Letter Grade Only			
Audit	Yes			

Materials Fee	
Fee Required?	No

Student Learning Outcomes	
Upon successful completion of this course, a student will meet the following outcomes:	
1. Demonstrate the principles of ray optics by solving analytical and numerical problems involving common optical elements like mirrors, lenses and prisms.	
2. Utilize matrix methods (for example, with popular computational tools like Matlab or Octave) to model the interaction of light rays with optical devices.	
3. Demonstrate ability to make measurements of ray-like optical properties.	
4. Demonstrate ability to assemble, align, measure, and analyze an optical 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. Apply the laws of reflection and refraction
2. Apply dispersion principles to describe light interaction with optical elements like prisms
3. Apply lens equations to explain the image formation from one lens or a combination of lenses
4. Explain the applications of apertures and field stops
5. Use matrix methods to describe lens and mirror systems
6. Understand deviations from ideal behavior such as aberrations, coma and astigmatism
7. Explain the behavior of a common imaging and focusing system like a telescope
8. Perform lens-rail alignment of optical elements
9. Measure the Brewster angle to determine refractive index
10. Perform spectral analysis of white light using a prism
11. Create and measure imaging from telescopic systems

Course Lecture Content

1. Light Propagation

- a. Scattering
- b. Transmission
- c. Reflection
- d. Laws of Reflection
- e. Refraction
- f. Laws of Refraction
- g. Fermat's principle
- h. Fresnel Equations
- i. Total internal reflection
- j. Dispersion
- k. The dispersion (Sellmeier) equation

2. Thin Lenses

- a. Thin lens Equation
- b. Focal Points and Planes
- c. Magnification
- d. Thin lens combination

3. Stops

- a. Aperture and field stops

b. Entrance and Exit Pupils

c. F-number

4. Mirrors

a. Planar Mirror

b. Aspherical Mirror

c. Spherical Mirror

d. Mirror formula

5. Prisms

a. Dispersing Prism

b. Reflecting Prism

6. Optical Systems

a. Eyes and Eyeglasses

b. Microscope

c. Camera

d. Telescope

i. Refracting

ii. Reflecting

7. Thick lens and lens systems

a. Principle plane and cardinal points

8. Analytical Ray tracing

a. Matrix Methods

9. Aberrations

a. Monochromatic Aberrations

b. Spherical Aberrations

c. Coma

d. Astigmatism

e. Chromatic Aberrations

Course Lab Content

<ol style="list-style-type: none"> 1. Working with optical systems <ol style="list-style-type: none"> 1. Introduction to optical systems 2. Handling of optical elements 3. Alignment of optical elements. 4. Safe use and handling of optical elements. 2. Reflection and refraction <ol style="list-style-type: none"> 1. Laws of reflection 2. Laws of refraction 3. Transmission through Prisms 4. Dispersion by prisms 5. Minimum deviation angle in prisms 6. Retro-reflectors 7. Total internal reflection 8. Attenuated total internal reflection. 3. Thin lens <ol style="list-style-type: none"> 1. Imaging with combination of thin lenses 2. Thin lens equation 4. Imaging <ol style="list-style-type: none"> 1. Image magnification and resolution 5. Geometrical Aberrations <ol style="list-style-type: none"> 1. Correction of aberrations 6. Photodetectors and computer data acquisition 7. Image formation in common optical systems <ol style="list-style-type: none"> 1. Optical microscope, magnification and resolution limits 2. Optical telescope, magnification and resolution limits
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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>	

Prerequisites/Corequisites		
Drag and Drop to Reorder		
Edit/Delete	Requisites	Analysis
	<p>Prerequisite Completion of, or concurrent enrollment in</p>	
	<p>Prerequisite PALT 401</p>	

Content Review

PALT 401 - Corequisite
(Objective to Objective)
Launched

Mode of Delivery

Modes of Delivery

Hybrid
Lecture
Lab

Representative Instructional Methods

Methods	Lecture Lab Experiments Guest Speakers Other (Specify)
Other Methods	The course will be supplemented by technology and by video and/or Web-based content as appropriate.

Representative Assignments

Writing Assignments

(List all assignments, including library assignments. Outside assignments are not required for lab-only courses, although they can be given.)

1. Weekly analysis of geometrical optical systems (1-3 pages in length).
2. Weekly Laboratory report (5-10 pages) for each laboratory experiment summarizing objectives, procedures, results and conclusions
3. Monthly formal laboratory report ((10-20 pages) following engineering technical writing guidelines.

Reading Assignments

(List all assignments, including library assignments. Outside assignments are not required for lab-only courses, although they can be given.)

1. Weekly textbook readings (50 pages).
2. Weekly Reading of laboratory handouts (2-20 pages)
3. Monthly Reading of technical articles in photonics and laser technology topics (2-6 pages)

Other Outside Assignments

(List all assignments, including library assignments. Outside assignments are not required for lab-only courses, although they can be given.)

- Out of class assignments will be in keeping with the goals and objectives of the course. The use of critical thinking is required for the students to apply the principles of optics to optical system design. Students are expected to complete a minimum of two hours of outside assignments for each hour of classroom lecture.

To be Arranged Assignments

(List all assignments, including library assignments. Outside assignments are not required for lab-only courses, although they can be given.)

- Not applicable

Representative Methods of Evaluation

This section defines the ways students will demonstrate that they have met the student learning outcomes.

Student grades will be based on multiple measures of student performance. Instructors will develop appropriate classroom assessment methods and procedures for calculating student grades, including the final semester grade. The following list displays typical assessment methods appropriate for this course. The actual assessment methods used in a particular classroom and section will be listed in the instructor's syllabus.

Methods must effectively evaluate critical thinking. Credit courses must include written communication, problem solving, and/or skills demonstrations.

