

OPTH-120 PRINCIPLES OF OPTICS

This course includes the study of the concepts of geometric optics, and the principles and nature of light. These principles are applied in the study of how light behaves in practical optical systems including lenses, spherical and plane mirrors, Galilean and astronomical telescopes, prisms and the human eye.

III. Statement of Course Need:

- A. This is a required course for the Ophthalmic Science-AAS degree, and Ophthalmic Science (Opticianry) Certificate- Apprenticeship Option.
- B. This course is not designed for transfer.

IV. Place of Course in College Curriculum

- A. Free elective.
- B. This course will serve as a required course for the Ophthalmic Science-AAS degree, and Ophthalmic Science (Opticianry) Certificate-Apprenticeship Option. It is suggested that the course be taken in the student's third semester.

V. Outline of Course Content

- A. Nature of light, wave theory vs. corpuscular theory, history, terminology, velocity, frequency, period, wavelength, constructive and destructive interference, refraction, index of refraction, critical angle of refraction, dispersion, total internal reflection.
- B. Plane mirrors, law of reflection, image formation, electromagnetic spectrum, ultra-violet radiation and ocular damage, absorptive lenses, CPF lenses.
- C. Shadows, penumbra, umbra, types of light sources, illumination, foot candles, lumens, luminous flux, spherical mirrors – concave and convex, case studies, image formation, magnification and minification, field of view, calculations, cylindrical mirrors, parabolic mirrors.
- D. Dispersion, nu valves, specific gravity, axial chromatism, fraunhofer lines, achromatic doublets, prism, angular deviation, linear displacement, strabismus.
- E. Thin lenses, case studies, image formation, concave and convex lenses, magnification and minification, calculations, focal length, focal plane, focal point optical center, optical axis, vergence, surface power, thin lenses in contact.

F. Combinations of thin lenses, intermediate image method calculation, sign conventions, final image formation, magnification and minification, telescopes, applications, and calculations.

G. Lens aberrations – chromatic, coma spherical, curvature of field, distortion, marginal astigmatism, lensmaker equation, afocal lenses, iseikonic lenses, aniseikonia, antimetropia, anisometropia, back vertex power, astigmatic lenses, retinal image size.

VI. A. Course Learning Outcomes

At the completion of the course, students will be able to:

1. Analyze the image formation in lenses and lens systems (GE- 2).
2. Analyze the image formation in plane and spherical mirrors (GE- 2).
3. Demonstrate an understanding of the history, principles and characteristics of light propagation and its interaction with objects according to the standards presented in the course handout.
4. Explain the concepts of illumination and shadow formation and apply these principles to ophthalmic prescriptions.
5. Calculate the image formation of various basic optical systems. These systems will include thin lenses, spherical mirrors and prisms.
6. Calculate the image formation of more advanced optical systems. These systems include afocal lenses, thin lens systems, telescopes, astigmatic lenses and retinal image size.
7. Explain the cause and concept of Abbe values and their impact on the fitting of ophthalmic lenses.
8. Explain the nature, cause and treatment of ophthalmic lens aberrations.
9. Establish competency for the geometric and physiological optics portion of the New Jersey Ophthalmic Dispensing State Board Exam.

B. Assessment Instruments

1. research paper
2. written examinations

VII. Grade Determinants

A. examinations

Given the goals and outcomes described above, LIST the primary formats, modes, and methods for teaching and learning that may be used in the course:

- A. Lecture/discussion
- B. Small group work
- C. Computer assisted instruction

VIII. Texts and Materials

- A. course supplement which includes topical information, diagrams and exercises
- B. film and video
- C. web sources
- D. power point presentations

(Please Note: The course outline is intended only as a guide to course content and resources. Do not purchase textbooks based on this outline. The RVCC Bookstore is the sole resource for the most up-to-date information about textbooks.)

IX. Resources

- A. Computer access
- B. Projection equipment

X .Honors Option : N/A