# All Fields Report

| Basic Course Information | |
|---|---|
| **College** | Cañada College |
| **Discipline** | PALT-Photonics and Laser Technology |
| **Course Number** | 407 |
| **Full Course Title** | Optical Coating Technology |
| **Catalog Course Description** | A hands-on review to optical coating technology. Topics include: matrix methods in coating analysis and design; Thin film coatings; coatings in color applications; coating production techniques; safe use and handling of coatings; measurement and modeling of coating performance. |
| **Class Schedule Course Description** | A hands-on review to optical coating technology. Topics include: matrix methods in coating analysis and design; Thin film coatings; coatings in color applications; coating production techniques; safe use and handling of coatings; measurement and modeling of coating performance. |
| **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:** | 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.<br><br>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.<br><br>The course content is recommended by the Advisory Board. It provides students with the necessary hands-on skills to safely use and operate optical components containing coatings. This course is a core requirement for the Certificate of Achievement in Advanced Photonics and Laser Technology. |
| **Honors Course** | No |
| **Open Entry/Open Exit** | No<br>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 |

## Student Learning Outcomes

Upon successful completion of this course, a student will meet the following outcomes:

1. Use matrix methods as a computational tool to solve problems in coating technology.
2. Apply principles of coating technology to design and analyze coatings.
3. Demonstrate the ability to work in teams to gather and analyze data and prepare technical reports describing experimental work.
4. Work independently to prepare and deliver presentations of design projects 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 matrix methods to find the optical transmission through single or multilayer coatings
2. Understand coating design to achieve desire reflection and transmission in single or broadband applications
3. Explain applications of coatings to achieve color
4. Describe technologies to fabricate thin film coatings

5. Learn to safely handle and use coatings
6. Measure the properties of coatings

## Course Lecture Content

1. Applications of Coatings in Optical Systems
    1. Multilayer interference devices
    2. Antireflection Coatings
    3. Spectral filtering and narrowband rejection
    4. Filters with broad spectral bandwidth
    5. Bandpasses
    6. Reflectors
    7. Beamdividers
2. Fundamentals of Optical Coatings
    1. Reflection and transmission at an interface
    2. Phase shift on reflection
    3. Properties of a multilayer
    4. Design concepts for non-normal incidence
3. Matrix methods in coating analysis and design
    1. Design and modeling of single and multilayer reflectors and bandpass filters
4. Thin film coatings
    1. Single layer
    2. Quarter-wave AR coating,
    3. Multi-layer coatings,
    4. High Reflectivity coatings
    5. Broadband coatings
5. Coatings in color applications
    1. Coating designs used in color applications
    2. Coatings for lighting, display, anti-counterfeiting and iridescent pigments
    3. Coatings for color targets, sunglasses, architectural structures.
    4. Color spaces and color difference formulas.
6. Coating production techniques
    1. Review of various methods for producing optical films
    2. Thin film structure
    3. Optical and physical thickness monitoring techniques
    4. Uniformity, and process control.
    5. Review of thin film deposition
    6. Vacuum environment
    7. Components of a deposition system including evaporation sources, assist sources, and optical/physical thickness monitoring.
7. Thin film techniques
    1. e-beam, IBS, magnetron sputtering
    2. Coating machines
8. Safe use and handling of Coatings.
    1. Laser Induced Damage Threshold of Coatings, ISO standard

## Course Lab Content

1. Measurement of coating characteristics
    1. Reflectance and Transmittance
    2. Absorption and Loss

3. Angle, polarization and wavelength dependence
2. Single-layer Thin film optical coating
    1. Determination of thickness of coatings
    2. Determination of transmission and reflection coefficients
3. Multilayer thin film coatings
    1. Determination of optical band gap
    2. Determination of refractive index
4. Optical Filters
    1. Determine power transmission through different color filters
    2. Calculate transmission through filter sets
    3. Calculate optical density of various filters
5. Design and analysis of coatings
    1. Computational design of coatings
    2. Computational analysis of coatings
    3. Comparison of theory versus experimental behavior or coatings
6. Measurement of spectral transmission of coated substrates
    1. Spectrometer based measurements
    2. Computations of spectral transmission
    3. Comparison of theory to experiment

## TBA Hours Content

## Frequently Recommended Preparation

| **Frequently Recommended** | |
|---|---|

## Justification for Frequently Recommended Preparation

**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.)**

## Other Recommended Preparation

*You have no defined requisites.*

## Prerequisites/Corequisites

**Drag and Drop to Reorder**

| Edit/Delete | Requisites | Analysis |
|---|---|---|
| | **Prerequisite**<br>PALT 404 | |

## Content Review

PALT 404 - Prerequisite
(Objective to Objective)
*Launched*

## Mode of Delivery

| **Modes of Delivery** |
|---|
| Online |

Hybrid
Lecture
Lab

| Representative Instructional Methods | |
|---|---|
| **Methods** | Lecture<br>Lab<br>Experiments<br>Guest Speakers<br>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 report of design, modeling and analysis of optical coating 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 or handout readings (20 pages).
2. Monthly Reading of laboratory handouts (2-20 pages)
3. Monthly Reading of tecnical articles in coating 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** | • Exams/Tests<br>• Homework<br>• Lab Activities<br>• Oral Presentation<br>• Quizzes<br>• Written examination |

## Representative Texts

Textbooks such as the following are appropriate:

| | |
|---|---|
| **Formatting Style** | APA |

**Textbooks**

| | |
|---|---|
| | 1. Baumeister, P.. *Optical Coating Technology*, ed. SPIE – The International Society for Optical Engineering, 2016 |

**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? CA in Advanced Photonics and Laser Technology |

| General Education/Degree/Transfer Course | |
|---|---|
| Page Last Saved on Friday, Oct 30, 2020 at 2:55 PM<br>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.<br>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<br>E-mail<br>One-Way Video Conferencing (One-way interactive video and two-way interactive audio)<br>Online Presentations<br>Resource Links<br>Two-Way Video conferencing (Two-way interactive video and audio) |
| **Representative Courseware/Textbooks Materials:** | |
| **Methods of Evaluation of Student Performance:** | Multiple types of formative and summative assessments will be used 1. Monthly 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** - Communication will occur at least two times a week. This will include course content as well as information on homework, labs, quizzes and tests. In addition, STEM related opportunities will also be announced at least once a month. |
| **Email Communication** - Response by email within 24-48 hours |
| **Office hours** - Weekly office hours held via video or phone call |
| **Other (explain)** - One ore more lesson content will be delivered each week by the online learning management platform |

| Resources Needed | |
|---|---|

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|---|---|
| **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<br>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.<br>New equipment needs |
| **Explain what effect the areas you have checked will have upon this college:** | |

## Comparable Transfer Course Information

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|---|---|
| **Are there comparable courses?** | Yes |
| **Edit/Del** | **College Info** |

## Minimum Qualification

No Minimum Qualifications For this Course

## CB Codes

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|---|---|
| **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** | B - Advance 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 Education Status** | Y - Not Applicable |
| **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

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|---|---|
| **Course Family** | |
| **Web Catalog** | ☐ 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** | B - Advance 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