

# GE1342: LIGHT: FROM DOUBLE RAINBOWS TO OPTICAL FIBERS

---

## Effective Term

Semester B 2024/25

## Part I Course Overview

### Course Title

Light: from Double Rainbows to Optical Fibers

### Subject Code

GE - Gateway Education

### Course Number

1342

### Academic Unit

Electrical Engineering (EE)

### College/School

College of Engineering (EG)

### Course Duration

One Semester

### Credit Units

3

### Level

B1, B2, B3, B4 - Bachelor's Degree

### GE Area (Primary)

Area 3 - Science and Technology

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

Nil

### Precursors

Nil

### Equivalent Courses

Nil

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

In this course, students will learn, understand and appreciate the basic properties and unique applications of light. This GE course is about optical phenomena. What is a double rainbow? What gives a peacock its fascinating color? Does optical fiber have anything to do with your smart phone? How do blue lasers help the CD industry to stay competitive? The wonderful optical phenomena in nature, milestones in optical discoveries over the century, and optical inventions that drastically shaped the modern world will be discussed, and students will acquire a qualitative appreciation of optics in everyday life through lectures and group presentations.

### Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 DEC-A2 DEC-A3 app.)			
1	Explain and demonstrate optical phenomena in nature, such as the rainbow and the blue sky from simple optical principles.		x	x	x
2	Describe inventions related to optics that change the world, such as the optical fiber and lasers as breakthrough discoveries that solve real-life problems.			x	x
3	Explain how optical discoveries shaped the modern philosophy in science with new methodologies and devices.		x	x	x
4	Describe the impacts of optical inventions in technology, science, and social context.			x	x

#### A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

#### A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

#### A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

### Learning and Teaching Activities (LTAs)

LTAs	Brief Description	CILO No.	Hours/week (if applicable)	
1	Lecture	Students will engage in lecture activities about basic concepts and applications of light.	1, 2, 3, 4	3 hrs/wk

2	Laboratory	Students will participate in a guided tour of the optoelectronic laboratories and high-tech clean room facilities to fabricate optical devices. Students will engage in hands-on demonstrations of various representative optical experiments.	1, 2	
3	Group Discussions	Students will be organized into groups for brain storming sessions. In addition to discussing course materials, each group will also work together on the group-based presentation topic provided by the course instructor. By holding these sessions as part of the curriculum time, guidance is afforded to students in their discussions by the instructor.	1, 2, 3, 4	
4	Group Presentation	Each team will present their findings of the group projects to the rest of the class.	1, 2, 3, 4	

**Assessment Tasks / Activities (ATs)**

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tests (min.: 2)	1, 2, 3, 4	30	
2	#Assignments (min.: 3)	1, 2, 3, 4	30	

**Continuous Assessment (%)**

60

**Examination (%)**

40

**Examination Duration (Hours)**

2

**Additional Information for ATs**

Remark: To pass the course, students are required to achieve at least 30% in continuous assessment and 30% in the examination. #may include homework, tutorial exercise, project/min-project, presentation

**Assessment Rubrics (AR)****Assessment Task**

Tests

**Criterion**

Achievements in CILOs

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

---

**Assessment Task**

Presentation and report

**Criterion**

Achievements in CILOs

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

---

**Assessment Task**

Examination

**Criterion**

Achievements in CILOs

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

## Part III Other Information

**Keyword Syllabus**Optics in the sky

Rainbows, blue sky, dispersion, reflection and refraction, scattering, waves and interference, cameras and lenses, adaptive optics and astronomy.

Optical fibers

History of optical fibers, submarine optical cables, fiber-to-the-home.

Lasers

Einstein and lasers, particle nature of light, blue laser materials, patent issues and lawsuits.

Solar power

Solar cells, photovoltaic materials, efficiency issues.

Nanotechnology and Bioimaging

Photonic crystals, synthetic photonic crystals, micro- and nano-structures, butterflies and peacock feathers, photonic metamaterials, microscopes.

**Reading List****Compulsory Readings**

Title	
1	Nil

**Additional Readings**

Title	
1	Grant R. Fowles, "Introduction to Modern Optics," Dover Books (1989)
2	David R. Falk et al., "Seeing the Light: Optics in Nature, Photography, Color, Vision, and Holography," Wiley & Sons Inc. (1986)
3	Robert D. Guenther, "Modern Optics" , Wiley (1990) QC355.2 .G84 1990
4	Eugene Hecht, "Optics" , Addison-Wesley (1998) QC355.2 .H42
5	<a href="http://science.howstuffworks.com/optics-channel.htm">http://science.howstuffworks.com/optics-channel.htm</a>

## Annex (for GE courses only)

**A. Please specify the Gateway Education Programme Intended Learning Outcomes (PILOs) that the course is aligned to and relate them to the CILOs stated in Part II, Section 2 of this form:**

Please indicate which CILO(s) is/are related to this PILO, if any (can be more than one CILOs in each PILO)

**PILO 1: Demonstrate the capacity for self-directed learning**

**PILO 2: Explain the basic methodologies and techniques of inquiry of the arts and humanities, social sciences, business, and science and technology**

1, 2

**PILO 3: Demonstrate critical thinking skills**

1, 2, 3, 4

**PILO 4: Interpret information and numerical data**

1, 2

**PILO 6: Demonstrate effective oral communication skills**

3, 4

**PILO 10: Demonstrate the attitude and/or ability to accomplish discovery and/or innovation**

1, 2, 3, 4

**B. Please select an assessment task for collecting evidence of student achievement for quality assurance purposes. Please retain at least one sample of student achievement across a period of three years.**

**Selected Assessment Task**

Final examination