Course Number and Title: LAS 271 Introduction to Lasers

Campus Location:
Stanton

Effective Date:
2022-52

Prerequisite:
(MAT 193 or higher), (PHY 205 and PHY 281)

Co-Requisites:
None

Course Credits and Hours:
4.00 credits
3.00 lecture hours/week
2.00 lab hours/week

Course Description:
This laboratory-based laser course will include elements and operation of lasers and optical power meters, laser safety, properties of laser light, emission and absorption, lasing action, optical cavities, temporal and spatial characteristics, He-Ne case study, and laser classification and characteristics.

Required Text(s):
Obtain current textbook information by viewing the campus bookstore - https://www.dtcc.edu/bookstores online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:
None

Schedule Type:
Classroom Course

Disclaimer:
None

Core Course Performance Objectives (CCPOs):

1. Solve problems involving elements and operation of a laser. (CCC 2, 6, PGC 1)
2. Solve problems involving elements and operation of an optical power meter. (CCC 2, 6, PGC 1)
3. Solve problems involving laser safety. (CCC 2, 6, PGC 1, 2, 3)
4. Solve problems involving properties of light. (CCC 2, 6, PGC 2)
5. Solve problems involving emission and absorption of light. (CCC 2, 6, PGC 1)
6. Solve problems involving lasing action. (CCC 2, 6, PGC 1, 2)
7. Solve problems involving optical cavities and modes of oscillation. (CCC 2, 6, PGC 1, 2)
8. Solve problems involving temporal characteristics of lasers. (CCC 2, 6, PGC 1, 2)
9. Solve problems involving spatial characteristics of lasers. (CCC 2, 6, PGC 1, 2)
10. Solve problems involving a He-Ne laser case study. (CCC 2, 6, PGC 1, 2)
11. Solve problems involving laser classifications. (CCC 2, 6, PGC 2)
12. Investigate and solve problems using experimental techniques. (CCC 1, 2, 3, 6, PGC 1, 2, 3)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):
Upon completion of this course, the student will:

1. Solve problems involving elements and operation of a laser.
    1. Solve problems involving the lasing process.
    2. Solve problems involving the four basic elements of a laser.
2. Solve problems involving elements and operation of an optical power meter.
    1. Solve problems involving the basic components of an optical power meter.
    2. Solve problems involving the use of an optical power meter.
3. Solve problems involving laser safety.
    1. Solve problems involving the detrimental effects lasers have on the eye.
    2. Solve problems involving the various laser safety classifications.
    3. Solve problems involving safety precautions.
4. Solve problems involving properties of light.
    1. Solve problems involving composition and operation of AR coatings.
    2. Solve problems involving composition and operation of HR coatings.
5. Solve problems involving emission and absorption of light.
    1. Solve problems involving spontaneous stimulation emission, stimulated emission, and absorption.
    2. Solve problems involving Doppler broadening.
6. Solve problems involving lasing action.
    1. Solve problems involving population inversion and meta-stable states.
    2. Solve problems involving transmission/absorption.
    3. Solve problems involving optical density.
7. Solve problems involving optical cavities and modes of oscillation.
    1. Solve problems involving loop gain and output power.
    2. Solve problems involving cavity length and bandwidth.
8. Solve problems involving temporal characteristics of lasers.
    1. Solve problems involving pulsed lasers.
    2. Solve problems involving Q-switched and mode-locked lasers.
    3. Solve problems involving coherence length.
    4. Solve problems involving laser beam output parameters.
9. Solve problems involving spatial characteristics of lasers.
    1. Solve problems involving TEM modes.
    2. Solve problems involving beam profiles.
    3. Solve problems involving laser beam output parameters.
10. Solve problems involving a He-Ne laser case study.
    1. Solve problems involving the specific operation of this laser.
    2. Solve problems involving its beam output parameters.
11. Solve problems involving laser classifications.
    1. Solve problems involving gas lasers.
    2. Solve problems involving solid-state lasers.
    3. Solve problems involving semiconductor lasers.
12. Investigate and solve problems using experimental techniques.
    1. Investigate and solve problems involving elements and operation of a laser.
    2. Investigate and solve problems involving elements and operation of an optical power meter.
    3. Investigate and solve problems involving laser safety.
    4. Investigate and solve problems involving properties of light.
    5. Investigate and solve problems involving emission and absorption of light.
    6. Investigate and solve problems involving lasing action.
    7. Investigate and solve problems involving optical cavities and modes of oscillation.
    8. Investigate and solve problems involving temporal characteristics of lasers.
    9. Investigate and solve problems involving spatial characteristics of lasers.
    10. Investigate and solve problems involving a He-Ne laser case study.

Evaluation Criteria/Policies:
The grade will be determined using the Delaware Tech grading system:

90	–	100	=	A
80	–	89	=	B
70	–	79	=	C
0	–	69	=	F

Students should refer to the Student Handbook - https://www.dtcc.edu/handbook for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):

1. Set-up, conduct, and troubleshoot systems involving laser/optics applications.
2. Construct and test basic laser/optics subassemblies.
3. Perform maintenance and systems checks on laser/optics components/systems.

Disabilities Support Statement:
The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the disabilities services - https://www.dtcc.edu/disabilitysupport web page or visit the campus Advising Center.