

OPT-1310: THEORETICAL OPTICS I

Cuyahoga Community College

Viewing: OPT-1310 : Theoretical Optics I

Board of Trustees:

January 2024

Academic Term:

Fall 2024

Subject Code

OPT - Optical Technology

Course Number:

1310

Title:

Theoretical Optics I

Catalog Description:

Study of ophthalmic and geometric optics, modern lens theory and construction as it relates to design, fitting and dispensing of spectacles and contact lenses.

Credit Hour(s):

2

Lecture Hour(s):

2

Lab Hour(s):

0

Other Hour(s):

0

Requisites

Prerequisite and Corequisite

Departmental approval: admission to program.

Outcomes

Course Outcome(s):

Analyze and interpret spectacle and contact lens prescriptions.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Apply geometrical formulae to surfacing, finishing, and dispensing.
2. Describe refractive errors and how to correct them.
3. Demonstrate skills in prescription interpretation and analysis.

Course Outcome(s):

Apply ophthalmic and geometric optics to spectacle and contact lens design.

Objective(s):

1. Apply geometrical formulae to surfacing, finishing, and dispensing.
2. Demonstrate an understanding of how geometric optics are used in the fitting, fabrication and dispensing of contact lenses.

3. Describe modern lens design.
4. Describe the ophthalmic optics of refractive errors and how to correct them.
5. Describe the policies of Food and Drug Administration, (FDA) American National Standards Institute (ANSI), and Occupational Safety and Health Administration (OSHA) as it relates to the ophthalmic industry.

Course Outcome(s):

Calculate measurements necessary for the fabrication of single vision and multifocal spectacles.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Apply geometrical formulae to surfacing, finishing, and dispensing.
2. Demonstrate skills in prescription interpretation and analysis.

Course Outcome(s):

Discuss the theory of fitting and dispensing contact lenses.

Objective(s):

1. Apply geometrical formulae to surfacing, finishing, and dispensing.
2. Demonstrate an understanding of how geometric optics are used in the fitting, fabrication and dispensing of contact lenses.
3. Describe modern lens design.
4. Describe the policies of Food and Drug Administration (FDA), American National Standards Institute (ANSI), and Occupational Safety and Health Administration (OSHA) as it relates to the ophthalmic industry.

Course Outcome(s):

Describe professional and ethical guidelines that govern opticianry.

Objective(s):

1. Apply geometrical formulae to surfacing, finishing, and dispensing.
2. Describe the policies of Food and Drug Administration (FDA), American National Standards Institute (ANSI), and Occupational Safety and Health Administration (OSHA) as it relates to the ophthalmic industry.

Methods of Evaluation:

1. Exams
2. Group Projects
3. Participation
4. Homework

Course Content Outline:

1. Concepts:
 - a. English-metric conversion
 - b. Theories of light
 - c. Geometric laws of refraction
 - d. Ophthalmic optics
 - e. Refraction of light through a lens
 - f. Lens types
 - g. Lens characteristics
 - h. Focal length
 - i. Nominal power
 - j. Flat transposition

- k. Toric transposition
 - l. Optical cross notation
 - m. Spherocylinder
 - n. Base curve
 - o. Vertex compensation
2. Skills:
- a. Apply geometric formulae to lenses
 - b. Use a scientific calculator
 - c. Identify the proper geometric formulae to correct a specific lens anomaly
 - d. Identify and correct lens-specific errors in finishing, surfacing, and dispensing
 - e. Describe how corneal curvature determines the base curve of a contact lens
 - f. Determine a contact lens prescription from a spectacle prescription
 - g. Describe how American National Standards Institute (A.N.S.I.) standards regulations pertain to spectacles and contact lenses
 - h. Describe how regulations put forth by the United States Food and Drug Administration (F.D.A.) and the Federal Trade Administration (F.T.C.) pertain to spectacles and contact lenses
 - i. Describe how the Occupational Safety and Health Administration (O.S.H.A) enforces A.N.S.I. standards that pertain to spectacles.
3. Issues
- a. Refractive errors
 - b. Lab rejects and spoilage
 - c. Apply knowledge of spectacle design, fabrication and verification
 - d. Lens materials
 - e. A.N.S.I. and O.S.H.A. standards.

Resources

Brooks, C., O.D. (1992) *Understanding lens surfacing*, Elsevier.

Brooks, Clifford W. (2023) *System for ophthalmic dispensing*, Elsevier.

Brooks, Clifford W. (2003) *Essentials of ophthalmic lens finishing*, Butterworth/Heinmann.

Stoner, Ellen, Patricia Perkins, and Roy Ferguson. (2005) *Optical Formulas Tutorial*, Elsevier.

Resources Other

1. 20/20 <https://www.2020mag.com/>
2. American Optometric Association. <https://www.aoa.org/patients-and-public/caring-for-your-vision/contact-lenses?sso=y> (<https://www.aoa.org/patients-and-public/caring-for-your-vision/contact-lenses/?sso=y>)
3. Centers for Disease Control and Prevention. "Healthy Contact Lens Wear and Care." <https://www.cdc.gov/contactlenses/index.html> (<https://www.cdc.gov/contactlenses/>)
4. Eyecare Business <https://www.eyecarebusiness.com/>
5. Invision <https://invisionmag.com/>
6. Khan Academy. <https://www.khanacademy.org/>
7. Ophthobook <https://timroot.com/ophthobook/>
8. OptiBoard Forums. <http://www.optiboard.com/forums/>
9. Quantum Optical. <http://www.quantumoptical.com/> (<https://www.2020mag.com/>)
10. Review of Optometry. <https://www.reviewofoptometry.com/>
11. Vision Professionals Board <https://vision.ohio.gov/vision-professionals/optician/3-optician> (<https://vision.ohio.gov/vision-professionals/optician/3-optician/>)