Seoul National University of
Science & Technology
232 Gongneung-ro,Nowon-gu,
Seoul 01811 Korea

MSDE Module Descriptor

Module Title Engineering Optics	**Module Code** MSDE 474	**Semester (Sem 1 / Sem 2)** Sem 2
Credits 10	**Level** 6	**Professor and email** Wonjong JOO joo@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, 5 short experiments, and a project that explores an optical method for the measurement of a mechanical property with a high precision.

Outline Syllabus

Introduction and History of Optics B
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. Birefrigence. 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, Josept W. Goodman, Roberts & Company, 2 006.

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

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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**
Coursework			
Project			
Quiz			
Test			
Laboratory	5 experiments / group lab report / 5pages each	15	Interim
Exam	Final exam / 3hr	55	Final
Presentation	2 Presentations (7 and 10min) + 2 Reports (5 and 10 pages)+ Reflection (journal)	30	Midterm/Final