Multiple measures may include, but are not limited to, the following:

Methods

- Class Participation
- Class Performance
- Exams/Tests
- Homework
- Lab Activities
- Oral Presentation
- Quizzes
- Written examination

Representative Texts

Textbooks such as the following are appropriate:

Formatting Style

APA

Textbooks

1. Hecht, E.. *Optics*, 5 ed. Pearson, 2016
2. Schwartz, S.. *Geometrical and Visual Optics*, 3 ed. Mcgraw-Hill, 2019

Manuals

You have no manuals defined.

Periodicals

You have no periodicals defined.

Software

You have no software defined.

Other

You have no other defined.

Degree/Certificate Applicability

Designation	Degree Credit
Proposed For	Certificate/Skill Award
Course Designation Text	Are there degrees/certificates to which this course applies? 1. CA in Photonics and Laser Technology 2. CA in Advanced Photonics and Laser Technology

General Education/Degree/Transfer Course

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By Ramki Kalyanaraman

CSU Transfer Course

Transfers to CSU Approved

Course Distance Education

Distance Ed Supplement	New distance education supplement
Distance Education	Distance education component was developed by an instructor with training in online pedagogy. Training: QOTL or equivalent Course at Canada College
Method of Distance Education	Online, Hybrid, Web Assisted Course; (If there are limitations on how this course would be offered please explain below)
Online Method Limitations	Will require students to access lab facilities on campus
Other Methods	
Course Content and Methodology	The objectives and content of the course are adequately covered by the methods of instruction, assignments, evaluation of student outcomes, and instructional materials.
Instructional Methodologies (How will you deliver the course content?):	Announcements/Bulletin Boards E-mail One-Way Video Conferencing (One-way interactive video and two-way interactive audio) Online Presentations Two-Way Video conferencing (Two-way interactive video and audio)
Representative Courseware/Textbooks Materials:	Possible textbooks include: Schwartz, S.. Geometrical and Visual Optics, 3 ed.Mcgraw-Hill, 2019 Hecht, E.. Optics, 5 ed.Pearson, 2016
Methods of Evaluation of Student Performance:	Multiple types of formative and summative assessments will be used 1. Bi-weekly assessment of laboratory reports that will be submitted online 2. Weekly assessment of homework assignments that will be submitted online
How are you ensuring that students with disabilities can access your course in accordance with Section 508?	Instructional materials have been tagged to indicate organizational structure and reading order. Images, tables and/or diagrams include textual representations. If applicable, the instructor will ask the publisher or content provider to provide a Voluntary Product Accessibility Template (VPAT) which evaluates how accessible the product is according to section 508 standards.

Plan for Regular Effective Communication Contact Between Faculty and Student (Title 5, 55204). "Local policies should establish and monitor minimum standards of regular effective contact."

Announcements/Bulletin Boards - Periodic announcements information students of upcoming tests, changes in schedule or other STEM related opportunities.

Email Communication - Response by email within 24-48 hours

Office hours - Weekly office hours held via video or phone call

Other (explain) - Twice a week interaction through content provided via the Canvas on-line CMS - weekly emails

Resources Needed

Adequate Library Resources	Consultation with the Coordinator of Library Services regarding the adequacy of campus and online information resources to fulfill course objectives is required prior to course approval. Inadequate to support the course Please Specify:
Affected Resources	Which of the following resources do you expect to be affected by the offering of this class? Check as many as appropriate. New equipment needs
Explain what effect the areas you have checked will have upon this college:	

Comparable Transfer Course Information

Are there comparable courses? No

Minimum Qualification

No Minimum Qualifications For this Course

CB Codes

CB03 TOP Code	0934.80 - Laser and Optical Technol
CB04 Course Credit Status	D - Credit - Degree Applicable
CB05 Course Transfer Status	B = Transferable to CSU only
CB08 Course Basic Skill Status (PBS Status)	2N = Course is not a basic skills course.
CB09 SAM Code	D - Possible Occupational
CB11 California Classification Codes	Y - Credit Course
CB21 Levels Below Transfer	Y = Not Applicable
CB23 Funding Agency Category	A = Fully Economic Development funds
CB25 Course General	Y - Not Applicable

Education Status	
CB26 Course Support Course Status	N - Course is not a support course

Codes/Dates

Entry of Special Dates

Instruction Office Review	01/22/2021
Last Outline Revision	
Content Review	01/22/2021
CC Approval	01/22/2021
DE Approval	01/22/2021
Effective Term	Term: Fall Year: 2021

Web Catalog

Course Family	
Web Catalog	<input type="checkbox"/> Exclude from Web Catalog

Instructional Services

Implementation Date	
Originator	Ramki Kalyanaraman
Origination Date	10/13/2020
Proposal Type	Cañada New Course
C-ID Numbers	
CB00 State ID	
CB03 TOP Code	0934.80 - Laser and Optical Technol
CB04 Course Credit Status	D - Credit - Degree Applicable
CB05 Course Transfer Status	B = Transferable to CSU only
CB08 Course Basic Skill Status (PBS Status)	2N = Course is not a basic skills course.
CB09 SAM Code	D - Possible Occupational
CB10 Course COOP Work Exp-ED	N = Not part of Coop Work Exp
CB11 California Classification Codes	Y - Credit Course
CB13-Special Class Status	N - Not Special
CB21 Levels Below Transfer	Y = Not Applicable
CB22 Non Credit Course Category	Y - Not Applicable
CB23 Funding Agency Category	A = Fully Economic Development funds
CB24-Program Course Status	1 = Program Applicable
CB25 Course General Education Status	Y - Not Applicable
CB26 Course Support Course Status	N - Course is not a support course

Web Catalog Metadata