**ESSEX COUNTY COLLEGE**

**Nursing and Allied Health Division**

**PHY 111 *–* Theory of Optics I**

**Course Outline**

**Course Number & Name:**  PHY 111 Theory of Optics I

**Credit Hours:**  3.0 **Contact Hours:**  3.0 **Lecture:** 3.0 **Lab:**  N/A **Other:**  N/A

**Prerequisites**:  acceptance into the Vision Care program

**Co-requisites:** None **Concurrent Courses:** None

**Course Outline Revision Date:** Fall 2010

**Course Description:** This course introduces the physics of optics and light. Topics include the nature of light, reflection, refraction, and image formation for simple optical systems. Laboratory experiments are demonstrated.

**Course Goals:** Upon successful completion of this course, students should be able to do the following:

1. define and explain fundamental concepts and theories of light; and
2. explain and apply basic physics concepts and formulae used in optics.

**Measurable Course Performance Objectives (MPOs)**: Upon successful completion of this course, students should specifically be able to do the following:

1. Define and explain fundamental concepts and theories of light:
   1. *list and explain the theories of the nature of light;*
   2. *list and describe the various properties of light;*
   3. *illustrate the visual spectrum within the electromagnetic spectrum;*
   4. *define wavelength, frequency, period of a wave, transparent, opaque, and translucent bodies, and optical media;*
   5. *explain the following terms: pencil of light, beam of light, ray of light and chief ray, as well as umbra and penumbra;* and
   6. *list the differences between diffuse and regular reflection*
2. Explain and apply basic physics concepts and formulae used in optics:
   1. *calculate mathematically and locate graphically the image of an object in front of both plane*

*and curved mirrors;*

* 1. *solve problems demonstrating Snell’s Law and finding the critical angle, as well as defining dispersion and Nu value;*
  2. *define all parameters relating to ophthalmic prisms and write the formula for deviation due to small angle prism;*
  3. *define and explain the following terms: vergences, focal point, optical center anterior and posterior focal points and focal lengths, and diopter;* and
  4. *write the formula for determining Dioptric power*

**Methods of Instruction**: Instruction will consist of lectures, demonstrations, guest speakers, and audio-visual aids.

**Outcomes Assessment:**  Test and exam questions are blueprinted to course objectives. Data is collected and analyzed to determine the level of student performance on these assessment instruments in regards to meeting course objectives. The results of this data analysis are used to guide necessary pedagogical and/or curricular revisions.

**Course Requirements:** All students are required to:

1. Maintain regular attendance.
2. Complete assigned homework on time.
3. Take part in class discussions.
4. Take all tests and exams given.

**Methods of Evaluation:** Final course grades will be computed as follows:

**% of**

**Grading Components final course grade**

* 3 or more Written Tests (dates specified by the instructor) 75%

Tests will show evidence of the extent to which students meet course objectives, including but not limited to identifying and applying concepts, analyzing and solving problems, and stating appropriate conclusions using correct terminology.

* **1 Written Final Exam** **25%**

The same objectives apply as with tests, but it is anticipated that students will provide increased evidence of synthesizing a combination of concepts.

Note: Students must obtain an overall average of at least 70% to pass the course.

**Academic Integrity:** Dishonesty disrupts the search for truth that is inherent in the learning process and so devalues the purpose and the mission of the College.  Academic dishonesty includes, but is not limited to, the following:

* plagiarism – the failure to acknowledge another writer’s words or ideas or to give proper credit to sources of information; could result in a
* cheating – knowingly obtaining or giving unauthorized information on any test/exam or any other academic assignment;
* interference – any interruption of the academic process that prevents others from the proper engagement in learning or teaching; and
* fraud – any act or instance of willful deceit or trickery.

Violations of academic integrity will be dealt with by imposing appropriate sanctions.  Sanctions for acts of academic dishonesty could include the resubmission of an assignment, failure of the test/exam, failure in the course, probation, suspension from the College, and even expulsion from the College.

**Student Code of Conduct:** All students are expected to conduct themselves as responsible and considerate adults who respect the rights of others. Disruptive behavior will not be tolerated. All students are also expected to attend and be on time all class meetings. No cell phones or similar electronic devices are permitted in class. Please refer to the Essex County College student handbook, *Lifeline*, for more specific information about the College’s Code of Conduct and attendance requirements.

**Course Content Outline:** based on the text **Optical Formulas Tutorial**, 2nd edition, by Stoner, Perkins, and Ferguson; published by Butterworth and Heinemann; ISBN #: 13 978-0-7506-7504-8

**Week Class Topics/Reading Assignments**

1. Brief history of optics

Read section I & II and handouts

1. Definitions and concepts of light

Homework problems

1. Discuss wave motion, velocity, wavelength frequency, etc.

Homework problems

1. Study types of optics & discuss vergence & interaction of light with an object

Read Section III and handouts

1. **Test 1**

6 Go over Test 1

Discuss Snell’s law & critical angles

Read section IV

Homework problems

7 Radius of curvature formula & lens makers formula and apparent & actual depth

Homework problems

8 Lens abberations, abbe values, and full and partial shadows & illumination Homework problems

9 **Test 2**

10 Go over Test 2

Discuss laws of refraction and reflection

Read section VII and handouts

Homework problems

11 Discuss plane and spherical mirrors and light tracing and image formation

Homework problems

12 Discuss spherical thin lenses and image formation

Homework problems

13 **Test 3**

14 Go over Test 3

Discuss double lens systems, spherical equivalent, interval of Sturm, and circle of least confusion

Review for Final Exam

15 **Final Exam**