

GE1338: SEEING IS BELIEVING, OR IS IT?

Effective Term

Semester B 2022/23

Part I Course Overview

Course Title

Seeing is Believing, or is it?

Subject Code

GE - Gateway Education

Course Number

1338

Academic Unit

Materials Science and Engineering (MSE)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

A1, A2 - Associate Degree

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

The student will discover some amazing science about image formation and how we see and interpret the world surrounding us. The course first addresses the nature of light and image formation which is followed by an exploration on innovative ways used by scientists to visualize our universe based on other forms of energy – from sound used to form the sonogram of an unborn baby to the energetic gravitational waves originating from the collision of distant black holes sending ripples through space-time across the universe. The basic features of image formation and interpretation will be discussed as powerful motivators for student innovation; this will include selected examples of applications in disciplines such as creative media, art, mathematics, materials science, physics, or biology. The student will discover ways in which images shape our understanding of the universe from the nanoworld to the cosmos.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe and explain the physical principles involved in image formation and scientific visualization		x	x	
2	Identify the principal processes necessary for visual stimulus formation, perception, and interpretation.		x	x	
3	Critically discuss the uses of visual media for human kind and the settlement of inconsistent human rights and social standards		x	x	
4	Discover ways in which images shape our life and provide innovative assessments on how to use, or modify, the way we see/explore our world in the scientific, social and legal contexts		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.

Teaching and Learning Activities (TLAs)

TLAs	Brief Description	CILO No.	Hours/week (if applicable)	
1	Lectures	Explain key concepts and theories.	1, 2, 3, 4	2
2	Tutorials	Provide additional explanations and examples. Provide guidance for the project.	1, 2, 3, 4	1

3	Project	Practice the ability to engage in long term self-directed learning, demonstrate and communicate the results of critical thinking, and team work.	1, 2, 3, 4	3 hrs/week for 3 weeks
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Assessment Tasks / Activities (ATs)

ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)	
1	Quizzes	1, 2	30	Demonstrate scientific knowledge related to seeing: scientific and general understanding of image formation, scientific visualization, perception and interpretation.
2	Report assignment and debate	3, 4	20	Assess critical reading and informed appreciation for scientific, legal, cultural aspects of images and its uses
3	Project++	1, 2, 3, 4	50	Demonstrate capacity for (1) self-directed learning, (2) produce structured and fluent text, and (3) presentation skills in public

Continuous Assessment (%)

100

Examination (%)

0

Assessment Rubrics (AR)**Assessment Task**

Quizzes

Criterion

The student can thoroughly identify and explain main theories and ideas associated to the science, legal aspects, art and culture of seeing.

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not reaching marginal level

Assessment Task

Report assignment and debate

Criterion

Ability to sustain an informed discussion, demonstrate critical thinking skills to argue and defending own ideas and position.

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

Project

Criterion

Capacity for self-directed learning and ability to explain key findings, theories, and concepts related to the subject of study.

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

- Properties of light, principles of image formation, optical instrumentation, imaging in science.
- Optical illusions, visual perception and visual effects
- Seeing or perceiving? Art and magic
- Seeing multidimensional spaces: projection and alternative perspectives.
- Use, abuse and defense of images - issues of freedom of expression, unregulated advertisement, image in religion-, cultural- and national identities.
- The selling power of images, branding, advertisement.

Reading List

Compulsory Readings

Title	
1	Hoffman, Donald D., “Visual intelligence : how we create what we see” New York : W.W. Norton, c1998.

Additional Readings

Title	
1	Graham Saxby. “The science of imaging: an introduction” Bristol ; Philadelphia : Institute of Physics Pub., c2002.
2	Zenon W Pylyshyn “Seeing and visualizing: it's not what you think” , Cambridge, Mass. MIT Press, c2003
3	Michael F. Land and Dan-Eric Nilsson, “Animal eyes” Oxford ; New York : Oxford University Press, 2012. 2nd ed.
4	Edwin Abbott, “Flatland: a romance of many dimensions” Oxford; New York: Oxford University Press, 2006.
5	Felipe Cucker, “Manifold mirrors : the crossing paths of the arts and mathematics” Cambridge University Press, 2013.
6	George . C Christie. “Philosopher Kings? The Adjudication of Conflicting Human Rights and Social Values” Oxford University Press 2011
7	Rhona K. M Smith, “Textbook on International Human Rights” Oxford University Press 2010

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

1, 2, 3, 4

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

1, 2, 3, 4

PILO 3: Demonstrate critical thinking skills

4

PILO 4: Interpret information and numerical data

1, 2, 3, 4

PILO 8: Recognise important characteristics of their own culture(s) and at least one other culture, and their impact on global issues

4

PILO 9: Value ethical and socially responsible actions

3, 4

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

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

Project (individual report)