



Module Title Engineering Optics	Module Code MSDE 474	Semester (Sem 1 / Sem 2) Sem 2
Credits 10	Level 6	Professor and email Gwanho Yoon gwanho@seoultech.ac.kr
Delivery Method Lecture / Exam / Lab	Delivery Location SeoulTech, Mugung Hall	

Module Synopsis

This module helps students to understand the science and engineering knowledge and theories of optics. Students learn about properties of light and its mathematical model, optical components and their characteristics, geometric and wave optics which include lenses, mirrors, interferometers, polarization, and diffraction. The learning outcomes are the ability to use mathematical methods relevant to optics, designing an optical system, and demonstrating its feasibility through testing or simulation. Assessment is done through a final examination and a project that explores computer simulation methods to design and evaluate optical components.

Outline Syllabus

Introduction and History of Optics

History of optics, Wave or particle. Electromagnetic theory.

Properties of Light

Rayleigh scattering. Reflection and refraction. Internal reflection. Fermat's theory. Optical properties of metals.

Geometric Optics

Thick and thin lens theories. Optical systems. Ray tracing. Aberrations. Lenses, Stops, Mirrors, Prisms, and Fibber

Wave Motion

Harmonic wave. Phase and phase velocity. Superposition principle. Addition of waves. Plane, spherical, and cylindrical waves

Interference

Conditions of interference. Wavefront-splitting and amplitude-splitting interferometers. Interference fringes. Applications of interferometers. Coherence

Polarization

Polarized light. Polarizers. Dichroism. Birefringence. Retarders.

Diffraction



Fraunhofer diffraction. Fresnel diffraction. Kirchhoff's diffraction.

Fourier Optics

Fourier transforms. Optical applications

Indicative Reading

- 1) Introduction to Optics, Frank L. Pedrotti, L. M. Pedrotti, and L. S. Pedrotti, Pearson Education Ltd., 2006.
- 2) Optics, 4th edition, Eugene Hecht, Addison Wesley, 2002.
- 3) Introduction to Fourier Optics, Joseph W. Goodman, Roberts & Company, 2006.

NOTIONAL STUDENT WORKLOAD	Hours
MODE OF DELIVERY (FT / PT / DL)	FT
Lectures	35
Seminars	
Tutorials	
Laboratories/studios/practical	15
Directed learning	
Independent Learning	50
Work experience/fieldwork	
Other: eg formal presentation	0
Total Workload 100 hours for a 10 credit module 200 hours for a 20 credit module	100



Module Outcomes	
KU1,3	KU1. Evaluate and apply complex knowledge of the scientific and mathematical principles of mechanical engineering to solve Real-World problems. KU3. Introduce and utilise complex methodologies to create solutions to a variety of Real-World engineering problems.
IPSA1	IPSA1. Apply advanced approaches to solving unfamiliar real world mechanical engineering problems.
PVA2	PVA2. Critically analyse advanced solutions to complex engineering problems.

Assessments	Assessment Type	Weighting %	Mid-Term/interim/final
Laboratory	Group report (Less than 5000 words)	15	Interim
Exam	Final exam (120 min)	55	Final
Presentation	Presentation (10 min)	30	Interim